Graduate School of Arts and Sciences *Programs and Policies*

2024-2025



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Contents

The President and Fellows of Yale University 7 The Officers of Yale University 8 The Administration of the Graduate School 9 Schedule of Academic Dates and Deadlines 10 A Message from the Dean 13 The Graduate School of Arts and Sciences 14 Mission Statement 14 Yale and the World 15 The Dean 16 Deputy Dean 16 Associate and Assistant Deans for Academic Affairs 16 Directors of Graduate Studies (DGS) 17 Graduate Student Development and Diversity 17 McDougal Graduate Student Center 17 Admissions 18 Financial Aid 19 Registrar's Office 19 Teaching Fellow Program 19 Committees 20 Graduate Student Assembly (GSA) 20 Graduate-Professional Student Senate (GPSS) 20 Degree-Granting Departments and Programs 22 African American Studies 23 African Studies 30 American Studies 37 Anthropology 49 Applied Mathematics 60 Applied Physics 64 Archaeological Studies 70 Architecture 74 Astronomy 83 Biomedical Engineering 87 Cell Biology 88 Cellular and Molecular Physiology 93 Chemical and Environmental Engineering -98 Chemistry 99 Classics 108 Comparative Literature 121 Computational Biology and Biomedical Informatics 135 Computer Science 141 Early Modern Studies 151 Earth and Planetary Sciences 164 East Asian Languages and Literatures 169

East Asian Studies 176 Ecology and Evolutionary Biology 184 Economics 188 Electrical and Computer Engineering 198 Engineering & Applied Science 199 English Language and Literature 223 Environment 234 European and Russian Studies 238 Film and Media Studies 243 French 250 Genetics 255 Germanic Languages and Literatures 262 History 268 History of Art 284 History of Science and Medicine 294 Immunobiology 304 Interdepartmental Neuroscience Program 312 International and Development Economics 318 Investigative Medicine 320 Italian Studies 324 Law 327 Linguistics 330 Management 341 Mathematics 358 Mechanical Engineering and Materials Science 364 Medieval Studies 366 Microbiology 371 Molecular Biophysics and Biochemistry 375 Molecular, Cellular, and Developmental Biology 384 Music 392 Near Eastern Languages and Civilizations 397 Nursing 413 Pathology and Molecular Medicine 417 Pharmacology 422 Philosophy 427 Physics 434 Political Science 442 Psychology 453 Public Health 462 Religious Studies 491 Slavic Languages and Literatures 498 Sociology 505 Spanish and Portuguese 510 Statistics and Data Science 514 Translational Biomedicine 524 Women's, Gender, and Sexuality Studies 529

Non-Degree-Granting Programs, Councils, and Research Institutes 539 Archaia 540 Atmospheric Science 543 Biological and Biomedical Sciences (BBS), Combined Program in the 544 College Teaching Preparation 547 Cowles Foundation 550 Economic Growth Center 551 Environmental Humanities 552 Ethnicity, Race, and Migration 555 Film and Media Studies 557 Graduate School of Arts and Sciences (GSAS) Summer Programs 559 Institution for Social and Policy Studies 560 Jewish Studies 561 Leadership and Research Management for Physician-Scientists 563 The MacMillan Center 564 African Studies, Council on 569 East Asian Studies, Council on 571 European Studies Council 573 Latin American and Iberian Studies, Council on 576 Middle East Studies, Council on 579 South Asian Studies Council 581 Southeast Asia Studies, Council on 584 Material Histories of the Human Record 586 Medical Research Scholars Program 589 Physical and Engineering Biology (PEB), Integrated Graduate Program in 591 Public Humanities 594 Quantum Materials Science and Engineering 597 Second Language Acquisition 599 Translation Studies 601 Women's, Gender, and Sexuality Studies 604 Yale Center for the Study of Globalization 606 Policies and Regulations 607 Admissions 607 Programs of Study 609 Full-Time Degree Candidacy 609 Part-Time Study 609 Nondegree Study 609 Interdisciplinary Study 610 Combined- and Joint-Degree Programs 610 Cooperative Degree Program 611 Exchange Scholar Program 612 International Graduate Student Exchange Agreements 612 Summer Study 613 Degree Requirements 591

Requirements for the Degree of Doctor of Philosophy 614 Requirements for the Degree of Master of Philosophy 620 Requirements for the Degree of Master of Arts or Master of Science 620 Requirements for Joint-Degree Programs 622 Professional Ethics and Responsible Conduct in Research 625 Petitioning for Degrees 626 Academic Regulations 627 Registration 627 Course Enrollment 629 Grades 630 Registration Status and Leaves of Absence 631 Personal Conduct and Academic Integrity Standards 639 Freedom of Expression 644 Recordings by Faculty, Staff, Students, and Invited Guests 646 Postering, Chalking, and Publicity Policy 646 Financing Graduate School 648 Tuition and Fees, 2024–2025 648 Student Accounts and Billing 649 Interruption or Temporary Suspension of University Services or Programs 651 Financial Aid 651 External Fellowships and Combined Award Policy 655 Eligibility for Fellowships 657 Other Means of Financing Graduate Education 657 Two Federal Regulations Governing Title IV Financial Aid Programs 658 Satisfactory Academic Progress 658 Department of Education Refund Policy 658 Yale University Resources and Services 659 Identification Cards 659 Health Services 659 Student Accessibility Services 664 Office of International Students and Scholars 665 Resources to Address Discrimination, Harassment, and Sexual Misconduct 665 The Work of Yale University 669 Campus Map 672

THE PRESIDENT AND FELLOWS OF YALE UNIVERSITY

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Maurie McInnis, B.A., M.A., Ph.D.

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THE OFFICERS OF YALE UNIVERSITY

President

Maurie McInnis, B.A., M.A., Ph.D.

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THE ADMINISTRATION OF THE GRADUATE SCHOOL

OFFICE OF THE DEAN

Lynn Cooley, Ph.D., Dean of the Graduate School Leah Jehan, Senior Executive Assistant to the Dean

ACADEMIC AFFAIRS

Pamela Schirmeister, Ph.D., Deputy Dean, Graduate School; Deputy Dean and Dean of Undergraduate Education and Senior Associate Dean, Yale College
Michelle Nearon, Ph.D., Senior Associate Dean and Director, Office for Graduate Student Development and Diversity
John Alvaro, Ph.D., Associate Dean for the Biological and Biomedical Sciences
Jasmina Besirevic Regan, Ph.D., Associate Dean for Graduate Education
Allegra di Bonaventura, J.D., Ph.D., Associate Dean for Graduate Academic Support
Robert Harper-Mangels, Ph.D., Associate Dean for Admissions and Financial Support
Sarah Insley, Ph.D., Assistant Dean for Graduate Education
Ksenia Sidorenko, Ph.D., Assistant Dean for Academic Support and Outreach
Suzanne Young, Ph.D., Assistant Dean for Graduate Student Professional Development

GRADUATE ADMISSIONS

Leah Phinney, M.B.A., Director of Admissions Lisa Furino, Assistant Director of Admissions

FINANCIAL AID

Kerry Worsencroft, B.S., Director of Financial Aid Kellie Webb, A.A., Assistant Director of Financial Aid Matthew Regan, M.B.A., Assistant Director, Teaching Fellow Program

ADMINISTRATION

Mary Magri, M.B.A., Senior Director of Finance and Administration Theresa Pierson, M.B.A., Director of Staff Operations Linda Reyes, M.B.A., Manager of Budgets and Financial Analysis Jennifer Medina, M.B.A., Manager of Finance and Administration Eduardo Cienfuegos Fernandez, M.B.A., Financial Analyst

OTHER ACADEMIC OFFICERS WITH RESPONSIBILITIES IN THE GRADUATE SCHOOL

Maurie McInnis, Ph.D., President Scott Strobel, Ph.D., Provost Tamar S. Gendler, Ph.D., Dean of the Faculty of Arts and Sciences Jeffery Brock, Ph.D., Dean of the School of Engineering & Applied Science

SCHEDULE OF ACADEMIC DATES AND DEADLINES

The following dates are subject to change as the university makes decisions regarding the 2024–2025 academic year. Changes will be posted online on the graduate school's website.

FALL TERM 2024

М	New student orientation week begins (mandatory)
М	Add/drop period opens, 8 a.m.
W	Fall-term classes begin
F	Monday classes meet on Friday
	Due date to notify department of intention to submit dissertation for award of
	the Ph.D. in December
	December
М	Labor Day. Classes do not meet
Т	Add/drop period ends, 5 p.m.
	Final day for registration. A fee of \$50 is assessed for course schedules accepted after this date
	Final day to apply for a fall-term personal leave of absence.
	The entire fall-term tuition charge or continuous registration fee (CRF) will
	be canceled for students who withdraw from the graduate school on or before
117	this date, or who are granted a leave of absence effective on or before this date
VV	Final day to apply for a fail-term personal leave of absence The entire fall-term tuition charge or continuous registration fee (CRE) will
	be cancelled for students who withdraw from the graduate school on or before.
	this date or who are granted a leave of absence effective on or before this date
SA	One-half of the fall-term full tuition charge will be canceled for students who
	withdraw from the graduate school on or before this date, or who are granted
	a medical leave of absence effective on or before this date. The CRF is not
-	prorated
1	Due date for dissertations to be considered by the Degree Committee for
	Final date for the faculty to submit grades to replace grades of Temporary
	Incomplete (TI) awarded during the previous academic year
Т	October recess begins after last academic obligation
М	Classes resume
F	Midterm
	Final day to change enrollment in a fall-term course from Credit to Audit or
	from Audit to Credit
	Final day to withdraw from a fall-term course
	who withdraw from the graduate school on or before this date, or who are
	granted a medical leave of absence effective on or before this date. The CRF is
	not prorated
	M M F M T W SA T T T M F

Oct. 31	TH	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in December
Nov. 6	W	Final day to withdraw a degree petition for degrees to be awarded in December
Nov. 8	F	Deadline for departments to return Degree Recommendation Forms for December degrees to registrar
Nov. 15	F	Registration for spring term 2025 opens, 8 a.m.
Nov. 22	F	November recess begins after last academic obligation
Dec. 2	М	Classes resume
Dec. 4	W	Final day to submit petitions for extended registration and Dissertation Completion Status for the spring term
Dec. 12	TH	Classes end Final examinations begin
Dec. 18	W	Examinations end Winter recess begins after last academic obligation
Dec. 19	TH	Registration for spring term 2025 closes, 5 p.m. Date of December degree award

SPRING TERM 2025

Jan. 3	F	Final grades for fall-term courses due Final day that faculty may submit a request for the assignment of a grade of Temporary Incomplete
Jan. 6	М	Add/drop period opens, 8 a.m.
Jan. 13	М	Spring-term classes begin
Jan. 20	М	Martin Luther King, Jr. Day. Administrative offices are closed. Classes do not meet
Jan. 22	W	Add/drop period closes, 5 p.m. A fee of \$50 is assessed for course schedules accepted after this date
Jan. 24	F	Monday classes meet
Jan. 27	М	Final day to apply for a spring-term personal leave of absence The entire spring-term tuition charge or continuous registration fee (CRF) will be canceled for students who withdraw from the graduate school on or before this date, or who are granted a leave of absence effective on or before this date
Feb. 6	TH	One-half of the spring-term full tuition charge will be canceled for students who withdraw from the graduate school on or before this date, or who are granted a medical leave of absence effective on or before this date. The CRF is not prorated
Feb. 14	F	Due date to notify department of intention to submit dissertation for award of the Ph.D. in May Final day to file petitions for M.A., M.S., and M.Phil. degrees to be awarded in May

Mar. 7	F	Midterm
		Spring recess begins after last academic obligation
		Final day to change enrollment in a spring-term course from Credit to Audit or from Audit to Credit
		Final day to withdraw from a spring-term course
		One-quarter of the spring-term full tuition charge will be canceled for students who withdraw from the graduate school on or before this date, or who are granted a medical leave of absence effective on or before this date. The CRF is not prorated
Mar. 15	SA	Due date for dissertations to be uploaded to DPRS for consideration by the Degree Committee for award of the Ph.D. in May
Mar. 24	М	Classes resume
Apr. 11	F	Registration for fall term 2025 opens, 8 a.m.
Apr. 15	Т	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in May
Apr. 17	TH	Deadline for departments to return Degree Recommendation Forms for May degrees to registrar Final day to withdraw a degree petition for degrees to be awarded in May
Apr. 18	F	Good Friday, Administrative offices closed, Classes meet
May 1	TH	Classes end Final examinations begin
May 7	W	Final examinations end
May 9	F	Final grades for spring-term courses are due for candidates for terminal M.A. and M.S. degrees to be awarded at Commencement
May 16	F	Registration for fall term 2025 closes, 5 p.m.
May 18	SU	Graduate School Convocation
May 19	М	University Commencement Date of May degree award
May 28	W	Final grades for spring-term and full-year courses due Final day that faculty may submit a request for the assignment of a grade of Temporary Incomplete
June 4	W	Final day to submit petitions for extended registration and Dissertation Completion Status for the fall term

A MESSAGE FROM THE DEAN

Welcome to the Graduate School of Arts and Sciences at Yale University, the first of its kind in North America. The graduate school stands at the very heart of Yale's mission as a university, and this publication, *Programs and Policies*, reveals the extraordinary breadth of opportunities for graduate study at Yale. As you peruse it, you likely will discover the intriguing ways in which graduate study differs from the undergraduate experience and the fulfillment brought by this intellectual progression. You have undertaken to explore a field in depth, master an area of inquiry, and learn to disseminate knowledge through classroom teaching. Graduate education culminates in a creative and original contribution in one's field of study representing the ability to participate in the advancement of human knowledge.

Yale's departments and programs constitute the center for most graduate student intellectual and social life at Yale. They comprise vital communities of faculty and students from around the world and with diverse backgrounds who share a common interest in advancing a particular discipline. Graduate students and faculty alike gain immeasurably from their intellectual and disciplinary collaborations. Yale's excellent laboratory facilities, unique museum collections, and tremendous library holdings all enrich the experience of a Yale University graduate education.

The Graduate School of Arts and Sciences has worked to extend and enrich the community life found within these disciplines. Interdisciplinary programs and institutes, as well as the events offered through the McDougal Graduate Student Center, the Office for Graduate Student Development and Diversity, the Office of Career Strategy, and the Poorvu Center for Teaching and Learning help graduate students prepare for their professional lives. The graduate school enables students to connect with skilled experts with a shared commitment to careers in teaching, research, and an array of potential leadership opportunities.

Use *Programs and Policies* as a guide throughout your graduate study at Yale. It includes practical information about registration, financial aid, teaching experiences, university resources available to you, and the full range of assistance provided by the graduate school. All of us in the graduate school wish you good fortune as you pursue your advanced degree, and we want you to contact us if we can help you along the way. Graduate study is exhilarating and life changing. For well over a century Yale has prepared students for truly extraordinary careers across many old, new, and evolving disciplines.

Lynn Cooley, Ph.D. Dean, Graduate School of Arts and Sciences Vice Provost for Postdoctoral Affairs C.N.H. Long Professor of Genetics and Professor of Cell Biology and of Molecular, Cellular, and Developmental Biology

THE GRADUATE SCHOOL OF ARTS AND SCIENCES

The Yale Graduate School of Arts and Sciences is one of fifteen schools composing Yale University and the only one that awards the degrees of Doctor of Philosophy, Master of Philosophy, Master of Arts, and Master of Science. The work of the graduate school is carried on in the divisions of the Humanities, Social Sciences, Biological Sciences, and Physical Sciences and Engineering. Fifty-eight departments and programs offer courses of study leading to the Ph.D. degree. Eighteen departments and programs offer terminal master's degrees.

Yale began to offer graduate education in 1847, and in 1861 it conferred the first Ph.D. degrees in North America. In 1876 Yale became the first American university to award the Ph.D. to an African American. The Graduate School of Arts and Sciences was formally established in 1892, when the first dean was appointed. It was in that same year that women were first admitted as candidates for the doctorate.

The graduate-school community has grown vigorously since the early twentieth century; today it comprises more than 3,500 graduate students and a faculty of over 1,100 who are among the world's most distinguished teachers and scholars. Admission to the graduate school is highly competitive; currently each entering class is made up of about 700 students.

The graduate school's purpose is to educate students in research, scholarship, and teaching in the arts and sciences. Under the guidance of the faculty, graduate students engage in advanced study of a discipline and then proceed to generate new knowledge and ideas through research. They learn to disseminate this knowledge in scholarly publications and teaching. Yale's graduate students have built careers in colleges and universities, research laboratories, government, the nonprofit sector, and private industry. Their education equips them for leadership roles in each of these callings.

Yale's standing as a great international research university is based on the strength and reputation of its graduate programs. The pursuit of advanced learning and new knowledge takes place in the departments and programs of the graduate school. Thus, it is the graduate school that makes Yale a university. Furthermore, graduate students as scholars and teachers in training engage with undergraduates and the faculty. A shared sense of common purpose makes Yale a community of scholars and a center of vibrant, intellectual exchange.

Mission Statement

The Graduate School of Arts and Sciences educates graduate students to seek answers to life's most challenging questions by leading in the advancement, application, and preservation of knowledge. We carry out this mission by investing in and drawing upon the strengths of a collaborative, diverse, and inclusive community of scholars and researchers.

Yale and the World

The Yale Graduate School has always comprised an international community, but it recognizes as well that now, more than ever, advanced scholarship must occur on transnational grounds. It is increasingly important that we prepare our students to participate in a global economy of research and knowledge and that we create institutional channels through which such participation can flourish. In addition to formal student exchanges that enable graduate students to perform research and fieldwork abroad, individual faculty members, departments, and the school participate in collaborative efforts with international partners.

Over forty percent of full-time graduate students at Yale come from outside the United States. In addition, many international students come to the graduate school as nondegree students in the Division of Special Registration (DSR). DSR students may undertake course work and/or research for periods of one term or one year. When appropriate the period may extend for a second year. These students are subject to the usual admissions procedure, are admitted to a department, and often work with a specific faculty member.

A GLOBAL UNIVERSITY

Global engagement is core to Yale's mission as one of the world's great universities. Yale aspires to:

- · Be the university that best prepares students for global citizenship and leadership
- · Be a worldwide research leader on matters of global import
- · Be the university with the most effective global networks

Yale's engagement beyond the United States dates from its earliest years. The university remains committed to attracting the best and brightest from around the world by offering generous international financial aid packages, conducting programs that introduce and acclimate international students to Yale, and fostering a vibrant campus community.

Yale's globalization is guided by the vice provost for global strategy, who is responsible for ensuring that Yale's broader global initiatives serve its academic goals and priorities, and for enhancing Yale's international presence as a leader in liberal arts education and as a world-class research institution. The vice provost works closely with academic colleagues in all of the university's schools and provides support and strategic guidance to the many international programs and activities undertaken by Yale faculty, students, and staff.

Teaching and research at Yale benefit from the many collaborations underway with the university's international partners and the global networks forged by Yale across the globe. International activities across all Yale schools include curricular initiatives that enrich classroom experiences from in-depth study of a particular country to broader comparative studies; faculty research and practice on matters of international importance; the development of online courses and expansion of distance learning; and the many fellowships, internships, and opportunities for international collaborative research projects on campus and abroad. Together these efforts serve to enhance Yale's global educational impact and are encompassed in the university's global strategy. The Office of International Affairs (https://world.yale.edu/oia) provides administrative support for the international activities of all schools, departments, centers, and organizations at Yale; promotes Yale and its faculty to international audiences; and works to increase the visibility of Yale's international activities around the globe. OIA also coordinates Yale's program for hosting scholars at risk.

The Office of International Students and Scholars (https://oiss.yale.edu) hosts orientation programs and social activities for the university's international community and is a resource for international students and scholars on immigration matters and other aspects of acclimating to life at Yale.

The Yale Alumni Association (https://alumni.yale.edu) provides a channel for communication between the alumni and the university and supports alumni organizations and programs around the world.

Additional information may be found on the "Yale and the World" website (https://world.yale.edu), including resources for those conducting international activities abroad and links to international initiatives across the university.

The Dean

Lynn Cooley; grad.dean@yale.edu

The dean of the Graduate School is appointed by the president of the university and is responsible for the educational mission of the graduate school, the quality of its programs, and the welfare of graduate students.

Deputy Dean

Pamela Schirmeister, Deputy Dean, Graduate School; Deputy Dean and Dean of Undergraduate Education, Yale College; pamela.schirmeister@yale.edu

Associate and Assistant Deans for Academic Affairs

Michelle Nearon, Senior Associate Dean and Director, Office for Graduate Student Development and Diversity (OGSDD); michelle.nearon@yale.edu John Alvaro, Associate Dean for the Biological and Biomedical Sciences; john.alvaro@yale.edu Jasmina Besirevic Regan, Associate Dean for Graduate Education; jasmina.besirevic@yale.edu Allegra di Bonaventura, Associate Dean for Graduate Academic Support; allegra.dibonaventura@yale.edu Robert Harper-Mangels, Associate Dean for Admissions and Financial Support; robert.harper-mangels@yale.edu Sarah Insley, Assistant Dean for Graduate Education; sarah.insley@yale.edu Ksenia Sidorenko, Assistant Dean for Diversity; ksenia.sidorenko@yale.edu Matthew Tanico, Assistant Dean for Academic Support and Outreach; matthew.tanico@yale.edu Suzanne Young, Assistant Dean for Graduate Student Professional Development; suzanne.young@yale.edu

The academic deans of the graduate school are responsible for the administration of graduate programs in consultation with the directors of graduate studies, and for the academic progress and well-being of students. They participate in decisions regarding admissions, financial aid, academic performance, and the application of the policies of the graduate school.

Directors of Graduate Studies (DGS)

A senior faculty member, appointed by the dean, serves as director of graduate studies (DGS) for each department or program. The directors of graduate studies are responsible for the satisfactory administration of the programs and function as advisers and guides to all graduate students in their respective departments and programs. They help graduate students to plan an appropriate course of study and research, and they advise on course schedules. The DGS acts as the liaison between each student in the department or program and the Office of the Dean.

Graduate Student Development and Diversity

Michelle Nearon, Senior Associate Dean and Director, OGSDD; Warner House, 1 Hillhouse Ave.

Ksenia Sidorenko, Assistant Dean for Diversity; Dow Hall, 370 Temple St. Suzanne Young, Assistant Dean for Graduate Student Professional Development; McDougal Center, 135 Prospect St.

The Office for Graduate Student Development and Diversity (OGSDD) is committed to expanding the diversity of the student body and enhancing the intellectual experience of the entire scholarly community. The OGSDD coordinates efforts to recruit and retain students at the Graduate School. The senior associate dean works collaboratively with departments and programs to support the needs of all students as they pursue graduate study and prepares reports on the Graduate School's progress in recruiting and retaining diverse students. The following programs and activities fall under the purview of the OGSDD: informal advising of prospective and current graduate students, the Summer Undergraduate Research Fellowship (SURF) Program, the Post-Baccalaureate Research Education Programs, Diversity Recruitment Days, Diversity Orientation Day, Diversity Preview Days, Transitions First-Year Focus, and the Annual Yale Bouchet Conference on Diversity and Graduate Education. The assistant dean of diversity, the assistant dean for graduate student professional development, and annually appointed graduate student diversity fellows assist with the development and implementation of these programs, as well as virtual recruitment fairs and webinars, social justice discussion seminars, mentoring programs, workshops and lectures presented by diverse scholars, and social and professional development events.

McDougal Graduate Student Center

Founders Hall, 135 Prospect St., upper level, 203.432.BLUE (2583),

mcdougal.center@yale.edu

http://gsas.yale.edu/life-yale/mcdougal-graduate-student-center

A generous gift from Alfred McDougal '53 and his wife, Nancy Lauter, enabled Yale to create the McDougal Graduate Student Center in 1997. The McDougal Center

provides space and programs for building intellectual, cultural, and social community, as well as facilitating professional development activities across the departments of the graduate school. The McDougal Center endowment supports the facilities of the center and the appointment of more than sixty McDougal Fellows in five offices who create programs and services for the graduate community through five collaborating offices of Development and Diversity, Career Strategy, Graduate Student Life, and the Poorvu Center for Teaching and Learning's Graduate Writing Lab and Graduate Teaching Program.

GRADUATE STUDENT LIFE

Jennifer Mendelsohn, Director, McDougal Center; Founders Hall, 135 Prospect St., upper level, Rm. 186, jennifer.mendelsohn@yale.edu http://gsas.yale.edu/life-yale/graduate-student-life-office http://yaleconnect.yale.edu

The Office of Graduate Student Life is responsible for student life programs in the McDougal Center and student services in the graduate school. McDougal Graduate Student Life Fellows and staff produce a wide array of student life programs annually, including arts, literary, music, sports, and cultural events; health and wellness programs; outings; family activities and resources; international student events; public service opportunities; and dances and other social events. Graduate Student Life advises and supports more than seventy graduate student organizations, which sponsor events at the center, on and off campus. Activities are announced in the weekly email McDougal Graduate Student Life Notes, on social media, and on the Yale Connect site listed above. This office also oversees the facilities and general services of the McDougal Center, assists with departmental recruitment activities, and organizes new student orientation and graduate school dean's social events.

EMBEDDED MENTAL HEALTH SERVICES

Eva Wilson, Ph.D., Lead Embedded Mental Health Clinician Julian Arias, M.S.W., L.C.S.W, Embedded Mental Health Clinician

Admissions

http://gsas.yale.edu/admission graduate.admission@yale.edu 203.432.2771

Leah Phinney, Director; Warner House, 1 Hillhouse Ave. Lisa Furino, Assistant Director; Warner House, 1 Hillhouse Ave.

The Office of Graduate Admissions supports the work of the faculty, programs, and deans of the graduate school by providing a centralized admissions process for attracting, admitting, and recruiting talented and diverse scholars and researchers to Yale. The office also assists applicants with the application and onboarding process.

Financial Aid

http://gsas.yale.edu/funding-aid/office-financial-aid gradfinaid@yale.edu (gradfinaid@yale.edu)

Kerry Worsencroft, Director; 246 Church St. Kellie Webb, Assistant Director; 246 Church St.

The Office of Financial Aid is a resource to graduate students, departments, and non-Yale organizations needing guidance or assistance regarding financial aid policies and the administration of fellowships and student loan programs. The office oversees and maintains financial and data management systems and disburses all graduate student financial aid.

Registrar's Office

https://registrar.yale.edu registrar.gsas@yale.edu

Shonna Marshall, University Registrar; 246 Church St. Renée Kamauf, Deputy University Registrar; 246 Church St. Kory Riddle, Associate University Registrar for Student Support; 246 Church St. Claudia Schiavone, Assistant University Registrar; 246 Church St.

The Registrar's Office maintains the academic records of all students in the graduate school. In addition, the office develops course and classroom schedules and oversees registration, tuition charges, academic holds, dissertation submission, final clearance at graduation, and release of diplomas for Commencement. Students should consult this office to report changes in name or social security number, to request transcripts, or to certify their enrollment in the graduate school. Students can change their address listing at https://registrar.yale.edu/students/yale-hub.

Teaching Fellow Program

http://gsas.yale.edu/academic-professional-development/teaching-fellow-program teaching.fellows@yale.edu

Pamela Schirmeister, Deputy Dean, Graduate School; Deputy Dean and Dean of

Undergraduate Education, Yale College; pamela.schirmeister@yale.edu Matthew Regan, Assistant Director; matthew.regan@yale.edu

The Teaching Fellow Program is the principal framework at Yale in which graduate students learn to become effective teachers. Learning to teach and to evaluate student work is fundamental to the education of graduate students. The Teaching Fellow Program provides opportunities for graduate students to develop teaching skills, under faculty guidance, through active participation in the teaching of Yale undergraduates. Teaching fellows who encounter problems or difficulties related to their teaching roles are encouraged to meet with the assistant director of the Teaching Fellow Program or the deputy dean.

Committees

Currently four standing committees are concerned with the policies and procedures of the graduate school; as with all standing committees, their deliberations are confidential. Student members of these committees are nominated by the Graduate Student Assembly.

The Executive Committee A committee of faculty members and graduate students, chaired by the dean, advises the dean on broad matters of policy, procedure, and curriculum and makes recommendations to the faculty of the graduate school.

The Degree Committee Composed of two senior faculty and chaired by the dean, this committee meets twice a year and is responsible to the faculty of the graduate school for maintaining standards of graduate education in the school and for recommending candidates for degrees. The committee may review special academic problems of individual students and, when appropriate, the educational programs of the departments.

The Graduate School of Arts and Sciences Climate and Inclusion Committee Composed of faculty, students, and staff, this committee advises the dean on matters of diversity, equity, and inclusion.

The Committee on Regulations and Discipline Composed of three graduate students, three faculty members, normally one from each division, and an associate dean or assistant dean, this committee reviews alleged violations of the regulations governing academic and personal conduct.

Graduate Student Assembly (GSA)

gsa@yale.edu http://gsa.yale.edu

Students in the graduate school are represented collectively by the Graduate Student Assembly (GSA), which provides a forum for students to address issues across the graduate school and university. The GSA consults with the dean and other administrators on proposed changes in graduate school policy, raises concerns expressed by the student body, nominates the student members of all graduate school standing committees, and administers a conference travel fund for graduate students. Representatives to the assembly are elected by students in individual departments and degree programs. Each department or program has at least one student representative, with additional representatives allotted proportionally by size of the student population.

Graduate and Professional Student Senate (GPSS)

gpss@yale.edu https://gpsenate.yale.edu

The Graduate and Professional Student Senate (GPSS) is composed of student-elected representatives from each of the fourteen graduate and professional schools at Yale. Any

student enrolled in these schools is eligible to run for a senate seat during fall elections. As a governing body, the GPSS advocates for student concerns and advancement within Yale, represents all graduate and professional students to the outside world, and facilitates interaction and collaboration among the schools through social gatherings, academic or professional events, and community service. GPSS meetings occur on alternating Thursdays and are open to the entire graduate and professional school community, as well as representatives from the Yale administration. GPSS also oversees the management of the Gryphon, a graduate and professional student center, located at 204 York Street. The center provides office and event space for GPSS and other student organization activities, funds student groups, and houses Gryphon's Pub, open nightly.

DEGREE-GRANTING DEPARTMENTS AND PROGRAMS

This section provides information on all degree-granting departments and programs of the Graduate School of Arts and Sciences. Each listing provides a roster of faculty, special admissions and degree requirements, and course offerings for that department or program. The requirements appearing in the *Graduate School of Arts and Sciences Programs and Policies* take precedence over any statements published separately by individual departments and programs.

The degree requirements of the graduate school itself appear later in this publication, under Policies and Regulations. These apply to all students in the graduate school, although there are variations in the pattern of their fulfillment in individual departments and programs. The requirements of the graduate school may change from time to time. If a requirement changes within the period normally required for completion of a student's course of study, the student will normally be given the choice of completing either the new or the old requirement.

The requirements of individual departments also may change from time to time, with the approval of the graduate school. All changes in departmental degree requirements occurring after the publication closing date of the *Graduate School of Arts and Sciences Programs and Policies* bulletin are posted on the departments' websites. General changes to degree requirements will be posted on the graduate school's website (https://gsas.yale.edu).

The course listings and instructors reflect information received by the registrar as of the publication date and are subject to change without notice. Students are advised to consult https://courses.yale.edu for the most recent information.

Fall-term courses are indicated by the letter "a," spring-term courses by the letter "b"; summer courses are indicated by the letter "c." A course designated "a or b" is the same course given in both terms. Yearlong courses list both "a" and "b." Courses in brackets are not offered during the current academic year.

African American Studies

81 Wall Street, 203.432.1170 http://afamstudies.yale.edu M.A., M.Phil., Ph.D.

Chair Phillip Atiba Goff

Interim Director of Graduate Studies Jonathan Howard

Professors Nana Adusei-Poku, Elijah Anderson, David Blight, Daphne Brooks, Marlene Daut, Erica Edwards, Roderick Ferguson, Kaiama Glover, Jacqueline Goldsby, Allison Harris, Elizabeth Hinton, Matthew Jacobson, Gerald Jaynes, Tavia Nyong'o, Edward Rugemer, Phillip Atiba Solomon, Michael Veal, Shane Vogel

Associate Professors Crystal Feimster

Assistant Professors Na Na Adusei-Poku, Allison Harris, Jonathan Howard, Elleza Kelley, Ernest Mitchell, Carolyn Roberts

Lecturers Thomas Allen Harris, Tasha Hawthorne, Ferentz Lafargue, Sarah Mahurin

FIELDS OF STUDY

The Department of African American Studies offers a combined Ph.D. in conjunction with several other departments and programs: currently, American studies; anthropology; English; film and media studies; French; history; history of art; music; political science; psychology; religious studies; sociology; Spanish and Portuguese; and women's, gender, and sexuality studies. Within the field of study, the student will select an area of concentration in consultation with the directors of graduate studies (DGS) of African American studies and the joint department or program. An area of concentration in African American studies may take the form of a single area study or a comparative area study. Students may focus on the history or artistic productions of any region within the African diaspora. Students are encouraged to draw from multiple disciplines in their intellectual pursuits, both in preparation for their qualifying examinations and in their dissertation research and writing. An area of concentration may also follow the fields of study already established within a single discipline, for example, race/minority/ethnic studies in a combined degree with sociology; the study of Black political thought, or voting patterns, in a combined degree with political science; a study of racial bias in a combined degree with psychology; or an ethnography in a combined degree with either anthropology, or sociology. An area of concentration must either be a field of study offered by the joint department or fall within the rubric of such a field. Please refer to the description of fields of study of the prospective joint department or program.

This is a combined degree program. To be considered for admission to this program, applicants must indicate both African American studies and one of the participating departments/programs listed above.

REQUIREMENTS FOR TRANSFER INTO THE AFRICAN AMERICAN STUDIES COMBINED PH.D. PROGRAM

- 1. Students applying for transfer into the combined Ph.D. program must already have taken AFAM 505 or be taking it in the term of application; must provide a plan outlining the AFAM courses already taken and those they will take; and must submit a research statement that explains how the combined Ph.D. will advance their research interests.
- 2. Students must provide two letters of recommendation: one from their adviser in the joint department or program, unless that adviser is jointly appointed with African American studies, in which case a letter from the student's DGS in the joint department or program is required; *and* a second letter from a faculty member in African American studies who commits to being the student's adviser throughout the completion of the dissertation.
- 3. Students cannot apply sooner than the second term of the first year and must apply by January 3, which is the deadline for African American studies' annual admissions cycle. Preference will be given to students in the second year of their Ph.D. program. Applications will receive a faculty vote early in the spring term to approve or reject, and results will be communicated to the student no later than spring break.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students will be subject to the combined Ph.D. supervision of the African American Studies department and the relevant participating department or program. The student's academic program will be decided in consultation with an adviser, the DGS of African American Studies, and the DGS of the participating department or program and must be approved by all three. Students are required to take five courses in African American studies, generally at least one course each term. Any variance in scheduling requires DGS approval. Core courses are (1) Theorizing Racial Formations (AFAM 505), which is a required course for all first-year graduate students in the combined program and (2) Dissertation Prospectus Workshop (AFAM 895 and AFAM 896), a two-term course, which graduate students in their third year of study must satisfactorily complete. This workshop is intended to support preparation of the dissertation proposal; each student will be required to present the dissertation prospectus orally to the faculty and to turn in a written prospectus draft by the end of spring term. Three other graduate-level African American studies courses are required: (1) a history course, (2) a social science course, and (3) a course in literature or culture.

Qualifying examinations and the dissertation proposal will be administered jointly by the African American studies department and the participating department or program and must be passed within the time required by the participating department or program. A current tenured or ladder faculty member in African American studies must serve on the qualifying examination committee, and on the dissertation committee. Both the qualifying exams and the dissertation must have an African American studies component. The total number of courses required will adhere to the requirements of the participating department or program. Each student must complete the minimum number of courses required by the participating department or program; African American studies courses (excepting the Dissertation Prospectus Workshop) count toward the participating department's or program's total. The number of courses that will count depends on the joint department or program. For details of these requirements, see the special requirements of the combined Ph.D. for the particular department or program in this bulletin. Students will be required to meet the foreign language requirements of the participating department or program. (See Degree Requirements under Policies and Regulations.) Students will not be admitted to candidacy until all requirements, including the dissertation prospectus, have been met and approved by the Graduate Studies Executive Committee of the African American Studies department and the participating department or program. A student who intends to apply for this combined Ph.D. in African American Studies and another department or program should consult the other department's or program's Ph.D. requirements and courses.

The faculty in African American Studies consider teaching to be an essential component of graduate education, and students therefore will teach, under the supervision of departmental professors, in their third and fourth years.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. (en route to the combined Ph.D.) Students will be awarded a combined M.A. degree in African American studies and the relevant participating department or program upon successful completion of all course work except the Dissertation Prospectus Workshop, which is taken in the student's third year of study. See also Degree Requirements under Policies and Regulations.

More information is available on the department's website, http://afamstudies.yale.edu.

COURSES

For course offerings in African languages, see African Studies.

AFAM 505a, Theorizing Racial Formations Staff

A required course for all first-year students in the combined Ph.D. program in African American Studies; also open to students in American Studies. This interdisciplinary reading seminar focuses on new work that is challenging the temporal, theoretical, and spatial boundaries of the field.

AFAM 510a / ENGL 938a, Black Geographic Thought Elleza Kelley This seminar focuses on classic and recent scholarship that constitute the interdisciplinary subfield of "black geographies." Bearing in mind that black studies is not merely the study of black people but, as Alexander Weheliye puts it, "a substantial critique of Western modernity and a sizable archive of social, political, and cultural alternatives," this seminar explores the critiques and alternatives that black studies brings to bear on the feeling, knowledge, representation, and politics of space and place. While we study scholarship across discipline (by geographers, architectural theorists, historians, etc.), we pay particular attention to how cultural production, like literature and visual art, articulates black geographic and spatial thought and how it might engage with, challenge, and enrich the fields of critical and literary geographies. Along the way, our study of literature is transformed by careful attention to the geographic, architectural, and ecological. We read the work of scholars like Katherine McKittrick, Clyde Woods, and AbdouMaliq Simone alongside creative works by poets, novelists, artists, filmmakers, architects, and more, from Toni Morrison and Dionne Brand to Torkwase Dyson and Mati Diop.

AFAM 522a / AMST 721a / ENGL 935a, The Beautiful Struggle: Blackness, the Archive, and the Speculative Daphne Brooks

This seminar takes its inspiration from concepts and questions centering theories that engage experimental methodological approaches to navigating the opacities of the archive: presumptively "lost" narratives of black life, obscure(d) histories, compromised voices and testimonials, contested (auto)biographies, anonymous testimonies, textual aporias, fabulist documents, confounding marginalia. The scholarly and aesthetic modes by which a range of critics and poets, novelists, dramatists, and historians have grappled with such material have given birth to new analytic lexicons -from Saidiya Hartman's "critical fabulation" to José Estaban Muñoz's "ephemera as evidence" to Tavia Nyong'o's "Afrofabulation." Such strategies affirm the centrality of speculative thought and invention as vital and urgent forms of epistemic intervention in the hegemony of the archive and open new lines of inquiry in black studies. Our class explores a variety of texts that showcase these new queries and innovations, and we also actively center our efforts from within the Beinecke Rare Book and Manuscript Library, where a number of sessions are held and where we focus on Beinecke holdings that resonate with units of the course. Various sessions also feature distinguished guest interlocutors via Zoom, who are on hand to discuss the specifics of their research methods and improvisational experimentations in both archival exploration and approaches to their prose and poetic projects.

AFAM 695b / MUSI 695b, The Study of African American Music Braxton Shelley This seminar explores the musical objects, critical debates, and scholarly methodologies that have shaped the study of African American music. How do artists, critics, and theorists differently define "Black music"? How do competing conceptions of Black musical traditions reflect and resist commercial and academic modes of categorization? In this course, we attend to the intersections and divergences that emerge from myriad attempts to define and discipline the musical products of black experience, converting Blues, Funk, Gospel, Hip-Hop, House, Jazz, Reggae, R&B, Soca, Soul, the Spiritual, and many other idioms, into a single knowledge-object. We investigate the intellectual genealogies and scholarly disagreements that arise from the interdisciplinary scope of Black music studies, including: cultural history, cultural studies, ethnomusicology, literary studies, historical musicology, music theory, sociology, and theology. Required for students in the Joint Ph.D. Program in Music and African American Studies, this reading-intensive graduate course brings together texts that have defined the interdisciplinary study of Black music and new work that is remaking the field.

AFAM 707b / CPLT 707b / MHHR 707b, What Is An Archive? Melissa Barton This graduate seminar seeks to answer the question in the course's title by looking closely at professional archival descriptive practices and broader, looser uses of the term in cultural and literary studies, art history, history, and beyond. By looking at these distinct but curiously, even suspiciously, concurrent genealogies, we seek to explain why the term "archive" has become so demonstrably popular, in multiple senses of the word, even as archival practice has become more professionalized and specialized. Put differently, many humanistic fields have undergone "archival turns" in recent decades, and many cultural and performance theorists, critics, and historians have advanced arguments about "the archive" as a monolithic concept, perhaps "the archives" as an abstract location where the work begins (e.g., "I've been in the archives"), or perhaps "my archive" as the group of texts I interpret and cite. Meanwhile, professional archivists regularly publish tweets, articles, and blog posts asking them to stop it. This course hopes to ponder and maybe even find a way toward an answer to the question: What is up with this? We explore archives in theory and practice, as both figurative and literal, both concrete and abstract, repositories for "primary" inquiry into the past. We consider theories of archives from humanities fields and the archival profession (including the emerging subfield "critical archival studies"), and we discuss how archives are made, how they are used, how they are made usable, what may be assumed or elided in the making and use of archives, and the popularity of, and tensions around, "the archive" as a concept. Topics and keywords include: what is primary or original? What is order or process? What is a trace, and how is it made distinct from the great mass of human traces? What does it mean to collect, to curate? What is an archival silence, and what might be comparable notions of archival noise? What does it mean to recover or discover? In addition to readings, students complete two assignments: a provenance research assignment and a descriptive project in the form of a survey of an existing collection at Yale or a subject guide to a collection or group of collections.

AFAM 709a / HIST 709a / HSHM 763a, Readings in Race and Racism in Medicine, Science, and Healthcare Carolyn Roberts

This graduate reading seminar invites students to study historical and contemporary texts related to race and racism in medicine, science, and healthcare. Our primary focus is anti-Black racism, and we study connections between the period of slavery and present-day issues in healthcare, biomedical research, reproductive justice, and medical and nursing education and practice. Students from any department and discipline are welcome to join this small seminar, which privileges deep listening, close reading, community, and care.

AFAM 719a / HIST 945a / HSHM 771a, Researching and Writing Histories of Health, Medicine, and Science Carolyn Roberts

This small graduate seminar is for students currently researching and writing histories of health, science, and medicine. Students learn about slow scholarship, the politics of the archive, and research organization and management and explore the craft of writing. Preference is given to graduate students in history, the history of science and medicine, and African American studies.

AFAM 752b / AMST 937b / HIST 937b / HSHM 761b, Researching and Writing Medicine, Health, and Empire Carolyn Roberts

This graduate research course is limited to a small number of graduate students who are currently involved in research projects that touch on any issues related to health, medicine, and the body in the context of slavery, colonialism, or neocolonialism. The course includes visits to diverse archives on campus, discussions of archival best practices, and digital organizational tools. The course provides graduate students with a balance of support and independence as they carry out their research. Graduate students in any discipline are warmly welcomed to participate in a compassion-based research community that prioritizes values of deep listening, presence, and care.

AFAM 766b / AMST 691b / HIST 737b, Research Seminar in U.S. Political Economy Jennifer Klein

Research seminar oriented around themes and issues in U.S. political economy from the late nineteenth century through the end of the twentieth. Readings in the first part of

the term look at various approaches to writing about political economy: for example, business history, intellectual history, labor history, biography, local monograph, or transnational history. Research projects explore new possibilities for writing about labor, business, the state, and capitalism.

AFAM 773a / SOCY 630a, Workshop in Urban Ethnography Elijah Anderson The ethnographic interpretation of urban life and culture. Conceptual and methodological issues are discussed. Ongoing projects of participants are presented in a workshop format, thus providing participants with critical feedback as well as the opportunity to learn from and contribute to ethnographic work in progress. Selected ethnographic works are read and assessed.

AFAM 778a / PSYC 728a, Research Topics in Racial Justice in Public Safety Phillip Atiba Solomon

In this seminar, graduate students and postdoctoral fellows have a chance to present their research, and undergraduate research assistants learn about how to conduct interdisciplinary quantitative social science research on racial justice in public safety. The course consists of weekly presentations by members and occasional discussions of readings that are handed out in advance. The course is designed to be entirely *synchronous*. Presenters may request a video recording if they can benefit from seeing themselves present (e.g., for a practice talk). This course is intended for graduate students, postdocs, and undergraduates interested in conducting original quantitative social science research about race and public safety. Permission of the instructor is required.

AFAM 797b / AMST 797b / HIST 797b, Atlantic Abolitions Marcela Echeverri Munoz

This readings course explores the historiography on the century of abolition, when the new states of the Americas abolished racial slavery. Beginning with the first abolitions in the U.S. North during the 1780s, we consider the emergence and process of abolition throughout the Atlantic world, including the Caribbean, Spanish America, and Brazil, through the 1880s.

AFAM 817a / HIST 741a, Research Seminar on the Early Atlantic World Edward Rugemer

This research seminar explores various approaches to writing the history of the early Atlantic world, with particular emphasis on race and slavery, from 1500 to about 1850. Every student writes a publishable article based upon original research.

AFAM 850b / AFST 937b / ENGL 6137b, African Urban Cultures: Mediations of the City Stephanie Newell

This course approaches the study of African cities and urbanization through the medium of diverse texts, including fiction, nonfiction, popular culture, film, and the arts, as well as scholarly work on African cities. Through these cultural "texts," attention is given to everyday conceptualizations of the body and the environment, as well as to theoretical engagements with the African city. We study urban relationships as depicted in literature and popular media in relation to Africa's long history of intercultural encounters, including materials dating back to the 1880s and the 1930s. Previously ENGL 937.

AFAM 86ob / ENGL 6157b / MHHR 708b, Ecologies of Black Print Jacqueline Goldsby

A survey of history of the book scholarship germane to African American literature and the ecosystems that have sustained black print cultures over time. Secondary works consider eighteenth- to twenty-first-century black print culture practices, print object production, modes of circulation, consumption, and reception. Students write critical review essays, design research projects, and write fellowship proposals based on archival work at the Beinecke Library, Schomburg Center, and other regional sites (e.g., the Sterling A. Brown papers at Williams College). Previously ENGL 957.

AFAM 895a, Dissertation Prospectus Workshop Staff

A noncredit, two-term course, which graduate students in their third year of study must satisfactorily complete. This workshop is intended to support preparation of the dissertation proposal. o Course cr

African Studies

Council on African Studies The MacMillan Center 137 Rosenkranz Hall, 203.432.1425 http://african.macmillan.yale.edu M.A.

Chair Cajetan Iheaka (*English*)

Director of Graduate Studies

Jill Jarvis (French)

Director of Program in African Languages

Kiarie Wa'Njogu (203.432.0110, john.wanjogu@yale.edu)

Professors Serap Aksoy (*Epidemiology*), Lea Brilmayer (*Law*), Richard Bucala (*Internal Medicine*), Theodore Cohen (*Epidemiology*), John Darnell (*Near Eastern Languages and Civilizations*), Anna Dyson (*Architecture*), Owen Fiss (*Emeritus*; *Law*), Robert Harms (*History*), Cajetan Iheka (*English*), Ann Kurth (*Nursing*), Daniel Magaziner (*History*), Roderick McIntosh (*Anthropology*), Stephanie Newell (*English*), Elijah Paintsil (*Pediatrics*; *Epidemiology*; *Pharmacology*), Catherine Panter-Brick (*Anthropology*), Curtis Patton (*Emeritus*; *Internal Medicine*), Ian Shapiro (*Political Science*), Donna Spiegelman (*Biostatistics*), Michael Veal (*Music*), Sten Vermund (*Epidemiology*; *Pediatrics*), David Watts (*Anthropology*), Elisabeth Wood (*Political Science*)

Associate Professors Katharine Baldwin (Political Science), Marie Brault (Public Health), Cécile Fromont (History of Art), Jill Jarvis (French), Kaveh Khoshnood (Epidemiology), Louisa Lombard (Anthropology), Urania Magriples (Obstetrics, Gynecology, and Reproductive Sciences), Meleko Mokgosi (School of Art), LaRon Nelson (Nursing), Sunil Parikh (Public Health; Internal Medicine), Carla Staver (Ecology and Evolutionary Biology), Jonathan Wyrtzen (Sociology)

Assistant Professors Amy Bei (*Epidemiology*), Lauren Berquist (*Economics*), Nicholas R. Jones (*Spanish*), Benedito Machava (*History*), Hani Mowafi (*Emergency Medicine*), Kyama Mugambi (*Divinity*), Nontsikelelo Mutiti (*School of Art*), Oluwatosin Onibokun (*Obstetrics, Gynecology, and Reproductive Sciences*), Nana Osei Quarshie (*History*), Tracy Rabin (*Internal Medicine*), Jeremy Schwartz (*Internal Medicine*), Sheela Shenoi (*Internal Medicine*), Carla Staver (*Ecology and Evolutionary Biology*), Jessica Thompson (*Anthropology*)

Lecturers Adalgisa Caccone (*Ecology and Evolutionary Biology*), Lacina Coulibaly (*Theater and Performance Studies*), Leslie Gross-Wyrtzen (*African Studies*), W. Casey King (*Public Health*), Sarah Ryan (*Law*), David Simon (*Political Science*), Veronica Waweru (*African Languages*)

Senior Lectors Oluseye Adesola (Yorùbá), Jonas Elbousty (Near Eastern Languages and Civilizations), Matuku Ngame (French), Nandipa Sipengane (isiZulu), Kiarie Wa'Njogu (Swahili)

FIELDS OF STUDY

African Studies considers the arts, history, cultures, languages, literatures, politics, religions, and societies of Africa as well as issues concerning development, health, and the environment. Considerable flexibility and choice of areas of concentration are offered because students entering the program may have differing academic backgrounds and career plans. Enrollment in the M.A. program in African Studies provides students with the opportunity to register for the many African studies courses offered in the various departments of the Graduate School of Arts and Sciences and the professional schools.

The Program in African Studies also offers two interdisciplinary seminars to create dialogue and to integrate approaches across disciplines. In addition to the M.A. degree program, the Council on African Studies offers students in the university's doctoral and other professional degree programs the chance to obtain a Graduate Certificate of Concentration in African Studies by fulfilling a supplementary curriculum. (See Council on African Studies, under Non-Degree Granting Programs, Councils, and Research Institutes.) Joint degrees are possible with the approval of the director of graduate studies (DGS) and the relevant officials in the Schools of the Environment, Law, and Public Health.

The African collections of the Yale libraries together represent one of the largest holdings on Africa found in North America. The university now possesses more than 220,000 volumes including, but not limited to, government documents, art catalogs, photographs, manuscripts, correspondence, and theses, many published in Africa.

SPECIAL REQUIREMENTS FOR THE M.A. DEGREE

The Yale University Master of Arts degree program in African Studies was instituted in 1986. The two-year interdisciplinary, graduate-level curriculum is intended for students who will later continue in a Ph.D. program or a professional school, or for those who will enter business, government service, or another career in which a sound knowledge of Africa is essential or valuable. A student may choose one of the following areas of concentration: history; anthropology; political science; sociology; arts and literatures; languages and linguistics; religion; environmental and development studies; and public health.

The program requires sixteen courses: one compulsory interdisciplinary seminar, Gateway to Africa (AFST 505); a second course employing an interdisciplinary approach to African Studies, approved by the DGS; four courses of instruction in an African language; four courses in one of the foregoing areas of concentration; four other approved courses offered in the graduate school or professional schools; and two terms of directed reading and research (AFST 590 and AFST 900) during which students will complete the required thesis; with permission of the DGS, AFST 951 may be substituted for AFST 590. The choice of courses must be approved by the DGS, with whom students should consult as soon as possible in the first term.

THE MASTER'S THESIS

The master's thesis is based on research on a topic approved by the DGS and advised by a faculty member with expertise or specialized competence in the chosen topic. Students must submit their thesis for joint evaluation by the adviser and a second reader, who is chosen by the student in consultation with the DGS.

PROGRAM IN AFRICAN LANGUAGES

The language program offers instruction in five major languages from sub-Saharan Africa: Kiswahili (eastern and central Africa), Wolof (through a consortium agreement with Columbia University), Yorùbá (West Africa), and isiZulu (southern Africa). Language-related courses and language courses for professionals are also offered. African language courses emphasize communicative competence, and instructors use multimedia materials that focus on the contemporary African context. Course sequences are designed to enable students to achieve advanced competence in all skill areas by the end of the third year, and the African Languages program encourages students to spend one summer or term in Africa during their language study.

Noncredited instruction in other African languages is available by application through the Directed Independent Language Study program at the Center for Language Study. Contact the director of the Program in African Languages.

More information is available on the program's website, http://african.macmillan. yale.edu.

COURSES

AFST 505a, Gateway to Africa Veronica Waweru

This multidisciplinary seminar highlights the study of contemporary Africa through diverse academic disciplines. Each session features a Yale faculty scholar or guest speaker who shares their unique disciplinary perspective and methodological approach to studying Africa. Topics include themes drawn from the humanities, social sciences, and public health, with faculty representing expertise from across Yale's graduate and professional school departments. The course is intended to introduce graduate students and upper-level undergraduates to the breadth and depth of Yale scholarship on Africa, facilitating the identification of future topics and mentors for thesis or senior paper research. Each weekly seminar focuses on a specific topic or region, and students are exposed to various research methods and techniques in archival research, data collection, and analysis. A specific goal of the course is to impart students with knowledge of how research across diverse disciplines is carried out, as well as to demonstrate innovative methodology, fieldwork procedures, presentation of results, and ethical issues in human subjects research.

AFST 565a / ANTH 512a, Infrastructures of Empire: Control and (In)security in the Global South Leslie Gross-Wyrtzen

This advanced seminar examines the role that infrastructure plays in producing uneven geographies of power historically and in the "colonial present" (Gregory, 2006). After defining terms and exploring the ways that infrastructure has been conceptualized and studied, we analyze how different types of infrastructure (energy, roads, people, and so on) constitute the material and social world of empire. At the same time, infrastructure is not an uncontested arena: it often serves as a key site of political struggle or even enters the fray as an unruly actor itself, thus conditioning possibilities for anti-imperial and decolonial practice. The geographic focus of this course is the African continent, but we explore comparative cases in other regions of the majority and minority world.

AFST 568a, Tackling the Big Three: Malaria, TB, and HIV in Resource-Limited Settings Sunil Parikh

Malaria, tuberculosis, and HIV account for more than five million deaths worldwide each year. This course provides a deep foundation for understanding these pathogens and explores the public health issues that surround these infectious diseases in resource-limited settings. Emphasis is placed on issues in Africa, but contrasts for each disease are provided in the broader developing world. The course is divided into three sections, each focusing in depth on the individual infectious disease as well as discussions of interactions among the three diseases. The sections consist of three to four lectures each on the biology, individual consequences, and community/public health impact of each infectious disease. Discussion of ongoing, field-based research projects involving the diseases is led by relevant faculty (research into practice). The course culminates with a critical discussion of major public health programmatic efforts to tackle these diseases, such as those of PEPFAR, the Bill & Melinda Gates Foundation, the Global Fund, and the Stop TB Partnership.

AFST 688a, Anthropology of Education Staff

This course explores how the insights and concepts of social anthropology contribute to improved understanding of educational theory and practice in multicultural settings. The course draws on ethnographic approaches to provide students with a comprehensive understanding of the intricate relationship between personhood, learning, and the centrality of culture within various educational contexts in sub-Saharan Africa. It illustrates the realities of what it means to be growing up and living in multicultural and multilingual African nations. Students are encouraged to think critically about the potential benefits and challenges of applying the discourses, models, and systems of Western education as a means of "development." Assigned readings will help critically examine traditional categories such as "gender," "class," "race," "kinship," "religion," and "nation." Class discussions acknowledge the intricate interplay of these categories in the context of contemporary experiences of migration. By end of the course, students develop a deeper understanding of the complex dynamics shaping educational systems and intercultural relations in Africa and beyond. Ultimate aim is to equip students with the confidence and cultural sensitivity necessary for making informed comparisons of teaching and learning practices within a global context.

AFST 836b / HIST 836b, Histories of Postcolonial Africa: Themes, Genres, and the Contingencies of Archival Research Benedito Machava

This course is both historiographic and methodological. It is meant as an introduction to the major themes that have dominated the study of postcolonial Africa in recent years, and the material circumstances in which they were produced. We pay close attention to the kinds of sources and archives that scholars have employed in their works, and how they addressed the challenges of writing contemporary histories in Africa. We center our weekly meetings around one key text and one or two supplementary readings. We engage with works on politics, detention, violence, environment and technology, women and gender, affect, fashion, leisure, and popular culture.

AFST 839b / HIST 839b, Environmental History of Africa Robert Harms An examination of the interaction between people and their environment in Africa and the ways in which this interaction has affected or shaped the course of African history. AFST 889a / CPLT 889a / ENGL 889a, Postcolonial Ecologies Cajetan Iheka This seminar examines the intersections of postcolonialism and ecocriticism as well as the tensions between these conceptual nodes, with readings drawn from across the global South. Topics of discussion include colonialism, development, resource extraction, globalization, ecological degradation, nonhuman agency, and indigenous cosmologies. The course is concerned with the narrative strategies affording the illumination of environmental ideas. We begin by engaging with the questions of postcolonial and world literature and return to these throughout the semester as we read primary texts, drawn from Africa, the Caribbean, and Asia. We consider African ecologies in their complexity from colonial through post-colonial times. In the unit on the Caribbean, we take up the transformations of the landscape from slavery, through colonialism, and the contemporary era. Turning to Asian spaces, the seminar explores changes brought about by modernity and globalization as well as the effects on both humans and nonhumans. Readings include the writings of Zakes Mda, Aminatta Forna, Helon Habila, Derek Walcott, Jamaica Kincaid, Ishimure Michiko, and Amitav Ghosh. The course prepares students to respond to key issues in postcolonial ecocriticism and the environmental humanities, analyze the work of the major thinkers in the fields, and examine literary texts and other cultural productions from a postcolonial perspective. Course participants have the option of selecting from a variety of final projects. Students can craft an original essay that analyzes primary text from a postcolonial and/or ecocritical perspective. Such work should aim at producing new insight on a theoretical concept and/or the cultural text. They can also produce an undergraduate syllabus for a course at the intersection of postcolonialism and environmentalism or write a review essay discussing three recent monographs focused on postcolonial ecocriticism.

AFST 937b / AFAM 850b / ENGL 6137b, African Urban Cultures: Mediations of the City Stephanie Newell

This course approaches the study of African cities and urbanization through the medium of diverse texts, including fiction, nonfiction, popular culture, film, and the arts, as well as scholarly work on African cities. Through these cultural "texts," attention is given to everyday conceptualizations of the body and the environment, as well as to theoretical engagements with the African city. We study urban relationships as depicted in literature and popular media in relation to Africa's long history of intercultural encounters, including materials dating back to the 1880s and the 1930s. Previously ENGL 937.

AFST 969a / CPLT 985a / FREN 969a, Islands, Oceans, Deserts Jill Jarvis This seminar brings together literary and theoretical works that chart planetary relations and connections beyond the paradigm of francophonie. Comparative focus on the poetics and politics of spaces shaped by intersecting routes of colonization and forced migrations: islands (Sri Lanka, Mauritius, Martinique), oceans (Indian, Mediterranean, Atlantic), and deserts (Sahara, Sonoran). Prerequisite: reading knowledge of French; knowledge of Arabic and Spanish invited. Conducted in English.

SWAH 610a, Beginning Kiswahili I John Wa'Njogu

A beginning course with intensive training and practice in speaking, listening, reading, and writing. Initial emphasis is on the spoken language and conversation. Credit only on completion of SWAH 620.
SWAH 640a, Intermediate Kiswahili II Veronica Waweru Continuation of SWAH 630.

YORU 610a, Beginning Yorùbá I Oluseye Adesola

Training and practice in speaking, listening, reading, and writing. Initial emphasis is on the spoken aspect, with special attention to unfamiliar consonantal sounds, nasal vowels, and tone, using isolated phrases, set conversational pieces, and simple dialogues. Multimedia materials provide audio practice and cultural information. Credit only on completion of YORU 620.

YORU 630a, Intermediate Yorùbá I Oluseye Adesola

Refinement of speaking, listening, reading, and writing skills. More natural texts are provided to prepare students for work in literary, language, and cultural studies as well as for a functional use of Yorùbá. Prerequisite: YORU 620.

YORU 650a, Advanced Yorùbá I Oluseye Adesola

An advanced course intended to improve aural and reading comprehension as well as speaking and writing skills. Emphasis is on acquiring a command of idiomatic usage and stylistic nuance. Study materials include literary and nonliterary texts; social, political, and popular entertainment media such as video movies and recorded poems *(ewi)*; and music. Prerequisite: YORU 640.

YORU 670a, Topics in Yorùbá Literature and Culture Oluseye Adesola

The course provides students with the opportunity to acquire Yorùbá up to the superior level. It is designed to give an in-depth discussion on advanced readings on Yorùbá literature and culture. It focuses on Yorùbá history, poetry, novels, dramas, and oral folklore. It also seeks to uncover the basics of the Yorùbá culture in communities where Yorùbá is spoken across the globe, with particular emphasis on Nigeria. It examines movies, texts, and written literature to gain insight into the Yorùbá philosophy and ways of life.

YORU 680a, Advanced Topics in Yorùbá Literature and Culture Oluseye Adesola A course for students with advanced proficiency in Yorùbá who are interested in discussion and research in Yorùbá at a level not covered by existing courses. A term paper or its equivalent is required.

ZULU 610a, Beginning isiZulu I Nandipa Sipengane

A beginning course in conversational isiZulu, using web-based materials filmed in South Africa. Emphasis on the sounds of the language, including clicks and tonal variation, and on the words and structures needed for initial social interaction. Brief dialogues concern everyday activities; aspects of contemporary Zulu culture are introduced through readings and documentaries in English. Credit only on completion of ZULU 620.

ZULU 630a, Intermediate isiZulu I Nandipa Sipengane

Development of basic fluency in speaking, listening, reading, and writing isiZulu, using web-based materials filmed in South Africa. Students describe and narrate spoken and written paragraphs. Review of morphology; concentration on tense and aspect. Materials are drawn from contemporary popular culture, folklore, and mass media. Prerequisite: ZULU 620.

ZULU 650a, Advanced isiZulu I Nandipa Sipengane

Development of fluency in using idioms, speaking about abstract concepts, and voicing preferences and opinions. Excerpts are drawn from oral genres, short stories, and dramas made for television. Introduction to other South African languages and to issues of standardization, dialect, and language attitude. Prerequisite: ZULU 640.

American Studies

Humanities Quadrangle, 203.432.1186 http://americanstudies.yale.edu M.A., M.Phil., Ph.D.

Chair

Laura Barraclough (HQ 314, 203.432.1186)

Director of Graduate Studies Daniel HoSang (HQ 304, 203.432.1186)

Professors Jean-Christophe Agnew (*Emeritus*), Laura Barraclough, Ned Blackhawk, Daphne Brooks, Hazel Carby (*Emerita*), Michael Denning, Wai Chee Dimock (*Emerita*), Kathryn Dudley, John Mack Faragher (*Emeritus*), Roderick Ferguson, Glenda Gilmore (*Emerita*), Jacqueline Goldsby, Inderpal Grewal (*Emerita*), Scott Herring, Matthew Jacobson, Kathryn Lofton, Lisa Lowe, Mary Lui, Joanne Meyerowitz, Charles Musser, Tavia Nyong'o, Stephen Pitti, Sally Promey, Ana Ramos-Zayas, Marc Robinson, Paul Sabin, Alicia Schmidt Camacho, Caleb Smith, Robert Stepto (*Emeritus*), Dara Strolovitch, Kalindi Vora, John Harley Warner, Tisa Wenger, Laura Wexler

Associate Professors Crystal Feimster, Zareena Grewal, Greta LaFleur, Albert Laguna, Elihu Rubin

Assistant Professors Julian Posada, Madiha Tahir

Senior Lecturer James Berger

FIELDS OF STUDY

Fields include American literature, history, the arts and material culture, philosophy, cultural theory, and the social sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

During the first two years of study students are required to take twelve term courses; at least half of these courses must be in American Studies. Two courses, both graded Satisfactory/Unsatisfactory, are required: AMST 600, American Scholars, taken in the first year, and AMST 602, Field Studies, taken in the second year. The student's program will be decided in consultation with the adviser and the director of graduate studies (DGS). In each of the two years, the student should take at least one seminar devoted to research or requiring a substantial original paper, and must achieve two grades of Honors, with an average overall of High Pass.

Students are required to show proficiency in a language other than English; they may fulfill this requirement by (1) conducting substantial research in the chosen language as part of the course requirements for one of the twelve required seminars, (2) passing a translation test, offered each term by various language departments, or (3) receiving a grade of B or higher in a Yale College intermediate- or advanced-level language course or in a Yale language-for-reading course, such as French for Reading or German for Reading. Upon completion of course work, students in their third year of study are required to participate in at least one term of a monthly prospectus workshop (AMST 902). Intended to complement the work of the prospectus committee, the workshop is designed as a professionalization experience that culminates in students' presentation of the dissertation prospectus at their prospectus colloquium.

Students should schedule the oral qualifying examinations in four fields, in the fifth term of study. Preparation, submission, and approval of the dissertation prospectus should be completed by the end of the sixth term, with a final deadline at the end of the seventh term with permission from the DGS. Students are admitted to candidacy for the Ph.D. upon completion of all predissertation requirements, including the prospectus. The faculty in American Studies considers training in teaching to be an important part of the program. Students in American Studies normally teach in years three and four.

COMBINED PH.D. PROGRAMS

American Studies and African American Studies

The American Studies Program also offers, in conjunction with the Department of African American Studies, a combined Ph.D. in American Studies and African American Studies. This combined degree is most appropriate for students who intend to concentrate in and write a dissertation on any aspect of African American history, literature, or culture in the United States and other parts of the Americas. Applicants to the combined program must indicate on their application that they are applying both to American Studies and to African American Studies. All documentation within the application should include this information. For further details, see African American Studies.

American Studies and Film and Media Studies

The American Studies Program also offers, in conjunction with the Program in Film and Media Studies, a combined Ph.D. in American Studies and Film and Media Studies. Applicants to the combined program must indicate on their application that they are applying both to American Studies and to Film and Media Studies. All documentation within the application should include this information. For further details, see Film and Media Studies.

American Studies and Women's, Gender, and Sexuality Studies

The American Studies Program also offers, in conjunction with the Program in Women's, Gender, and Sexuality Studies, a combined Ph.D. in American Studies and Women's, Gender, and Sexuality Studies. This combined degree is most appropriate for students who intend to concentrate in and write a dissertation on any aspect of gender and sexuality; transnational politics and security regimes; citizenship and statelessness; public law and sexual violence; public policy and political representation; kinship, reproduction, and reproductive technologies; policing, surveillance, and incarceration; social movements and protest; indigeneity, racialization, and racism; literature, language, and translation; Islam and neoliberalism; colonialism and postcolonialism. Applicants to the combined program must indicate on their application that they are applying both to American Studies and to Women's, Gender, and Sexuality Studies. All documentation within the application should include this information. For further details, see Women's, Gender, and Sexuality Studies.

PUBLIC HUMANITIES CERTIFICATE

The Certificate in Public Humanities is granted upon the completion of all requirements. For more details on these requirements, as well as information on courses, projects, and teaching opportunities, see Public Humanities under Non-Degree Granting Programs, Councils, and Research Institutes.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students may apply for a terminal master's degree in American Studies. For the M.A. degree, students must successfully complete seven term courses, including a special writing project, and the language requirement. The project involves the submission of substantial written work either in conjunction with one course or as a tutorial that substitutes for one course. Students must earn a grade of Honors in two of their courses and an average grade of High Pass in the others. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met. Doctoral students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the above requirements and have not already received the M.Phil. degree.

More information is available on the department's website, http://americanstudies. yale.edu.

COURSES

AMST 520b / ER&M 520b / HSHM 757b / WGSS 520b, Applied Research in Feminist Science and Technology Studies Kalindi Vora

In this seminar, participants conduct applied research on projects with the primary investigator/instructor. Structured as a lab, we learn research methods, design research activities including building bibliographies for scholarly review, and collecting data through surveys and interviews. Topics vary but are linked to active research by instructor in feminist science and technology studies. Permission of instructor is required. Undergraduates may enroll by permission of instructor.

AMST 600a, American Scholars Laura Wexler

This required seminar for incoming first-year graduate students in the American Studies doctoral program focuses on varieties of scholarship and research methods employed in the field. The course aims to be both a history of the interdisciplinary American Studies field and an exploration of newer debates, approaches, and frameworks that engage and revise earlier objects, areas, historical timelines, methods, and periods. Beyond the narratives of United States exceptionalism, we engage American Studies scholarship that considers U.S. culture, history, and politics in relation to the histories of slavery, settler colonialism, capitalism, race, gender, sexuality, subcultures, war and empire. To explore the various kinds of approaches and projects, the seminar features visits from Yale scholars. Students will read 100 pages of visiting scholars' work and collaborate on topical and thematic questions for discussion. Assignments include brief weekly writing assignments. This course is mandatory for first-year American Studies graduate students.

AMST 602b, Field Studies Staff

Students work with faculty to identify relevant field-specific literature (e.g., in preparation for oral examinations), formulate compelling research questions, explore appropriate interdisciplinary methods, and/or describe intended contributions to the field. On completion of the course, students are prepared to write competitive fellowship applications and to engage in full-time dissertation research (after their transition to candidacy).

AMST 619a / ER&M 620a / HSHM 792a / WGSS 620a, Enduring Conditions: Chronic Illness, Disability, Care, and Access Kalindi Vora

This interdisciplinary course brings together scholarship on access and care that bridges concerns in the fields of disability studies and humanistic approaches to chronic illness. Scholarly texts are drawn from the fields of critical race and ethnic studies, gender and sexuality studies, anthropology and sociology of medicine, history, and feminist science and technology studies (fSTS). Seminar participants also engage with the arts and media as critical sites for understanding culture work bringing together knowledge in disability and chronic illness spaces. To embrace community-based research and knowledge sharing, the course features regular guest lectures from grassroots disability justice organizers and culture workers. The course is offered in a hybrid format. To consider what disability studies and work on chronic illness can build together, we explore the work of Moya Bailey, Aimi Hamraie, Jina B. Kim, Sami Schalk, Akemi Nishida, Ryan Cartwright, and Arthur Kleinman, among others. Permission of instructor.

AMST 620a, Pedagogy Staff

Faculty members instruct their Teaching Fellows on the pedagogical methods for teaching specific subject matter.

AMST 622a and AMST 623b / CPLT 622a, Working Group on Globalization and Culture Michael Denning

A continuing yearlong collective research project, a cultural studies "laboratory." The group, drawing on several disciplines, meets regularly to discuss common readings, develop collective and individual research projects, and present that research publicly. The general theme for the working group is globalization and culture, with three principal aspects: (1) the globalization of cultural industries and goods, and its consequences for patterns of everyday life as well as for forms of fiction, film, broadcasting, and music; (2) the trajectories of social movements and their relation to patterns of migration, the rise of global cities, the transformation of labor processes, and forms of ethnic, class, and gender conflict; (3) the emergence of and debates within transnational social and cultural theory. The specific focus, projects, and directions of the working group are determined by the interests, expertise, and ambitions of the members of the group, and change as its members change. The working group is open to doctoral students in their second year and beyond. Graduate students interested in participating should contact michael.denning@yale.edu.

AMST 630b / HSAR 529b / RLST 819b, Museums and Religion: The Politics of Preservation and Display Sally Promey

This interdisciplinary seminar focuses on the tangled relations of religion and museums, historically and in the present. What does it mean to "exhibit religion" in the institutional context of the museum? What practices of display might one encounter for this subject? What kinds of museums most frequently invite religious display? How is religion suited (or not) for museum exhibition and museum education? Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but also encouraged to join us. There are no set prerequisites, but, assuming available seats, permission is granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

AMST 652a / WGSS 652a, Queer Repertoires and the "Great American Songbook" Karen Tongson

Queer Repertoires is a critical writing and intensive reading workshop using the "Great American Songbook" (in some of its canonical, as well as wildly innovative reimaginings) alongside recent and key texts about popular music, sound, sexuality, and race to explore other ways of approaching "academic writing," broadly conceived. The class is suitable for students interested in queer studies, sound studies, musical theater studies, and popular music studies, as well as students who are interested in exploring other styles and methods of public writing with scholarly/research-based foundations. From Water Pater's "Preface to The Renaissance" declaring that "all arts aspire to the condition of music," to Roland Barthes' claim in "The Grain of the Voice" that writing about music inspires an endlessly evasive and "predicative" language, aesthetes, philosophers, and critical theorists have struggled to find methods for writing about music, while playing with musicality in their own language. Meanwhile, American studies has engaged with popular music not merely as another archive constitutive of what constitutes "the American," but also as a theoretical apparatus and set of stylistic techniques. This course encourages your experiments in critical writing about music, race, and sexuality in and beyond academic contexts. Seminar participants are expected to write short weekly assignments and to create playlists, while also exploring other multimedia modes (including audio storytelling) to workshop with the group on a rotating basis.

AMST 653a / FILM 653a, Studies in Documentary Film Charles Musser This course examines key works, crucial texts, and fundamental concepts in the critical study of nonfiction cinema, exploring the participant-observer dialectic, the performative, and changing ideas of truth in documentary forms.

AMST 691b / AFAM 766b / HIST 737b, Research Seminar in U.S. Political Economy Jennifer Klein

Research seminar oriented around themes and issues in U.S. political economy from the late nineteenth century through the end of the twentieth. Readings in the first part of the term look at various approaches to writing about political economy: for example, business history, intellectual history, labor history, biography, local monograph, or transnational history. Research projects explore new possibilities for writing about labor, business, the state, and capitalism.

AMST 696a / ENGL 906a / ER&M 696a / HSHM 782a / RLST 630a / WGSS 696a,

Michel Foucault I: The Works, The Interlocutors, The Critics Greta LaFleur This graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on The History of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Instructor permission required.

AMST 697b / ENGL 5197b / ER&M 697b / HSHM 783b, Michel Foucault II: The Works, the Interlocutors, The Critics Greta LaFleur

Continuing graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on *The History* of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give

students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Previously ENGL 907.

AMST 721a / AFAM 522a / ENGL 935a, The Beautiful Struggle: Blackness, the Archive, and the Speculative Daphne Brooks

This seminar takes its inspiration from concepts and questions centering theories that engage experimental methodological approaches to navigating the opacities of the archive: presumptively "lost" narratives of black life, obscure(d) histories, compromised voices and testimonials, contested (auto)biographies, anonymous testimonies, textual aporias, fabulist documents, confounding marginalia. The scholarly and aesthetic modes by which a range of critics and poets, novelists, dramatists, and historians have grappled with such material have given birth to new analytic lexicons -from Saidiya Hartman's "critical fabulation" to José Estaban Muñoz's "ephemera as evidence" to Tavia Nyong'o's "Afrofabulation." Such strategies affirm the centrality of speculative thought and invention as vital and urgent forms of epistemic intervention in the hegemony of the archive and open new lines of inquiry in black studies. Our class explores a variety of texts that showcase these new queries and innovations, and we also actively center our efforts from within the Beinecke Rare Book and Manuscript Library, where a number of sessions are held and where we focus on Beinecke holdings that resonate with units of the course. Various sessions also feature distinguished guest interlocutors via Zoom, who are on hand to discuss the specifics of their research methods and improvisational experimentations in both archival exploration and approaches to their prose and poetic projects.

AMST 762b / ANTH 764b, Anthropology in the Anthropocene Kathryn Dudley This research seminar examines the anthropological project in the context of the Anthropocene and its intertwined histories of agriculture, empire, slavery, and capitalism. Drawing on transdisciplinary readings that open up multiple ways to conceptualize anthropology's evolving relationship to our planetary predicament, students develop critical approaches to ecological and governmental problematics produced, as Agamben suggests, by anthropological machines that produce the human and nonhuman within perpetually updated spaces of exception. Throughout we pay close attention to ethnographic analytics and writing practices that trouble such binaries in favor of affective or relational modes of knowing and being. In-class workshops offer opportunities to share term papers in progress.

AMST 787a / WGSS 787a, Transgender Legal History Greta LaFleur This course offers a graduate-level introduction to the histories of the regulation of gendered and sexual comportment in the United States from the colonial period through the present, understanding gendered and sexual comportment to be historical formations indelibly shaped by racialization, religion, immigration status, disability, and class and labor status (among others). Building on the work of trans studies scholars and legal historians (which are not, of course, mutually exclusive constituencies), this course offers a substantive introduction to trans and legal archives and the unique questions and methodologies that engagement with each of these fields demands. Drawing on the work of scholars such as Dean Spade, Emily Skidmore, Katrina Rose, Sonia Katyal, C. Riley Snorton, Kimberlé Crenshaw, Paisley Currah, Marie-Amélie George, Michael Silverman, Kendra Field, Kyle Kirkup, Kevin Barry, Elizabeth Glazer, Catharine MacKinnon, Siobhan Somerville, Stephen Robertson, Colby Gordon, Sahar Sadjadi, and many more, this course provides graduate students with an advanced introduction to four vectors of inquiry: First and foremost, the course grapples with historical and historiographical questions surrounding what might be included under the umbrella of trans history or histories. Second, the course introduces students to legal history as a field and a method. Third, the course explores the complicated patchwork of laws that, together, make up the legal histories of gendered and gender nonconforming experience. Finally, we consider the role of law and policy in the *production* of *transgender* as a framework for experience and site of legislation, regulation, protection, enforcement, etc. Students must be enrolled in a Ph.D. program at Yale University.

AMST 797b / AFAM 797b / HIST 797b, Atlantic Abolitions Marcela Echeverri Munoz

This readings course explores the historiography on the century of abolition, when the new states of the Americas abolished racial slavery. Beginning with the first abolitions in the U.S. North during the 1780s, we consider the emergence and process of abolition throughout the Atlantic world, including the Caribbean, Spanish America, and Brazil, through the 1880s.

AMST 798b / WGSS 800b, Methods in Gender and Sexuality Studies Eda Pepi This seminar explores the dynamics of power and knowledge, the ethics of representation and accountability, and the nexus between disciplinarity and interdisciplinarity. It is designed for graduate students developing research projects that engage feminist, queer, postcolonial, and critical race methodologies, among others. The course adopts an epistemological approach that centers "encounter" across geopolitical scales and multiple disciplinary fronts in the humanities and social sciences. It posits that research methods, regardless of their origin, can adopt feminist, queer, decolonial/postcolonial, and critical race perspectives and potentially serve counterdisciplinary purposes. Although we cover a broad spectrum of methods-ranging from ethnographic, historiographic/archival, and geographic, to literary, media, and textual analysis, cultural studies, and political theory-our work does not unfold as a practicum. Instead of experimenting with a predefined "toolkit," students critically engage book-length works that demonstrate counter-disciplinary methodologies, reflecting hermeneutically on how method and theory relate in these texts by drawing on Foucault's framework of "the archaeology of knowledge."

AMST 802b / HIST 702b, Readings in Early National America Joanne Freeman An introduction to the early national period and its scholarship, exploring major themes such as nationalism, national identity, the influence of the frontier, the structure of society, questions of race and gender, and the evolution of political cultures.

AMST 805a / HSAR 720a / RLST 699a / WGSS 779a, Sensational Materialities: Sensory Cultures in History, Theory, and Method Sally Promey

This interdisciplinary seminar explores the sensory and material histories of (often religious) images, objects, buildings, and performances as well as the potential for the senses to spark contention in material practice. With a focus on American things and

religions, the course also considers broader geographical and categorical parameters so as to invite intellectual engagement with the most challenging and decisive developments in relevant fields, including recent literatures on material agencies. The goal is to investigate possibilities for scholarly examination of a robust human sensorium of sound, taste, touch, scent, and sight-and even "sixth senses"-the points where the senses meet material things (and vice versa) in life and practice. Topics include the cultural construction of the senses and sensory hierarchies; investigation of the sensory capacities of things; and specific episodes of sensory contention in and among various religious traditions. In addition, the course invites thinking beyond the "Western" five senses to other locations and historical possibilities for identifying the dynamics of sensing human bodies in religious practices, experience, and ideas. The Sensory Cultures of Religion Research Group meets approximately once per month at 7 p.m. on Tuesdays; class participants are strongly encouraged, but not required, to attend. Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but encouraged to join us. There are no set prerequisites, but, assuming available seats, permission will be granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

AMST 832a and AMST 833a / FILM 735a and FILM 736a, Documentary Film Workshop Charles Musser

This workshop in audiovisual scholarship explores ways to present research through the moving image. Students work within a Public Humanities framework to make a documentary that draws on their disciplinary fields of study. Designed to fulfill requirements for the M.A. with a concentration in Public Humanities.

AMST 839a / HIST 743a / HSHM 744a, Readings in Environmental History Sunil Amrith

Readings and discussion of key works in environmental history. The course explores major forces shaping human-environment relationships, such as markets, politics, and ecological dynamics, and compares different approaches to writing about social and environmental change.

AMST 856a / ER&M 658a, American Mobilities Laura Barraclough

The "mobilities turn," developed primarily in the social sciences since the early 2000s, examines the structured movements of people, ideas, and things; the transportation and communication infrastructures that move them; and the cultural meanings attributed to mobility and immobility. This course integrates critical mobilities scholarship with American studies and adjacent fields to consider the significance of (im)mobilities for the evolution of American history, geographies, society, and culture. Our focus is on American (im)mobilities and mobility justice in relationship to settler colonialism, racism, and capitalism in a variety of regions and from the seventeeth century to the present.

AMST 857b / WGSS 857b, Frailties Scott Herring

An overview of the methodologies and interdisciplinary potentials of critical age studies. After beginning with a recent issue of *Radical History Review* on "Old/Age," we spend our weeks discussing topics such as ageism and age discrimination; immigrant caregiving and servitude; black debility; creative iterations of queer and trans aging; age standardizations in the early twentieth-century United States; "deaths of despair"

amidst "the new longevity"; feminist critiques of optimal aging; and junctures of disability and aging. The course brings together a range of thinkers including historians such as Corinne T. Field and Nicholas L. Syrett; theorists such as Kathleen Woodward and Margaret Morganroth Gullette; disability justice activists such as Leah Lakshmi Piepzna-Samarasinha; and sociologists such as Mignon R. Moore. Two governing concerns that we answer as a class: How do considerations of age, aging, and gerontophobia featured in our readings amplify the contemporary investments of American studies? How can we chart political and aesthetic formations of the frail that offset their persistent nonrecognition?

AMST 858a / ENGL 858a, Edgar Allan Poe and His Critics Caleb Smith

A seminar on Poe's work and how people think about it. We read Poe's gothic tales, detective stories, Romantic poetry, book reviews, essays, satires, and hoaxes. We also take up some of his interlocutors, such as Charles Baudelaire, Walter Benjamin, Jorge Luis Borges, Colin Dayan, Jacques Lacan, Mat Johnson, Toni Morrison, Emily Ogden, and Walt Whitman. Histories of slavery and empire, science and secularism, crime and punishment, magazine culture and the literary marketplace. Theories of consciousness, aesthetics, affect, power, guilt.

AMST 866a / HIST 775a / WGSS 712a, Readings in the History of Sexuality Regina Kunzel

Selected topics in the history of sexuality. Emphasis on key theoretical works and recent historical literature.

AMST 877a / HIST 926a / HSHM 703a, Problems in the History of Medicine and Public Health John Warner

An examination of the variety of approaches to the social, cultural, and intellectual history of medicine, focusing on the United States. Reading and discussion of the recent scholarly literature on medical cultures, public health, and illness experiences from the early national period through the present. Topics include the role of gender, class, ethnicity, race, religion, and region in the experience of health care and sickness and in the construction of medical knowledge; the interplay between vernacular and professional understandings of the body; the role of the marketplace in shaping professional identities and patient expectations; health activism and social justice; citizenship, nationalism, and imperialism; and the visual cultures of medicine.

AMST 900a or b, Independent Research Staff

AMST 901a or b, Directed Reading Staff

AMST 902a or b, Prospectus Workshop Daniel HoSang

Upon completion of course work, students are required to participate in at least one term of the prospectus workshop, ideally the term before the prospectus colloquium is held. Open to all students in the program and joint departments, the workshop serves as a forum for discussing the selection of a dissertation topic, refining a project's scope, organizing research materials, identifying appropriate methods and theoretical frameworks, and evaluating work in progress. Additional topics include finding intellectual communities, preparing for academic conferences, and balancing the demands of teaching and research. The workshop meets six times during the semester.

AMST 903b / HIST 746b / PHUM 903b, Introduction to Public Humanities

Matthew Jacobson and Ryan Brasseaux What is the relationship between knowledge produced in the university and the circulation of ideas among a broader public, between academic expertise on the one hand and nonprofessionalized ways of knowing and thinking on the other? What is possible? This seminar provides an introduction to various institutional relations and to the modes of inquiry, interpretation, and presentation by which practitioners in the humanities seek to invigorate the flow of information and ideas among a public more broadly conceived than the academy, its classrooms, and its exclusive readership of specialists. Topics include public history, museum studies, oral and community history, public art, documentary film and photography, public writing and educational outreach, the socially conscious performing arts, and fundraising. In addition to core readings and discussions, the seminar includes presentations by several practitioners who are currently engaged in different aspects of the Public Humanities. With the help of Yale faculty and affiliated institutions, participants collaborate in developing and executing a Public Humanities project of their own definition and design. Possibilities might include, but are not limited to, an exhibit or installation, a documentary, a set of walking tours, a website, a documents collection for use in public schools.

AMST 904a or b / PHUM 904a or b, Practicum Matthew Jacobson Public Humanities students are required to complete a one-term internship with one of our partnered affiliates (to be approved by the Public Humanities DGS or assistant DGS) for practical experience in the field. Potential internships include in-house opportunities at the Beinecke Library, Sterling Memorial Library, or one of Yale's museums, or work at a regional or national institution such as a media outlet, museum, or historical society. In lieu of the internship, students may choose to complete a "micro-credential." Micro-credentials are structured as workshop series (3–5 daylong meetings over the course of a year) rather than as term courses, and include revolving offerings in topics such as oral history, collections and curation, writing for exhibits, podcast production, website design, scriptwriting from the archive, or grant writing for public intellectual work.

AMST 905a or b / PHUM 905a or b, Public Humanities Capstone Project Staff The course work and practicum/micro-credential lead to a significant project to be approved by the DGS or assistant DGS (an exhibition, documentary, research paper, etc.) and to be presented in a public forum on its completion.

AMST 917a or b, American Studies Professionalization Workshop Lisa Lowe This seminar is designed for advanced Ph.D. candidates who are going on the job market. Students draft and revise three full rounds of the five standard genres of job market materials: job letter, CV, dissertation abstract, teaching portfolio, and diversity statement. Students also participate in mock interviewing skills, developing a job talk, and preparing applications for postdoctoral fellowships. Graded Satisfactory/ Unsatisfactory.

AMST 937b / AFAM 752b / HIST 937b / HSHM 761b, Researching and Writing Medicine, Health, and Empire Carolyn Roberts

This graduate research course is limited to a small number of graduate students who are currently involved in research projects that touch on any issues related to health, medicine, and the body in the context of slavery, colonialism, or neocolonialism. The course includes visits to diverse archives on campus, discussions of archival best practices, and digital organizational tools. The course provides graduate students with a balance of support and independence as they carry out their research. Graduate students in any discipline are warmly welcomed to participate in a compassion-based research community that prioritizes values of deep listening, presence, and care.

Anthropology

10 Sachem Street, 203.432.3670 http://anthropology.yale.edu M.A., M.Phil., Ph.D.

Chair **Douglas Rogers**

Acting Chair Erik Harms [F]

Director of Graduate Studies Lisa Messeri

Professors Richard Bribiescas, Richard Burger, Michael Dove (School of the Environment), Kathryn Dudley (Anthropology; American Studies), Eduardo Fernandez-Duque, Erik Harms, William Honeychurch, Marcia Inhorn, Paul Kockelman, Catherine Panter-Brick, Douglas Rogers, Eric Sargis, Helen Siu, Kalyanakrishnan Sivaramakrishnan, Anne Underhill, Claudia Valeggia, David Watts

Associate Professors Oswaldo Chinchilla, Yukiko Koga, Louisa Lombard, Lisa Messeri, Christen Smith (Anthropology; African American Studies)

Assistant Professors Jessica Thompson, Serena Tucci

Lecturers Carol Carpenter, Jane Lynch

FIELDS OF STUDY

The department covers three subfields: archaeology; sociocultural and linguistic anthropology; and physical anthropology. Archaeology focuses on ritual complexes and writing, ceramic analysis, warfare, ancient civilizations, origins of agriculture, and museum studies. Sociocultural anthropology provides a range of courses: ethnography and social theory, science and technology, performance, racial formations, Black feminisms, religion, myth and ritual, kinship and descent, historical anthropology, culture and political economy, agrarian studies, ecology, environment and social change, medical anthropology, emotions, public health, sexual meanings and gender, postcolonial development, ethnicity, identity politics and diaspora, urban anthropology, global mass culture, and alternate modernity. Linguistic anthropology includes language, nationalism and ideology, structuralism and semiotics, and feminist discourse. Physical anthropology focuses on paleoanthropology, evolutionary theory, human functional anatomy, race and human biological diversity, and primate ecology. There is strong geographical coverage in Africa, the Caribbean, East Asia (China and Japan), Latin America and South America, Southeast Asia (Indonesia), South Asia and the Indian Ocean, the Near East, Europe, and the United States.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

To earn a Ph.D. in anthropology, students must: (1) be admitted to candidacy and (2) submit a dissertation which is deemed to be of sufficient academic integrity to be approved by the faculty. Currently matriculating students are expected to complete these requirements in six years. There are no required courses or seminars for archaeology and biological anthropology graduate students. However, graduate students in these subfields are expected to confer closely with their primary adviser and faculty to develop the most enriching and cogent program of courses. In sociocultural anthropology, more than three-fourths of a student's program consists of electives, including course work in other departments. Sociocultural students must take three required courses, plus enroll in four semesters of the 0.5 credit Ethnography and Social Theory seminar, with the remainder of courses being electives among anthropology courses and other departments' courses. Admission to Ph.D. candidacy requires (1) completion of two years of coursework (twelve term courses), (2) independent study and research, (3) satisfactory performance on qualifying examinations, and (4) a dissertation research prospectus submitted and approved before the end of the third year. The form of the exams and prospectus is specific to each subfield and is described in detail in the anthropology graduate student handbook, which is updated annually before the start of each academic term and posted to the anthropology program's website.

Because of the diversity of our students' training program, the department does not have a general foreign language requirement, either for admission or for admission to Ph.D. candidacy. Rather, each student's advisory committee must determine the necessary level and nature of foreign language proficiency (including scholarly languages and languages to be used in field research) to be met by the student, as well as any required competencies in statistics and other quantitative or qualitative methods. Advisory committees will stipulate such requirements in writing to the director of graduate studies (DGS) at the earliest possible stage of the student's program of study for approval by the DGS and the department faculty. Such committee stipulations should specify exactly when and how it will be determined that the student has or has not met the requirements.

The faculty consider teaching to be an important part of the professional preparation of graduate students. Therefore, students are expected to complete four terms of teaching as part of their graduate training. Depending on course schedules and the timing of fieldwork, this teaching typically occurs during the third, fourth, or fifth years of study.

COMBINED PH.D. PROGRAMS

The Anthropology department also offers a combined Ph.D. in Anthropology and Environment in conjunction with the School of the Environment; a combined Ph.D. in Anthropology and African American Studies in conjunction with the Department of African American Studies; and a combined Ph.D. in Anthropology and Women's, Gender, and Sexuality Studies with the Program in Women's, Gender, and Sexuality Studies. These combined programs are ideal for students who intend to concentrate in, and to write dissertations on, thematic and theoretical issues centrally concerned with anthropology and one of these other areas of study. Students in the combineddegree programs will be subject to the combined supervision of faculty members in the Anthropology department and in the respective department or school.

For more information on the combined-degree program in Anthropology and Environment, see Environment.

Admission into the combined-degree program in Anthropology and African American Studies is based on mutual agreement between these two departments. Individual students will develop courses of study in consultation with their academic advisers and with the directors of graduate study for both departments. Students in the program must take core courses in Anthropology and in African American Studies, plus related courses in both departments approved by their advisory committees. In addition, they must successfully complete the African American Studies third-year Dissertation Prospectus Workshop (AFAM 895 and AFAM 896). Oral and written qualifying examinations must include two topics in the field of African American Studies and two topics in Anthropology. The examination committee must include at least one faculty member from each department. The dissertation prospectus must be submitted to the directors of graduate study of both departments and approved by the faculty of both. The thesis readers committee must also include at least one faculty member from each department, and the faculties of both departments must approve its composition.

For more information on the combined-degree program in Anthropology and Women's, Gender, and Sexuality Studies, see Women's, Gender, and Sexuality Studies.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Applications for a terminal master's degree are not accepted. The M.A. degree is awarded only to students not continuing in the Ph.D. program. The student must complete eight graduate-level term courses approved for credit in the Anthropology department and maintain an average grade of High Pass. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.A.

Contact information: Director of Graduate Studies, Department of Anthropology, Yale University, PO Box 208277, New Haven CT 06520-8277; 203.432.3670; anthropology@yale.edu; http://anthropology.yale.edu.

COURSES

ANTH 502a, Research in Sociocultural Anthropology: Design and Methods Marcia Inhorn

The course offers critical evaluation of the nature of ethnographic research. Research design includes the rethinking of site, voice, and ethnographic authority.

ANTH 512a / AFST 565a, Infrastructures of Empire: Control and (In)security in the Global South Leslie Gross-Wyrtzen

This advanced seminar examines the role that infrastructure plays in producing uneven geographies of power historically and in the "colonial present" (Gregory, 2006). After defining terms and exploring the ways that infrastructure has been conceptualized and studied, we analyze how different types of infrastructure (energy, roads, people, and so on) constitute the material and social world of empire. At the same time, infrastructure is not an uncontested arena: it often serves as a key site of political struggle or even enters the fray as an unruly actor itself, thus conditioning possibilities for anti-imperial and decolonial practice. The geographic focus of this course is the African continent, but we explore comparative cases in other regions of the majority and minority world.

ANTH 515b / EAST 515b, Culture, History, Power, and Representation Helen Siu This seminar critically explores how anthropologists use contemporary social theories to formulate the junctures of meaning, interest, and power. It thus aims to integrate symbolic, economic, and political perspectives on culture and social process. If culture

refers to the understandings and meanings by which people live, then it constitutes the conventions of social life that are themselves produced in the flux of social life, invented by human activity. Theories of culture must therefore illuminate this problematic of agency and structure. They must show how social action can both reproduce and transform the structures of meaning, the conventions of social life. Even as such a position becomes orthodox in anthropology, it raises serious questions about the possibilities for ethnographic practice and theoretical analysis. How, for example, are such conventions generated and transformed where there are wide differentials of power and unequal access to resources? What becomes of our notions of humans as active agents of culture when the possibilities for maneuver and the margin of action for many are overwhelmed by the constraints of a few? How do elites - ritual elders, Brahmanic priests, manorial lords, factory-managers-secure compliance to a normative order? How are expressions of submission and resistance woven together in a fabric of cultural understandings? How does a theory of culture enhance our analyses of the reconstitution of political authority from traditional kingship to modern nationstate, the encapsulation of pre-capitalist modes of production, and the attempts to convert "primordial sentiments" to "civic loyalties"? How do transnational fluidities and diasporic connections make instruments of nation-states contingent? These questions are some of the questions we immediately face when probing the intersections of culture, politics and representation, and they are the issues that lie behind this seminar.

ANTH 530a or b, Ethnography and Social Theory Erik Harms

This seminar for first- and second-year Ph.D. students in Anthropology runs in tandem with the department's reinvigorated EST Colloquium. The colloquium consists of public presentations by cutting-edge speakers – four or five each term – selected and invited by students enrolled in the seminar. In the seminar, students and the instructor discuss selected works (generally no longer than article-length) related to the topics presented by the colloquium, including but not limited to developing readings lists, creating a viable calendar, curating the list of speakers, securing co-sponsorships, writing invitations, and introducing and hosting the speakers. Open to first- and second-year Ph.D. students in Anthropology only. ¹/₂ Course cr

ANTH 531a / CLSS 815a / EALL 773a / HIST 502a / HSAR 564a / JDST 653a / NELC 533a / RLST 803a, Archaia Seminar: Law and Society in China and Rome

Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

ANTH 541a / ENV 836a / HIST 965a / PLSC 779a / SOCY 617a, Agrarian Societies: Culture, Society, History, and Development Jonathan Wyrtzen and Elisabeth Wood

An interdisciplinary examination of agrarian societies, contemporary and historical, Western and non-Western. Major analytical perspectives from anthropology, economics, history, political science, and environmental studies are used to develop a meaning-centered and historically grounded account of the transformations of rural society. Team-taught.

ANTH 542a / EAST 546a, Cultures and Markets: Asia Connected through Time and Space Helen Siu

Historical and contemporary movements of people, goods, and cultural meanings that have defined Asia as a region. Reexamination of state-centered conceptualizations of Asia and of established boundaries in regional studies. The intersections of transregional institutions and local societies and their effects on trading empires, religious traditions, colonial encounters, and cultural fusion. Finance flows that connect East Asia and the Indian Ocean to the Middle East and Africa. The cultures of capital and market in the neoliberal and postsocialist world.

ANTH 553a / CPLT 503a / GMAN 553a / SOCY 661a, Karl Marx's Capital Paul North A careful reading of Karl Marx's classic critique of capitalism, *Capital* volume 1, a work of philosophy, political economy, and critical social theory that has had a significant global readership for over 150 years. Selected readings also from *Capital* volumes 2 and 3.

ANTH 559b / ARCG 559b, Introduction to Experimental Archaeology Ellery Frahm Experimental archaeology is one of the most important tools to develop and test models that link human behaviors and natural forces to the archaeological record. This class explores the elements of good experimental design and procedures.

ANTH 562a, Unity and Diversity in Chinese Culture Helen Siu

An exploration of the Chinese identity as it has been reworked over the centuries. Major works in Chinese anthropology and their intellectual connections with general anthropology and historical studies. Topics include kinship and marriage, marketing systems, rituals and popular religion, ethnicity and state making, and the cultural nexus of power.

ANTH 578b, Postwar Vietnam Erik Harms

An introduction to the study of Vietnamese society since the end of the Vietnam War in 1975, with a focus on how economic and political changes intersect with cultural and social life. Examination of the historical challenges of postwar socialism, economic renovation, and the intersection of "market-oriented socialism" with class dynamics, urbanization, gender, health care, and ritual life.

ANTH 607b, Qualitative Research Methods in Public Health Ashley Hagaman This is a course about doing qualitative social research in public health. The course, which has both theoretical and practical components, introduces students to various epistemological, philosophical, and ethical considerations that are involved with qualitative research methods and the practice of social science research more generally. Additionally, students gain hands-on experience with some of the strategies and techniques that are needed to conduct qualitative research.

ANTH 615b / HSHM 755b, Anthropological Perspectives on Science and Technology Lisa Messeri

The course focuses on ethnographic work on scientific and technical topics, ranging from laboratory studies to everyday technologies. Selected texts include canonical books as well as newer work from early scholars and the most recent work of established scholars. Divided into four units, this seminar explores the theme of "boundaries," a

perennial topic in anthropology of science that deals with the possibility and limits of demarcation. Each week, different kinds of boundaries are examined, and students learn to see their social constructedness as well as the power they carry. We begin by exploring where science is and isn't, followed by the boundary between ourselves and technology, which is a specific example of the third boundary we examine: the one artificially drawn between nature and culture. We end with readings on geopolitics and the technologies of delineating nation from nation as well as thinking about postnational scientific states. Class discussion guides each session. One or two students each week are responsible for precirculating a book review on the week's reading, and a third student begins class by reacting to both the texts and the review. The final assignment is a research paper or a review essay.

ANTH 621a, Engaging Anthropology: Histories, Theories, and Practices Lisa Messeri

This is the first course of a yearlong sequence for doctoral students in Anthropology and combined programs. Students are introduced to the discipline through theoretical, historical, and experimental approaches. In addition to gaining an expansive view of the field, students have the opportunity to hone foundational scholarly skills.

ANTH 623b, The Anthropology of Possible Worlds Paul Kockelman This course focuses on the nature of possible worlds: literary worlds (Narnia), ideological worlds (the world according to a particular political stance), psychological worlds (what someone remembers to be the case, wishes to be the case, or believes to be the case), environmental worlds (possible environmental futures), virtual worlds (the World of Warcraft), and – most of all – ethnographic works in which the actual and possible worlds of others are represented (the world according to the ancient Maya). We do not focus on the contents of such worlds per se, but rather on the range of resources people have for representing, regimenting, and residing in such worlds, as well as the roles such resources play in mediating social relations and cultural values.

ANTH 659b, Feminist and Queer Ethnographies: Borders and Boundaries Eda Pepi This seminar gives students a storm's eye view of contemporary crises, where borders are as volatile as the ring of a wedding bell or the birth of a child. Feminist and queer ethnographies explore the geopolitical lines and social divides that define and confine us. Manifesting through laws, social norms, and physical barriers, borders and boundaries shape our identities, turning the intimate act of living into a fiercely political one. We consider them as lived experiences that cross militarized lines - as the everyday realities of families, detention centers, workplaces, universities, and even nightclubs. Our readings trace the fluidity of borders, the extension of the global north's influence, and the internal colonialism that redraws the landscapes of nations. Contemporary ways of bridging time and space are profoundly gendered, sexualized racialized, and class-specific, capable of materializing with sudden intensity for some and remaining imperceptible to others, morphing from ephemeral lines to seemingly permanent barriers. The course is an invitation to think beyond the map-to understand borders as something people live, challenge, and transform. Our intellectual battleground is the liminal space where geopolitics meets the raw human struggle for recognition, peeling back the layers of political theatre to witness the making and unmaking of our borderlands. Anchored by a "radical hope for living otherwise," the seminar also aims to expand the intellectual horizons necessary for dreaming of, and working towards, the world to come.

ANTH 668a, Economic Anthropology Paul Kockelman

An introduction to understanding economic systems in other cultures and societies. How work and leisure are organized, who gets what and how, and how economic concerns tie into other aspects of social life. Major debates and controversies examined, and examples from different parts of the world presented. No prior background in economics or anthropology assumed.

ANTH 701b / **ARCG 701b**, **Foundations of Modern Archaeology** Richard Burger How method, theory, and social policy have influenced the development of archaeology as a set of methods, an academic discipline, and a political tool. Prerequisite: a background in the basics of archaeology equivalent to one of the introductory courses.

ANTH 716La / ARCG 716La, Introduction to Archaeological Laboratory Sciences Ellery Frahm

Introduction to techniques of archaeological laboratory analysis, with quantitative data styles and statistics appropriate to each. Topics include dating of artifacts, sourcing of ancient materials, remote sensing, and microscopic and biochemical analysis. Specific techniques covered vary from year to year.

ANTH 726b / ARCG 726b, Ancient Civilizations of the Eurasian Steppes William Honeychurch

Peoples of the steppe zone, stretching from Eastern Europe to Mongolia, have played a pivotal role in Old World prehistory, though much about their societies and lifeways is still shrouded in mystery. The archaeology of this macro-region has developed rapidly since the 1990s, and this course presents an overview of major topics and debates in the region based on what archaeologists currently know about Eurasian steppe societies of the past.

ANTH 743a, Archaeological Research Design and Proposal Development William Honeychurch

An effective proposal requires close consideration of all steps of research design, from statement of the problem to data analysis. The course is designed to provide an introduction to the principles by which archaeological research projects are devised and proposed. Students receive intensive training in the preparation of a research proposal with the expectation that the final proposal will be submitted to national and international granting agencies for consideration. The course is structured around the creation of research questions; hypothesis development and statement of expectations; and the explicit linking of expectations to material patterning, field methods, and data analysis. Students review and critique examples of funded and nonfunded research proposals and comment extensively on each other's proposals. In addition to developing one's own research, learning to constructively critique the work of colleagues is imperative for becoming a responsible anthropological archaeologist.

ANTH 750a / ARCG 750a, Analysis of Lithic Technology Oswaldo Chinchilla Mazariegos

This course provides an introduction to the analysis of the chipped and ground stone tools found on archaeological sites. As a laboratory course, it includes hands-on instruction: we learn how to manufacture chipped stone tools out of obsidian. We begin by reviewing the development of chipped and ground stone tool technology from the earliest simple pebble tools to historical period tools. We discuss the relevance of lithics research to issues of subsistence, craft specialization, and trade. We also discuss how these artifacts are recorded, analyzed, and drawn, and we review related studies such as sourcing and use-wear analysis.

ANTH 753a / WGSS 757a, Feminist Anthropology Eda Pepi

This seminar explores the impact of feminist theory on anthropology and interdisciplinary ethnography, charting its influence from the decline of structural functionalism to the embrace of poststructuralist and post-colonial perspectives. It engages feminist contributions on pivotal debates over the universality of women's subordination, the denaturalization of kinship, and the reframing of gender and sexuality as performative, highlighting the intersection of the "sex/gender system" with other analytical categories on a global scale. Through the feminist reevaluation of kinship studies, once the bedrock of anthropology, the course takes up how traditional analyses of biological, social, and societal reproduction that treat politics, economy, kinship, and religion as distinct cultural domains naturalize power and inequality. This paradigm shift inspired empirically informed interdisciplinary analyses across the social sciences and humanities – including in women's studies, Black and Latina studies, queer studies, masculinity studies, affect theory, and science and technology studies. As such, the seminar is also an invitation to participate in both hopeful and skeptical new visions of anthropology – to dream of an "otherwise" future for our and other fields.

ANTH 754b / ARCG 754b, Statistics for Archaeological Analysis William Honeychurch

An introduction to quantitative data collection, analysis, and argumentation for archaeologists. Lectures, readings, and exercises emphasize the exploration, visualization, and analysis of specifically archaeological data using simple statistical approaches. No prior knowledge of statistics is required.

ANTH 756a / ARCG 756a, The Archaeology of Trade and Exchange Richard Burger This seminar focuses on archaeological approaches to exchange and trade. As background, we review some of the principal theories of exchange from anthropology and sociology, such as those of Mauss, Malinowski, and Polanyi. The role of trade and exchange in different kinds of societies is examined by contextualizing these transactions within specific cultural configurations and considering the nature of production and consumption as they relate to movement of goods. We consider methods and models that have been used to analyze regions of interaction at different spatial scales and the theoretical arguments about the social impact of inter-regional and intra-regional interactions involving the transfer of goods, including approaches such as world systems, unequal development, and globalization. In addition, we examine the ways that have been utilized in archaeology to identify different kinds of exchange systems, often through analogies to well-documented ethnographic and historic cases. Finally, we consider the range of techniques that have been employed in order to track the movement of goods across space. These sourcing techniques are evaluated in terms of their advantages and disadvantages from an archaeological perspective, and in terms of how the best technical analyses may vary according to the nature of natural or cultural materials under consideration (ceramics, volcanic stone, metals, etc.). The theme for this year's seminar is obsidian; students select some aspect of obsidian research for their final paper and presentation.

ANTH 764b / **AMST 762b**, **Anthropology in the Anthropocene** Kathryn Dudley This research seminar examines the anthropological project in the context of the Anthropocene and its intertwined histories of agriculture, empire, slavery, and

capitalism. Drawing on transdisciplinary readings that open up multiple ways to conceptualize anthropology's evolving relationship to our planetary predicament, students develop critical approaches to ecological and governmental problematics produced, as Agamben suggests, by anthropological machines that produce the human and nonhuman within perpetually updated spaces of exception. Throughout we pay close attention to ethnographic analytics and writing practices that trouble such binaries in favor of affective or relational modes of knowing and being. In-class workshops offer opportunities to share term papers in progress.

ANTH 785a / ARCG 785a, Archaeological Ceramics I Anne Underhill Ceramics are a rich source of information about a range of topics including ancient technology, cooking practices, craft specialization, regional trade, and religious beliefs. This course provides a foundation for investigating such topics and gaining practical experience in archaeological analysis of ceramics. Students have opportunities to focus on ceramics of particular interest to them, whether these are low-fired earthen wares, or porcelains. We discuss ancient pottery production and use made in diverse contexts ranging from households in villages to workshops in cities. In addition we refer to the abundant ethnoarchaeological data about traditional pottery production.

ANTH 806b, Causal Inference in Behavioral Ecology, Evolution, and Environmental Sciences Eduardo Fernandez-Duque

If correlation does not usually imply causation, how can we understand causes and effects when we cannot do "real" experiments and most of our data are observational? This seminar is intended for students planning or conducting research in the ecological, environmental, evolutionary and behavioral sciences. The course is focused on how to design studies that allow us to make inferences about causality ("causal inference") when most data are observational (as opposed to experimental). We read book chapters and journal articles on observational and experimental research, deductive and inductive reasoning, formulation of research questions, conceptual diagrams, hypotheses and predictions, selection/definition/validity of variables, causal diagrams and paths, mediators, moderators, and confounding factors. Offered as a seminar, students are required to participate, and a couple of times lead, class discussions; write weekly/biweekly short essays; and produce a final term project.

ANTH 812b, Current Topics in Anthropological Genetics Serena Tucci This course is a series of seminars on cutting-edge topics in the field of anthropological genetics. Topics include the use of modern and ancient DNA as powerful tools for studying human evolution, population history, and adaptation. The course also explores ethical and social implications of human genetic research and direct-toconsumer genetic testing. Students actively work through these topics, using readings, presentations, and class discussions. Students learn how genetic data can help us unlock our evolutionary past, how to interpret and communicate human genetic variation, and how to assess issues and challenges of conducting anthropological genetic research.

ANTH 824a, Politics of Memory Yukiko Koga

This course explores the role of memory as a social, cultural, and political force in contemporary society. How societies remember difficult pasts has become a contested site for negotiating the present. Through the lens of memory, we examine complex roles that our relationships to difficult pasts play in navigating issues we face today. The course explores the politics of memory that takes place in the realm of popular culture and public space. It asks such questions as: How do you represent difficult

and contested pasts? What does it mean to enable long-silenced victims' voices to be heard? What are the consequences of re-narrating the past by highlighting past injuries and trauma? Does memory work heal or open wounds of a society and a nation? Through examples drawn from the Holocaust, the atomic bombing in Hiroshima, the Vietnam War, genocide in Indonesia, and massacres in Lebanon, to debates on confederacy statues, slavery, and lynching in the United States, the course approaches these questions through an anthropological exploration of concepts such as memory, trauma, mourning, silence, voice, testimony, and victimhood.

ANTH 830a, Topics and Issues in Human Life History Evolution Richard Bribiescas This seminar reviews our current understanding of life history traits that have been central to human evolution. Traits to be examined include patterns of growth, sexual maturation, reproduction, and aging. Emphasis is placed on the examination of the literature of forager and non-industrialized communities as well as comparative information from nonhuman animal models, particularly nonhuman primates.

ANTH 864b / ARCG 864b, Human Osteology Eric Sargis

A lecture and laboratory course focusing on the characteristics of the human skeleton and its use in studies of functional morphology, paleodemography, and paleopathology. Laboratories familiarize students with skeletal parts; lectures focus on the nature of bone tissue, its biomechanical modification, sexing, aging, and interpretation of lesions.

ANTH 876b, Observing and Measuring Behavior Eduardo Fernandez-Duque The primary subject matter of the course is the methods used for the systematic observation and measurement of the behavior of living organisms and the quantification and analyses of the information collected.

ANTH 894a and ANTH 895b, Methods and Research in Molecular Anthropology I Serena Tucci

A two-part practical introduction to molecular analyses of anthropological questions. In the first term, students learn a range of basic tools for laboratory-based genetic analyses and bioinformatics. In the second term, students design and carry out independent laboratory projects that were developed in the first term.

ANTH 910a, Teaching Anthropology: Foundations and Pedagogical Approaches Claudia Valeggia

Anthropology, as a discipline, encompasses the study of the human experience, which involves cultural, material, and biological variation. Teaching anthropology involves not just imparting knowledge about this variation but also fostering critical thinking, empathy, and cross-cultural understanding among students. This seminar delves into various pedagogical approaches employed in teaching anthropology, aiming to foster learning and engagement.

ANTH 950a, Directed Research: Preparation for Qualifying Exam Staff By arrangement with faculty.

ANTH 951a, Directed Research in Ethnology and Social Anthropology Staff By arrangement with faculty.

ANTH 953a, Directed Research in Archaeology and Prehistory Staff By arrangement with faculty.

ANTH 954a, Directed Research in Biological Anthropology Staff By arrangement with faculty.

ANTH 963a and ANTH 964b / HIST 963a and HIST 964b / HSAR 841a and HSAR 842b / HSHM 691a and HSHM 692b, Topics in the Environmental Humanities Staff

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. This course does not count toward the corrigework requirement in history. Open only to students pursuing the Graduate Certificate in Environmental Humanities. ¹/₂ Course cr per term

ANTH 965a, Directed Research in Physical Anthropolgy Erik Harms

By arrangement with faculty.

Applied Mathematics

Leet Oliver Memorial Hall http://applied.math.yale.edu M.S., M.Phil., Ph.D.

Director of Graduate Studies Anna Gilbert

Professors Yang Cai (Computer Science), Joseph Chang (Statistics and Data Science), Ronald Coifman (Mathematics; Computer Science), Thierry Emonet (Molecular, Cellular, and Developmental Biology; Physics), Michael Fischer (Computer Science), Anna Gilbert (Mathematics; Statistics and Data Science), Jonathon Howard (Molecular Biophysics and Biochemistry), Yuval Kluger (Pathology), Rajit Manohar (Electrical and Computer Engineering), Owen Miller (Applied Physics), Nicholas Read (Physics; Applied Physics; Mathematics), Vladimir Rokhlin (Computer Science; Mathematics), Charles Smart (Mathematics), Mitchell Smooke (Mechanical Engineering and Materials Science; Applied Physics), Daniel Spielman (Computer Science; Mathematics), Van Vu (Mathematics), John Wettlaufer (Earth and Planetary Sciences; Mathematics; Physics), Huibin Zhou (Statistics and Data Science), Steven Zucker (Computer Science; Biomedical Engineering)

Associate Professors Sekhar Tatikonda (Statistics and Data Science)

Assistant Professor Roy Lederman (Statistics and Data Science), Quanquan Liu (Computer Science), Andre Wibisono (Computer Science)

FIELDS OF STUDY

The graduate Program in Applied Mathematics comprises the study and application of mathematics to problems motivated by a wide range of application domains. Areas of concentration include the analysis of data in very high-dimensional spaces, the geometry of information, computational biology, mathematical physics (optical and condensed matter physics), and randomized algorithms. Topics covered by the program include classical and modern applied harmonic analysis, linear and nonlinear partial differential equations, inverse problems, quantum optics, imaging, numerical analysis, scientific computing and applications, discrete algorithms, combinatorics and combinatorial optimization, graph algorithms, geometric algorithms, discrete mathematics and applications, information theory, econometrics, financial mathematics, statistical computing, and applications of mathematical and computational techniques to fluid mechanics, combustion, and other scientific and engineering problems.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in Applied Mathematics may also apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

All students are required to:

- 1. complete eight term courses (including reading courses) at the graduate level, at least two with Honors grades;
- pass a qualifying examination on their general applied mathematical knowledge (in four core topics and specialized topics in consultation with the Director of Graduate Studies) by the end of their second year;
- 3. submit a dissertation prospectus;
- 4. participate in the instruction of undergraduates for at least two terms;
- 5. be in residence for at least three years; and
- 6. complete a dissertation that clearly advances understanding of the subject it considers.

Prior to registering for a second year of study, and in addition to all other academic requirements, students must successfully complete MATH 991, Ethical Conduct of Research, or another approved course on responsible conduct in research. Teaching is considered an integral part of training at Yale University, so all students are expected to complete two terms of teaching. Students who require additional support from the graduate school will be required to teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

Requirement (1) normally includes four core courses in each of (i) the methods of applied analysis, (ii) numerical computation or algorithms, and (iii) discrete mathematics or probability or statistics; these should be taken during the first year. The qualifying examination is normally taken by the end of the fourth term and will test knowledge of the core courses as well as more specialized topics. The thesis is expected to be independent work, done under the guidance of an adviser. An adviser is usually contacted not long after the student passes the qualifying examinations; students are encouraged to find an adviser sooner rather than later. A student is admitted to candidacy after completing requirements (1)–(5) and finding an adviser.

In addition to the above, all first-year students must successfully complete one course on the responsible conduct of research (e.g., MATH 991 or CPSC 991) and AMTH 525, Seminar in Applied Mathematics.

HONORS REQUIREMENT

Students must meet the Graduate School's Honors requirement by the end of the fourth term of full-time study.

M.D.-PH.D. STUDENTS

With permission of the DGS, M.D.-Ph.D. students may request a reduction in the program's academic teaching requirement to one term of teaching. Only students who teach are eligible to receive a university stipend contingent on teaching.

MASTER'S DEGREES

M.Phil. The minimum requirements for this degree are that a student shall have completed all requirements for the Applied Mathematics Ph.D. program as described above except the required teaching, the prospectus, and the dissertation. Students

will not generally have satisfied the requirements for the M.Phil. until after two years of study, except where graduate work done before admission to Yale has reduced the student's graduate course work at Yale. In no case will the degree be awarded after less than one year of residence in the Yale Graduate School of Arts and Sciences. See also Degree Requirements under Policies and Regulations.

M.S. Only students who withdraw from the Ph.D. program may be eligible to receive the M.S. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.S., students must successfully complete seven graduate-level term courses, maintain a High Pass average, and meet the Graduate School's Honors requirement.

More information is available on the program's website, http://applied.math.yale.edu.

COURSES

AMTH 631a / S&DS 631a, Optimization and Computation Zhuoran Yang An introduction to optimization and computation motivated by the needs of computational statistics, data analysis, and machine learning. This course provides foundations essential for research at the intersections of these areas, including the asymptotic analysis of algorithms, an understanding of condition numbers, conditions for optimality, convex optimization, gradient descent, linear and conic programming, and NP hardness. Model problems come from numerical linear algebra and constrained least squares problems. Other useful topics include data structures used to represent graphs and matrices, hashing, automatic differentiation, and randomized algorithms. Prerequisites: multivariate calculus, linear algebra, probability, and permission of the instructor. Enrollment is limited, with preference given to graduate students in Statistics and Data Science.

AMTH 640b / CPSC 640b / MATH 640b, Topics in Numerical Computation

Vladimir Rokhlin

This course discusses several areas of numerical computing that often cause difficulties to non-numericists, from the ever-present issue of condition numbers and ill-posedness to the algorithms of numerical linear algebra to the reliability of numerical software. The course also provides a brief introduction to "fast" algorithms and their interactions with modern hardware environments. The course is addressed to Computer Science graduate students who do not necessarily specialize in numerical computation; it assumes the understanding of calculus and linear algebra and familiarity with (or willingness to learn) either C or FORTRAN. Its purpose is to prepare students for using elementary numerical techniques when and if the need arises.

AMTH 666a / ASTR 666a / EPS 666a / MATH 666a, Classical Statistical Thermodynamics John Wettlaufer

Classical thermodynamics is derived from statistical thermodynamics. Using the multiparticle nature of physical systems, we derive ergodicity, the central limit theorem, and the elemental description of the second law of thermodynamics. We then develop kinetics, the origin of diffusion, transport theory, and reciprocity from the linear thermodynamics of irreversible processes. Topics of focus include Onsager reciprocal relations, the Fokker-Planck and Cahn-Hilliard equations, stability in the sense of Lyapunov, time invariance symmetry and maximum principles. We explore phenomena cross a range of problems in science and engineering. Prerequisites for Yale College students: PHYS 301, PHYS 410, MATH 246 or similar and/or permission of instructor.

AMTH 675a / MATH 675a, Numerical Methods for Partial Differential Equations Vladimir Rokhlin

Review of the classical qualitative theory of ODEs; (2) Cauchy problem. Elementary numerical methods: Euler, Runge-Kutta, predictor-corrector. Stiff systems of ODEs: definition and associated difficulties, implicit Euler, Crank-Nicolson, barrier theorems. Richardson extrapolation and deferred corrections; (3) Boundary value problems. Elementary theory: finite differences, finite elements, abstract formulation and related spaces, integral formulations and associated numerical tools, nonlinear problems;
(4) Partial differential equations (PDEs). Introduction: counterexamples, Cauchy-Kowalevski theorem, classification of second-order PDEs, separation of variables;
(5) Numerical methods for elliptic PDEs. Finite differences, finite elements, Richardson and deferred corrections, Lippmann–Schwinger equation and associated numerical tools, classical potential theory, "fast" algorithms;
(6) Numerical methods for parabolic PDEs. Finite differences, finite elements, integral formulations and related numerical tools;
(7) Numerical methods for hyperbolic PDEs. Finite differences, finite elements, integral formulations and related numerical tools;
(7) Numerical methods for hyperbolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, time-invariant problems and Fourier transform.

AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

Applied Physics

Becton Center, 203.432.2210 http://appliedphysics.yale.edu M.S., M.Phil., Ph.D.

Chair Vidvuds Ozolins

Director of Graduate Studies

Peter Schiffer (BCT 329; 203.432.2647; peter.schiffer@yale.edu)

Professors Charles Ahn, Sean Barrett (*Physics*), Hui Cao, Michel Devoret, Paul Fleury (*Emeritus*), Steven Girvin (*Physics*), Leonid Glazman (*Physics*), Jack Harris (*Physics*), Victor Henrich (*Emeritus*), Sohrab Ismail-Beigi, Marshall Long (*Mechanical Engineering and Materials Science*), Simon Mochrie, Corey O'Hern (*Mechanical Engineering & Materials Science*), Vidvuds Ozolins, Daniel Prober, Nicholas Read, Peter Schiffer, Robert Schoelkopf, Ramamurti Shankar (*Physics*), Mitchell Smooke (*Mechanical Engineering & Materials Science*), A. Douglas Stone, Hong Tang (*Electrical Engineering*), Robert Wheeler (*Emeritus*), Werner Wolf (*Emeritus*)

Associate Professors Michael Choma (Biomedical Engineering), Peter Rakich

Assistant Professors Yu He, Owen Miller, Shruti Puri

FIELDS OF STUDY

Fields include areas of theoretical and experimental condensed-matter and materials physics, optical and laser physics, quantum science, quantum information, and nanoscale science. Specific programs include surface and interface science, first principles electronic structure methods, photonic materials and devices, complex oxides, magnetic and superconducting artificially engineered systems, quantum computing and superconducting device research, quantum transport, quantum optics, and random lasers.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in Applied Physics may also apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The requirements for a Ph.D. in applied physics include passing at least nine course units. Courses such as Dissertation Research, Master's Thesis, or seminars do not count towards the nine-course requirement, but two terms of Special Investigation courses are acceptable. Other than the Special Investigation courses, the courses counting toward the nine-course requirement must be full-credit graduate courses. Courses outside of those identified as acceptable in the departmental degree guidelines must have a clear technical, scientific, or mathematical focus that is related to applied physics in the judgement of the student's adviser and the DGS. Within the nine-course requirement, students must pass the three core courses, unless they are substituted or waived with approval by the DGS. The three core courses are Electromagnetic Theory I (PHYS 502), Quantum Mechanics I (PHYS 508), and Statistical Physics I (PHYS 512).

Students must also take the Research in Applied Physics Seminar (APHY 576) and the Responsible Conduct in Research for Physical Scientists Seminar (APHY 590).

Students typically complete most of their course requirements in the first year, and sufficient progress toward meeting the course requirements is necessary to remain in good standing in the program. Note that the required courses are just the minimum, and students are strongly encouraged to consult with their adviser about taking additional courses that are needed to facilitate their dissertation research.

By the end of the first year, students must find a research adviser who is willing to supervise a project that is consonant with the research program of that faculty. Research advisers must have an appointment in the graduate school and be engaged in research that falls broadly within the subject of applied physics, although they do not need to be members of the department's faculty.

After completing coursework, the next step toward a degree is admission to candidacy, indicating that the student is prepared to do original and independent research. To be admitted to candidacy, students must submit a written research prospectus and pass an area examination early in their third year. If a student has faced unusual circumstances, this deadline can be extended, with the support of the research adviser and approval of the DGS.

There is no foreign language requirement.

Teaching experience is regarded as an integral part of the graduate training program at Yale University, and all applied physics graduate students are required to serve as teaching fellows for two terms, typically during years two and three. Teaching duties normally involve assisting in laboratories or discussion sections and grading papers. Teaching duties are not expected to require more than ten hours per week. Students are not permitted to teach during the first year of study. Students who require additional support from the graduate school must teach for up to an additional two terms, if needed.

If a student was admitted to the program having earned a score of less than 26 on the Speaking section of the Internet-based TOEFL, the student will be required to take an English as a Second Language (ESL) course each term at Yale until the graduate school's Oral English Proficiency standard has been met. This must be achieved by the end of the third year in order for the student to remain in good standing.

HONORS REQUIREMENT

In order to remain in good standing in the program, students are expected make steady progress in meeting their course requirements and to obtain Honors grades in at least two full-term courses by the end of their fourth term of full-time study. Courses such as Master's Thesis, seminars, or Special Investigations cannot be used to fulfill the requirement for two Honors grades. An extension may be granted on a case-by-case basis at the discretion of the DGS, in consultation with the student's adviser. Students are also expected to maintain an average grade of High Pass during their time at Yale, following the averaging methodology determined by the graduate school.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Students may apply for a terminal master's degree in applied physics. For the M.S. degree, the requirements are that the student pass eight full-credit graduate courses (not seminars), typically courses similar to those that would meet the course requirements for the Ph.D. No more than two of the courses may be Special Investigations. Students may substitute other graduate courses with a clear technical, scientific, or mathematical focus that is related to applied physics in the judgement of the student's adviser and the DGS. An average grade of at least High Pass is required, with at least one grade of Honors. This terminal degree program is normally completed in one year. Doctoral students who withdraw from the Ph.D. program may be eligible to receive the M.S. if they have met the above requirements and have not already received the M.Phil.

Program materials are available upon e-mail request to applied.physics@yale.edu, or at http://appliedphysics.yale.edu.

COURSES

APHY 506a, Basic Quantum Mechanics Staff

Basic concepts and techniques of quantum mechanics essential for solid state physics and quantum electronics. Topics include the Schrödinger treatment of the harmonic oscillator, atoms and molecules and tunneling, matrix methods, and perturbation theory.

APHY 526a, Explorations in Physics and Computation Logan Wright

Computation has taken on an important, often central, role in both the practice and conception of physical science and engineering physics. This relationship is intricate and multifaceted, including computation for physics, computation with physics, and computation as a lens through which to understand physical processes. This course takes a more or less random walk within this space, surveying ideas and technologies that either apply computation to physics, that understand physical phenomena through the lens of computation, or that use physics to perform computation. Given the extent to which machine learning methods are currently revolutionizing this space of ideas, we focus somewhat more on topics related to modern machine learning, as opposed to other sorts of algorithms and computation. Since it is covered more deeply in other courses, we do not extensively cover error-corrected/fault tolerant quantum information processing, but we do frequently consider quantum physics. The course does not provide a systematic overview of any one topic, but rather a sampling of ideas and concepts relevant to modern research challenges. It is therefore intended for graduate students in early years of their program or research-inclined senior undergraduate students contemplating a research career. As a result, in addition to the scientific topics at hand, key learning goals include the basics of literature review, presentation, collegial criticism (peer review), and synthesizing new research ideas. Evaluation is primarily through two projects, one a lecture reviewing a topic area of interest and one a tutorial notebook providing worked numerical examples/code meant to develop or introduce a concept. Prior experience with Python is ideal, but can be

learned as part of the coursework. Students should ideally be familiar with quantum mechanics, including density matrices and some phase-space methods, but this applies to only small fraction of the course. The course is primarily a survey-level overview of many topics, not a deep dive into any one topic. As a result, students who have extensive background on many of the topics described in the syllabus are welcome to participate but should speak with the instructor beforehand so we can determine if their learning goals can be met.

APHY 548a / ENAS 850a / PHYS 548a, Solid State Physics I Vidvuds Ozolins A two-term sequence (with APHY 549) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

APHY 549b / ENAS 851b / PHYS 549b, Solid State Physics II Yu He A two-term sequence (with APHY 548) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

APHY 576a, Topics in Applied Physics Research Peter Rakich The course introduces the fundamentals of applied physics research to graduate students in the Department of Applied Physics in order to introduce them to resources and opportunities for research activities. The content of the class includes overview presentations from faculty and other senior members of the department and related departments about their research and their career trajectories. The class also includes presentations from campus experts who offer important services that support Applied Physics graduate students in their successful degree completion.

APHY 588b, Modern Nanophotonics: Theory and Design Owen Miller This course is an introduction to modern nanophotonic theory and design. We introduce a broad range of mathematical and computational tools with which one can analyze, understand, and design for a diverse range of nanophotonic phenomena. The course is meant to be in the orthogonal complement of traditional courses working through Jackson's Classical Electrodynamics - we (mostly) avoid specialized highsymmetry cases in which Maxwell's equations can be solved exactly. Instead, our emphasis is on general mode, quasinormal-mode, and scattering-matrix descriptions, as well as surface- and volume-integral formulations that distill the essential physics of complex systems. The unique properties and trade-offs for a variety of computational methods, including finite-element, finite-difference, integral-equation, and modalexpansion (e.g., RCWA) approaches, comprise a significant portion of the latter half of the term. The robust open-source computational tools Meep, S4, and NLopt are introduced early on, to be learned and utilized throughout the term. Prerequisites: undergraduate-level electromagnetism (e.g., APHY 322) and linear algebra (e.g., MATH 222 or 225); familiarity with any of Matlab/Python/Julia/etc., or a willingness to learn.

APHY 590b / PHYS 590b, Responsible Conduct in Research for Physical Scientists Karsten Heeger

A review and discussion of best practices of conduct in research including scientific integrity and misconduct; mentorship; data management; and diversity, equity, and inclusion in science.

APHY 607b, Modern Topics in Optics and Quantum Electronics Peter Rakich This course provides a survey of modern topics involving integrated photonics, optomechanics, nonlinear optics, and laser physics for students interested in contemporary experimental optics research. Subjects include nonlinear wave phenomena, optomechanical interactions, phonon physics, light scattering, light emission and detection, cavities, systems of cavities, traveling-wave devices and interactions, perturbation theory, reciprocal and nonreciprocal systems, parametric interactions, laser oscillators and related technologies. Students are encouraged to explore these and related research topics through independent study and classroom presentations.

APHY 610b / PHYS 610b, Quantum Many-Body Theory Leonid Glazman Identical particles and second quantization. Electron tunneling and spectral function. General linear response theory. Approximate methods of quantum many-body theory. Dielectric response, screening of long-range interactions, electric conductance, collective modes, and photon absorption spectra. Fermi liquid; Cooper and Stoner instabilities; notions of superconductivity and magnetism. BCS theory, Josephson effect, and Majorana fermions in condensed matter; superconducting qubits. Bose-Einstein condensation; Bogoliubov quasiparticles and solitons.

APHY 628b / PHYS 628b, Statistical Physics II Nicholas Read

An advanced course in statistical mechanics. Topics may include mean field theory of and fluctuations at continuous phase transitions; critical phenomena, scaling, and introduction to the renormalization group ideas; topological phase transitions; dynamic correlation functions and linear response theory; quantum phase transitions; superfluid and superconducting phase transitions; cooperative phenomena in low-dimensional systems.

APHY 650a / PHYS 650a, Theory of Solids I Leonid Glazman

A graduate-level introduction with focus on advanced and specialized topics. Knowledge of advanced quantum mechanics (Sakurai level) and solid state physics (Kittel and Ashcroft-Mermin level) is assumed. The course teaches advanced solid state physics techniques and concepts.

APHY 660a / PHYS 601a, Quantum Information and Computation Staff

This course focuses on the theory of quantum information and computation. We cover the following tentative list of topics: overview of postulates of quantum mechanics and measurements, quantum circuits, physical implementation of quantum operations, introduction to computational complexity, quantum algorithms (DJ, Shor's, Grover's, and others as time permits), decoherence and noisy quantum channels, quantum errorcorrection and fault-tolerance, stabilizer formalism, error-correcting codes (Shor, Steane, surface-code, and others as time permits), quantum key distribution, quantum Shannon theory, entropy and data compression. **APHY 675a / PHYS 675a, Principles of Optics with Applications** Hui Cao Introduction to the principles of optics and electromagnetic wave phenomena with applications to microscopy, optical fibers, laser spectroscopy, nanophotonics, plasmonics, and metamaterials. Topics include propagation of light, reflection and refraction, guiding light, polarization, interference, diffraction, scattering, Fourier optics, and optical coherence.

APHY 725a / ENAS 725a, Advanced Synchrotron Techniques and Electron Spectroscopy of Materials Charles Ahn

This course provides descriptions of advanced concepts in synchrotron X-ray and electron-based methodologies for studies of a wide range of materials at atomic and nano-scales. Topics include X-ray and electron interactions with matter, X-ray scattering and diffraction, X-ray spectroscopy and inelastic methods, time-resolved applications, X-ray imaging and microscopy, photo-electron spectroscopy, electron microscopy and spectroscopy, among others. Emphasis is on applying the fundamental knowledge of these advanced methodologies to real-world materials studies in a variety of scientific disciplines.

APHY 816a / PHYS 816a, Techniques of Microwave Measurement and RF Design Robert Schoelkopf

An advanced course covering the concepts and techniques of radio-frequency design and their application in making microwave measurements. The course begins with a review of lumped element and transmission line circuits, network analysis, and design of passive elements, including filters and impedance transformers. We continue with a treatment of passive and active components such as couplers, circulators, amplifiers, and modulators. Finally, we employ this understanding for the design of microwave measurement systems and techniques for modulation and signal recovery, to analyze the performance of heterodyne/homodyne receivers and radiometers.

APHY 990a or b, Special Investigations Peter Rakich

Faculty-supervised individual projects with emphasis on research, laboratory, or theory. Students must define the scope of the proposed project with the faculty member who has agreed to act as supervisor, and submit a brief abstract to the director of graduate studies for approval.

Archaeological Studies

10 Sachem Street, 203.432.3670 http://archaeology.yale.edu M.A.

Chair and Director of Graduate Studies Richard Burger [F]

Professors Richard Burger (Anthropology), Edward Cooke, Jr. (History of Art; American Studies), John Darnell (Near Eastern Languages and Civilizations), Stephen Davis (Religious Studies; History), Eckart Frahm (Near Eastern Languages and Civilizations), Milette Gaifman (History of Art; Classics), William Honeychurch (Anthropology), J.G. Manning (Classics; History), Roderick McIntosh (Emeritus), Nadine Moeller (Near Eastern Languages and Civilizations), Eric Sargis (Anthropology; Ecology and Evolutionary Biology), Anne Underhill (Anthropology), David Watts (Anthropology), Harvey Weiss (Near Eastern Languages and Civilizations; School of the Environment)

Associate Professors Oswaldo Chinchilla (*Anthropology*), Andrew Johnston (*Classics*; *History*)

Lecturers, Research Associates, and Research Scientists Ellery Frahm (Anthropology), Gregory Marouard (Near Eastern Languages and Civilizations), Lucy Salazar (Anthropology), Catherine Skinner (Earth and Planetary Sciences)

The aim of the program is to give students the academic background needed for careers in museums, cultural resource management, and teaching in community colleges and secondary schools. It also provides the opportunity for teachers, curators, and administrators to refresh themselves on recent developments in archaeology. In addition, the program enables some of our students to strengthen their background in archaeology before applying to Ph.D. programs. The program is administered by Yale's Council on Archaeological Studies, with faculty from the Departments of Anthropology, Classics, Earth and Planetary Sciences, History, History of Art, Near Eastern Languages and Civilizations, and Religious Studies.

SPECIAL REQUIREMENTS FOR THE M.A. DEGREE

Courses are drawn from the graduate programs of the participating departments and from those undergraduate courses that are also open to graduate students. Eight courses are required. Unless previously taken for credit, these will include the archaeological laboratory overview; at least one additional laboratory course; a course related to archaeology in two of the following three groups: (1) anthropology; (2) classics, history, history of art, Near Eastern languages & civilizations, or religious studies; (3) earth and planetary sciences, ecology and evolutionary biology, or environment; and four electives. All students are required to participate in an approved summer field project. In addition, each student will write a master's thesis. Degree candidates are required to pay a minimum of one year of full tuition. Full-time students can complete the course requirements in one academic year, and all students are expected to complete the program within a maximum period of three academic years.

For further information, visit the Archaeological Studies website, http:// archaeology.yale.edu. Inquiries may be directed to Director of Graduate Studies, c/o
Registrar, Archaeological Studies, Department of Anthropology, Yale University, PO Box 208277, New Haven CT 06520-8277, or via email, marleen.cullen@yale.edu.

COURSES

ARCG 500a / CLSS 808a / NELC 500a, Environmental Archaeology of West Asia, Egypt, and the Mediterranean Harvey Weiss

The new linkages of high-resolution paleoclimate and archaeological and epigraphic records revise earlier historiography for the major disjunctions, including societal genesis, collapse, habitat tracking, and technological and ideological innovations, from 4000 to 40 BCE across west Asia, Egypt, and the Aegean. The seminar synthesizes speleothem and lake, marine, and glacial core records for abrupt climate changes and coincident societal adaptations previously unexplained.

ARCG 559b / ANTH 559b, Introduction to Experimental Archaeology Ellery Frahm Experimental archaeology is one of the most important tools to develop and test models that link human behaviors and natural forces to the archaeological record. This class explores the elements of good experimental design and procedures.

ARCG 645a / NELC 743a, Archaeology of Ancient Egypt: An Introduction Gregory Marouard

This seminar examines in detail the archaeology of ancient Egypt following the chronological order of Egyptian history and covering almost 4,000 years, from the late Neolithic period to the end of the Greco-Roman period. The aim is not only to give a comprehensive overview of major sites and discoveries but also to use as much as possible information from recent excavations, discuss problems and priorities concerning this field, and offer an introduction to new fieldwork methods and approaches used in Egypt as well as a short history of this discipline.

ARCG 701b / ANTH 701b, Foundations of Modern Archaeology Richard Burger How method, theory, and social policy have influenced the development of archaeology as a set of methods, an academic discipline, and a political tool. Prerequisite: a background in the basics of archaeology equivalent to one of the introductory courses.

ARCG 716La / ANTH 716La, Introduction to Archaeological Laboratory Sciences Ellery Frahm

Introduction to techniques of archaeological laboratory analysis, with quantitative data styles and statistics appropriate to each. Topics include dating of artifacts, sourcing of ancient materials, remote sensing, and microscopic and biochemical analysis. Specific techniques covered vary from year to year.

ARCG 726b / ANTH 726b, Ancient Civilizations of the Eurasian Steppes William Honeychurch

Peoples of the steppe zone, stretching from Eastern Europe to Mongolia, have played a pivotal role in Old World prehistory, though much about their societies and lifeways is still shrouded in mystery. The archaeology of this macro-region has developed rapidly since the 1990s, and this course presents an overview of major topics and debates in the region based on what archaeologists currently know about Eurasian steppe societies of the past.

ARCG 750a / ANTH 750a, Analysis of Lithic Technology Oswaldo Chinchilla Mazariegos

This course provides an introduction to the analysis of the chipped and ground stone tools found on archaeological sites. As a laboratory course, it includes hands-on instruction: we learn how to manufacture chipped stone tools out of obsidian. We begin by reviewing the development of chipped and ground stone tool technology from the earliest simple pebble tools to historical period tools. We discuss the relevance of lithics research to issues of subsistence, craft specialization, and trade. We also discuss how these artifacts are recorded, analyzed, and drawn, and we review related studies such as sourcing and use-wear analysis.

ARCG 754b / ANTH 754b, Statistics for Archaeological Analysis William Honeychurch

An introduction to quantitative data collection, analysis, and argumentation for archaeologists. Lectures, readings, and exercises emphasize the exploration, visualization, and analysis of specifically archaeological data using simple statistical approaches. No prior knowledge of statistics is required.

ARCG 756a / ANTH 756a, The Archaeology of Trade and Exchange Richard Burger This seminar focuses on archaeological approaches to exchange and trade. As background, we review some of the principal theories of exchange from anthropology and sociology, such as those of Mauss, Malinowski, and Polanyi. The role of trade and exchange in different kinds of societies is examined by contextualizing these transactions within specific cultural configurations and considering the nature of production and consumption as they relate to movement of goods. We consider methods and models that have been used to analyze regions of interaction at different spatial scales and the theoretical arguments about the social impact of inter-regional and intra-regional interactions involving the transfer of goods, including approaches such as world systems, unequal development, and globalization. In addition, we examine the ways that have been utilized in archaeology to identify different kinds of exchange systems, often through analogies to well-documented ethnographic and historic cases. Finally, we consider the range of techniques that have been employed in order to track the movement of goods across space. These sourcing techniques are evaluated in terms of their advantages and disadvantages from an archaeological perspective, and in terms of how the best technical analyses may vary according to the nature of natural or cultural materials under consideration (ceramics, volcanic stone, metals, etc.). The theme for this year's seminar is obsidian; students select some aspect of obsidian research for their final paper and presentation.

ARCG 785a / ANTH 785a, Archaeological Ceramics I Anne Underhill Ceramics are a rich source of information about a range of topics including ancient technology, cooking practices, craft specialization, regional trade, and religious beliefs. This course provides a foundation for investigating such topics and gaining practical experience in archaeological analysis of ceramics. Students have opportunities to focus on ceramics of particular interest to them, whether these are low-fired earthen wares, or porcelains. We discuss ancient pottery production and use made in diverse contexts ranging from households in villages to workshops in cities. In addition we refer to the abundant ethnoarchaeological data about traditional pottery production.

ARCG 864b / ANTH 864b, Human Osteology Eric Sargis

A lecture and laboratory course focusing on the characteristics of the human skeleton and its use in studies of functional morphology, paleodemography, and paleopathology. Laboratories familiarize students with skeletal parts; lectures focus on the nature of bone tissue, its biomechanical modification, sexing, aging, and interpretation of lesions.

Architecture

Rudolph Hall, 203.432.2288

https://www.architecture.yale.edu/academics/programs/4-p-h-d M.Phil., Ph.D.

Dean Deborah Berke

Director of Doctoral Studies

Joan Ockman (316 Rudolph, 203.432.6874, joan.ockman@yale.edu)

Professors Sunil Bald, Phillip G. Bernstein, Francesco Casetti, Anna Dyson, Keller Easterling, Joan Ockman, Eeva-Liisa Pelkonen, Alan Plattus, Kishwar Rivzi

Associate Professors Craig Buckley, Mark Foster Gage, Elihu Rubin

Assistant Professors Anthony Acciavatti, Mae-Ling Lokko, David Sadighian, Ife Vanable

Lecturers and Critics Mohamed Aly-Etman, Kyle Dugdale, Christopher Hawthorne, Yoko Kawai, Justin Garrett Moore, M. Surry Schlabs

Visiting Faculty Luis Carranza, Vyjayanthi Rao

FIELDS OF STUDY

The doctoral program in Architecture offers two tracks of study: History and Theory of Architecture and Ecosystems in Architectural Sciences. Both tracks offer rigorous grounding in their respective fields of specialization while giving future scholars and educators a broad awareness of issues currently facing architecture in its relations with society and the world at large.

The History and Theory track provides training in the historiography and culture of architecture and the built environment. It prepares candidates for careers in university teaching, cultural advocacy and administration, museum curatorship, and publishing, among others. Students focus on a diverse range of topics, often drawing on related disciplines ranging from art history to the history of science and technology and beyond. The program aims to foster both a deep knowledge of the past and a strong spirit of critical inquiry.

The Ecosystems in Architectural Sciences track provides preparation in interdisciplinary scientific inquiry in support of both academic and professional research careers, qualifying students to collaborate across disciplines and to incorporate environmental research methods within new design frameworks. Doctoral thesis work involves the investigation, development, and testing of novel material and information systems. Students in this track engage in research related to the behaviors of living ecosystems, emphasizing their interconnection with built environment processes.

HISTORY AND THEORY TRACK Admission Requirements

Applicants must have a master's degree or equivalent in architecture, urban planning, environmental design, or, exceptionally, a related field. Two years of professional

work in an architecture office are recommended. The Graduate Record Examination (GRE) General Test taken no more than five years prior to application is required. All applicants whose native language is not English are also required to take the Internetbased Test of English as a Foreign Language (TOEFL iBT), which includes a section on spoken English. The TOEFL requirement may be waived only for applicants who, prior to matriculation at Yale, will have received a baccalaureate degree or its international equivalent from a college or university where English is the primary language of instruction. Applicants must have studied in residence at the baccalaureate institution for at least three years to receive the waiver. A waiver will not be granted on the basis of an advanced degree (such as M.A., M.S., or Ph.D.) from another institution.

In addition to meeting the qualifying criteria, candidates are required as part of the application to submit a portfolio of their own architectural work, a writing sample in the form of a substantial research paper or publication, and an explanation of their motivation for engaging in their chosen course of study. Qualified applicants may be invited to interview with a member of the doctoral faculty.

The portfolio should be a well-edited representation of the applicant's creative work. Portfolios may not contain videos. Anything submitted that is not entirely the applicant's own work must be clearly identified as such. The portfolio is submitted digitally as a single PDF document optimized not to exceed 20Mb and will need to be uploaded as part of the online application. Pages of the pdf portfolio should be uploaded as spreads. The digital portfolio will be viewed on computer screens, so resolution above 150 dpi is not necessary.

Admission to the Ph.D. program in Architecture is administered by the Yale Graduate School of Arts and Sciences. For general questions regarding admissions, please contact graduate.admissions@yale.edu.

The Application Process

The online application can be accessed at http://gsas.yale.edu/admission when it is available. Applications for the program beginning in the 2024–2025 academic year must be submitted no later than January 2, 2024. Applicants will not be allowed to submit applications after the deadline has passed.

Requirements for the History and Theory Ph.D. Track

Students are required to be full-time and in residence in the New Haven area during their first three academic years. Students may be asked to attend summer orientation courses before their first term. (See Degree Requirements under Policies and Regulations in the Bulletin of the Graduate School of Arts and Sciences.)

During the first two years, students engage in a concerted course of study that leads directly to work on the dissertation. In all, they are required to take twelve graduate-level seminars for credit. These include a Ph.D. seminar taught in each of the first two terms by a standing or visiting faculty member of the School of Architecture. The Ph.D. seminars, ARCH 551 and ARCH 552, constitute the program's methodological foundation and introduce students to an array of historiographic approaches and areas of study. The content of the two seminars varies from year to year.

For purposes of fulfilling their remaining course requirements, students are encouraged to take one or more courses outside the School of Architecture that are related to their specific area of interest. For example, a student working on architecture in Brazil would likely take courses in Latin American history and culture. Students may also opt to do independent readings with individual faculty in their area.

Not later than the end of the second year, students are expected to demonstrate competence in at least one foreign language relevant to their field of study. Language competence is more than a formality and requires some acquaintance with literature in the chosen language; competency may be demonstrated by a grade of B or better in a full-year intermediate-level language course or through examination. By the end of the second year, all course and language requirements are normally completed, and the student's field of interest is defined. At this point the director of doctoral studies (DDS) works with the student to identify a thesis adviser, who may or may not be from the School of Architecture.

In the fall term of the third year, students are required to take an oral examination on three topics relevant to their field of doctoral research. The exam, combining questions on each of the three fields in one two-hour session, is administered by the thesis adviser and two additional examiners selected by the student. Following their successful completion, the DDS, in consultation with the student's principal adviser, appoints the student's dissertation committee, which consists of the student's principal adviser plus two additional faculty members. It is typical for one of the dissertation committee members to come from outside the School of Architecture, with selection based on the student's area of interest.

At the end of the third year or, at latest, the beginning of the fourth, students are expected to defend their dissertation prospectus, a preliminary proposal of their dissertation topic. The prospectus comprises a description of the topic, an outline of a detailed program of research, and an annotated bibliography. Upon passing all predissertation requirements including the field exams and prospectus defense, students are admitted to candidacy for the Ph.D. and are "ABD" (all but dissertation). At this point, they embark on their dissertation research and writing, submitting drafts of the dissertation chapters as they are completed. The dissertation committee guides and monitors the student's progress through the course of writing and evaluates the dissertation upon completion.

The Ph.D. program is designed to be completed in five years. However, if the dissertation has not been completed by the end of the fifth year and if, at that time, the program certifies that the candidate will complete the dissertation by August of the following academic year, the candidate may be eligible to take a teaching position in the School of Architecture or elsewhere in the university and extend funding for up to an additional nine months.

Graduate Research Assistant and Teaching Fellow Experience

Teaching is an important part of the doctoral program in History and Theory of Architecture. Students in the program are expected to teach or serve as research assistants for four terms, normally in their third and fourth years. During these four terms, it is anticipated that a student in the History and Theory track will teach in two survey courses in the student's area of study at the School of Architecture or elsewhere in the university and teach in two design studios at the School of Architecture. All teaching assignments are carried out under the direct supervision of senior faculty.

ECOSYSTEMS IN ARCHITECTURAL SCIENCES TRACK

Anna Dyson, Program Director, Ecosystems in Architectural Sciences

The Ecosystems in Architectural Sciences track supports students to innovate the means and methods of architectural systems. This track provides preparation in interdisciplinary scientific inquiry, qualifying students to incorporate rigorous scientific methods in the research, development, and deployment of novel material and informational ecosystems for the built environment. Students in this track engage in research related to the behaviors of living ecosystems, emphasizing the interconnections between the built environment process and health, equity, and justice across both human and non-human living systems.

Admission Requirements

Applicants must have a master's degree or equivalent in architecture, engineering, environmental design, or, exceptionally, in a related field. Two years of professional work in an architecture office are recommended. The Graduate Record Examination (GRE) General Test taken no more than five years prior to application is required. All applicants whose native language is not English are also required to take the Internetbased Test of English as a Foreign Language (TOEFL iBT), which includes a section on spoken English.

In addition to meeting the qualifying criteria, candidates are required as part of the application to submit a portfolio of their own architectural work, a writing sample in the form of a substantial research paper or publication, and an explanation of their motivation for engaging in their chosen course of study. Qualified applicants may be invited to interview with a member of the doctoral faculty.

The portfolio should be a well-edited representation of the applicant's creative work. Anything submitted that is not entirely the applicant's own work must be clearly identified as such. The portfolio is submitted digitally as a single PDF document optimized not to exceed 20Mb and will need to be uploaded as part of the online application. Pages of the pdf portfolio should be uploaded as spreads. The digital portfolio will be viewed on computer screens, so resolution above 150 dpi is not necessary.

Admission to the Ph.D. program in Architecture is administered by the Yale Graduate School of Arts and Sciences. For general questions regarding admissions, please contact graduate.admissions@yale.edu.

The Application Process

The online application can be accessed at http://gsas.yale.edu/admission when it is available. Applications for the program beginning in the 2024–2025 academic year must be submitted no later than January 2, 2024. Applicants will not be allowed to submit applications after the deadline has passed.

Requirements for the Ecosystems in Architectural Sciences Ph.D. Track

The Ecosystems in Architectural Sciences is housed within the Yale Center for Ecosystems in Architecture (Yale CEA) at the Yale School of Architecture. As a labbased program, this track requires students to be full-time and in residence in the New Haven lab during the duration of their program, with the exception of a maximum of four semesters that might be undertaken in field research related to their area of inquiry. Students may be asked to attend summer orientation courses before their first term. (See Degree Requirements under Policies and Regulations in the Bulletin of the Graduate School of Arts and Sciences.)

This Ph.D. track supports two areas of specialization: 1) Built Environment (BE) Systems Modeling and (2) Environmental Control Systems (ECS) Design and Development. The two proposed areas of specialization are complementary and have considerable overlap in terms of curriculum. However, they differ in terms of the dissertation deliverables. The modeling specialization requires the development of novel contributions to computational methods for quantifying and qualifying the behavior and performance of built environment systems, and the experimental specialization requires the design, physical prototyping, and experimental observation of a novel environmental systems concept within the context of architectural design research.

All students are encouraged to take courses related to their specific areas of interest outside the School of Architecture. For example, a student working on biodiversity in urban contexts might take courses in the School of the Environment. Typically, at least two of the eight elective seminars would be in related fields. Students can also opt to do independent readings with individual faculty members related to their specific areas of interest.

For the Ecosystems in Architectural Sciences track, not later than the end of their second year, students are also expected to demonstrate competence in the pertinent bioclimatic and architectural modeling languages. Computational design competence is more than a formality and requires some acquaintance with the software languages that are current in the chosen area of inquiry. Competency may be demonstrated by a grade of High Pass in at least two of the related required courses and/or seminars.

The student's field of interest within the Ecosystems in Architectural Sciences track is defined by the end of the second year, by which point all course requirements are normally completed, although further options courses that deepen interdisciplinary expertise may be pursued beyond second year. At this time, the program director assigns the student a thesis adviser, who may or may not be from the School of Architecture, and typically many students may be co-advised by an additional member of their committee depending on the area of inquiry. During the fall term of the third year, students undergo an examination on topics relevant to their doctoral research in the presence of the thesis adviser. Following successful completion of the examination, the program director, in consultation with the student's adviser, appoints a dissertation committee for the student. The dissertation committee consists of the student's adviser plus a minimum of two additional faculty members. One of the dissertation committee members typically comes from outside the School of Architecture, with selection based on the student's area of interest. Upon appointment of the committee, the student will undertake a qualifications exam, which includes an oral component with the committee and a written component. Upon successful completion of the Qualification Exam, a student is ready to prepare for the Candidacy Exam and final dissertation.

FIELD, QUALIFYING, AND CANDIDACY EXAMINATIONS

Each Ph.D. student in the Ecosystems in Architectural Sciences track is required to undergo three stages of evaluations that determine whether they are prepared to proceed to the next stage in the Ph.D. course of study. The proposed timelines are typical but may be adjusted in exceptional cases in consultation with the Graduate School of Arts and Sciences. During the first three terms of coursework, the student will undertake three oral field examinations in the presence of their adviser, typically taking the standard format of architectural design review juries. Between the second and third year of doctoral studies, the student undergoes a qualification examination with their appointed committee that contains both written and oral components. Finally, between the third and fourth year, the student takes the candidacy examination with their committee.

Field Examinations

Purpose The field examinations are designed to test the basic knowledge in the chosen field of inquiry, as accumulated within the student's first terms of coursework, including topics in building physics, energy modeling, passive and active building systems, history and theory of ecology and environmental design, and material systems and production. Students undertake an oral exam with external reviewers sometime after the first year of course work, and successful completion is required in order to continue on to further doctoral studies within the Ecosystems in Architectural Sciences track.

Descriptions and Procedures The field exam is given as an oral exam by a minimum of three master's-sequence course instructors in which the candidate presents their work and is asked a series of questions by the reviewers. Usually, this process takes place during the period of mid-term and end-of-term reviews. The review takes sixty to ninety minutes with articulated responses to questions in which a variety of topics as listed above may be covered.

Evaluation Following the reviews, instructors meet to discuss the student's performance on the exam and determine whether the student warrants a pass or fail grade. Pass: student proceeds without conditions; Fail: student may not be considered for continuing acceptance into the Ph.D. program.

Qualifying Examination

Purpose The qualifying examination is the prerequisite for preparing the candidacy proposal and writing a dissertation. It is designed to examine the knowledge acquired by the student in their proposed field of inquiry. In this context, knowledge of the field not only entails a mastery of the subjects related to the field but also requires the ability to formulate and elaborate on both theoretical and practical problems related to the chosen field of inquiry. Both aspects are tested with the oral and written formats of the qualifying examination. The qualifying examination in the Ecosystems in Architectural Sciences track is typically taken after the conclusion of coursework and must be completed before admission to Ph.D. candidacy. Preparation for the

qualifying examination comprises a combination of coursework and supplementary individual readings as discussed with advisers throughout the course of doctoral studies. Typically, students are recommended to take the examination at the end of their second year of doctoral studies, depending on the required coursework and preparation as agreed upon by the student and their primary adviser. The scope and focus of each examination is a matter for discussion and negotiation with individual examiners. In preparation, the student should strive for a level of knowledge and expertise such as would be required to construct and teach a course on the subject and to be able to conduct independent scholarship in the field.

Descriptions and Procedures The qualifying examination is divided into two parts: an oral examination and a written examination. The examination format is intended to strike a balance between comprehensive knowledge of the related field(s) that are pertinent to the proposed dissertation and the requisite tools for critical scholarship in the chosen area within Ecosystems in Architectural Sciences. The specific format of each examination is tailored to individual student needs, interests, and background.

For the preparation of both parts of the examination, the student prepares and submits a comprehensive bibliography in support of their dissertation proposal and related to the preparatory literature review that they have accumulated during course work and independent readings in support of their proposed dissertation topic. This comprehensive bibliography should be submitted alongside their proposal (two to five pages) to their adviser and eventual examiners two months prior to taking the qualifying examinations. Responsibility for formulating exam questions rests with faculty members specializing in the related fields of inquiry, and others who are appropriate in specific cases as deemed by the examination committee members. The committee is made up of at least two examiners who are not the principal adviser to the student and at least one examiner who is from a department outside of the School of Architecture.

The oral examination, which does not exceed two hours, concentrates intensively on a precise cluster of problems specifically related to the body of literature as presented by the student's qualification proposal summary and bibliography.

The written examination is also formulated by the committee in response to the student's proposal summary and bibliography and is designed to examine the student's facility in carrying out research in the chosen field. The examiners present the student with three relevant questions to be answered in essay format. Two of the questions can be answered with access to books, notes, and any other available resources and are to be completed within five days, comprising no more than thirty typewritten, double-spaced pages. The third question is prepared during a six-hour session at the end of the five-day period within the Ecosystems in Architectural Science lab space, without the aid of supporting materials.

Evaluation There are four possible categories of evaluation on the qualifying exam. 1) Pass: The student will proceed to prepare the candidacy exam and the doctoral committee will be confirmed; (2) Pass with conditions: The exam was generally acceptable and the student will begin preparations for candidacy but minor specific recommendations on further evaluation are needed, and a doctoral committee will be confirmed to set a date for further evaluation of additional requirements; (3) Reexamination required: The scheduling of another examination date to be determined; and (4) Fail: The committee doesn't think that the candidate will be able to accomplish the proposed dissertation project. The student receives an M.Phil. degree upon graduation of this phase, provided that the units of academic credit on all coursework have been successfully completed.

Candidacy Examination

By the end of the third year, students are required to present and defend their preliminary proposal of a dissertation topic. This prospectus should consist of a topic statement, an outline of a detailed program of research, and an annotated bibliography. Students are admitted to candidacy for the Ph.D. upon completion of all pre-dissertation requirements, including the prospectus, oral examinations, and qualifying exam with the committee. At this point, they begin dissertation research and writing, submitting drafts of the dissertation chapters as they are completed. The dissertation committee guides and monitors the student's progress in writing the dissertation and evaluates the dissertation upon completion.

Procedures Following the successful completion of the qualifying examination and acceptance of the summary dissertation proposal, the committee is confirmed for the development of the dissertation proposal itself. The dissertation proposal, accompanied by a working bibliography, is prepared and submitted to the committee three months prior to the candidacy exam. It is worked out in consultation with the advising faculty and submitted to the committee, who then meet with the student for a two-hour colloquium to assess the scope, significance, and feasibility of the topic and the student's preparation to accomplish it within the standard doctoral time frame. After approval by the committee, a two-page, single-spaced summary of the proposal is submitted to director of doctoral studies for approval to proceed. Once accepted, this proposal becomes the basis for the eventual assessment of the completed dissertation. After acceptance of the proposal, the student is admitted to candidacy for the Ph.D. Students must be admitted to candidacy by the beginning of the fourth year of study, unless exceptional circumstances are approved by the director of graduate studies and the Graduate School of Arts and Sciences.

Graduate Research Assistant and Teaching Fellow Experience

The program in Architecture considers teaching to be an important part of graduate training. Students in the Ph.D. program in Architecture are expected to teach or serve as research assistants for four terms, normally in their third and fourth years. Students in the Ecosystems in Architectural Sciences track are expected to serve as both teaching fellows in the School of Architecture and research assistants in the school's Center for Ecosystems in Architecture. All assignments are carried out under the direct supervision of senior faculty.

en route master's degree

M.Phil. The Master of Philosophy degree is awarded en route to the Ph.D. The minimum requirement for this degree is completion of all requirements for the Ph.D., with the exception of the teaching or research assignments and the dissertation.

COURSES

For a current listing of Architecture courses, consult the School of Architecture bulletin, available online at https://bulletin.yale.edu, and Yale Course Search at https:// courses.yale.edu.

Required Courses in the History and Theory of Architecture Track

ARCH 551	Ph.D. Seminar: History/Theory I: Architecture &
	Geography
ARCH 552	Ph.D. Seminar: History/Theory II

Required Courses in the Ecosystems in Architectural Sciences Track

ARCH 558	Ph.D. Seminar: Ecosystems in Architecture I
ARCH 559	Ph.D. Seminar: Ecosystems in Architecture II
ARCH 568	Ph.D. Seminar: Ecosystems in Architecture III
ARCH 569	Ph.D. Seminar: Ecosystems in Architecture IV

Astronomy

219 Prospect St., 203.432.3000 http://astronomy.yale.edu M.S., M.Phil., Ph.D.

Chair Priyamvada Natarajan

Director of Graduate Studies

Pieter van Dokkum (203.432.3000, pieter.vandokkum@yale.edu)

Professors Héctor Arce, Charles Bailyn, Charles Baltay (*Physics*), Sarbani Basu, Paolo Coppi, Pierre Demarque (*Emeritus*), Debra Fischer (*Emeritus*), Marla Geha, Larry Gladney (*Physics*), Jeffrey Kenney, Richard Larson (*Emeritus*), Priyamvada Natarajan, C. Megan Urry (*Physics*), William van Altena (*Emeritus*), Frank van den Bosch, Pieter van Dokkum, Robert Zinn

Associate Professors Reina Maruyama (*Physics*), Daisuke Nagai (*Physics*), Nikhil Padmanabhan (*Physics*)

Assistant Professor Earl Bellinger, Laura Newburgh (*Physics*), Chiara Mingarelli (*Physics*), Malena Rice

FIELDS OF STUDY

Fields include observational and theoretical astronomy, solar and stellar astrophysics, exoplanets, the interstellar medium and star formation, galactic astronomy, extragalactic astronomy, radio astronomy, high-energy astrophysics, and cosmology.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

A typical program of study includes twelve courses taken during the first four terms, and must include the core courses listed below:

The Physics of Astrophysics (ASTR 500), Computational Methods in Astrophysics and Geophysics (ASTR 520), Observational Astronomy (ASTR 555), Interstellar Matter and Star Formation (ASTR 560), either Stellar Populations (ASTR 510) or Stellar Astrophysics (ASTR 550), and either Galaxies (ASTR 530) or The Evolving Universe (ASTR 565). ASTR 620 or PHYS 678 may be substituted for ASTR 520 with the permission of the director of graduate studies (DGS).

Students require the permission of the instructor and the DGS to skip a core class if they think that they have sufficient knowledge of the field. Students will be required to demonstrate their knowledge of the field before they are allowed to skip any core class.

Two of the twelve courses must be research credits, each earned by working in close collaboration with a faculty member. Of the two research credits, one must be earned doing a theoretical research project and one doing an experimental research project. The students need to present the results of the project as a written report and will be given an evaluation of their performance.

The choice of the four remaining courses depends on the candidate's interest and background and must be decided in consultation with the DGS and/or the prospective

thesis adviser. Advisers may require students to take particular classes and obtain a specified minimum grade in order for a student to work with them for their thesis. Students must take any additional course that their supervisors require even after their fourth term. In addition, all students, regardless of their term of study, have to attend Professional Seminar (ASTR 710 and ASTR 711) every term, unless registered in absentia. Students must also take Responsible Conduct in Research for Physical Scientists (PHYS 590), which discusses ethics and responsible conduct in scientific research and fulfills the requirement stipulated by the National Science Foundation for all students and for all postdoctoral researchers funded by the NSF. Note that ASTR 710, ASTR 711, and PHYS 590 may not be used to fulfill the twelve-course requirement.

Students are encouraged to take graduate courses in physics or related subjects. On an irregular basis, special topic courses and seminars are offered, which provide the opportunity to study some fields in greater depth than is possible in standard courses. To achieve both breadth and depth in their education, students are encouraged to take a few courses beyond their second year of study.

There is no foreign language requirement. A written comprehensive examination, normally taken at the end of the fourth term of graduate work, tests the student's familiarity with the entire field of astronomy and related branches of physics and mathematics. Particular attention will be paid to the student's performance in the field in which the student plans to do research. An oral examination, held a few weeks after the written examination, is based on the student's chosen field of research. Satisfactory performance in these examinations, an acceptable record in course and research work, and an approved dissertation prospectus are required for admission to candidacy for the Ph.D. degree. The dissertation should present the results of an original and thorough investigation, worthy of publication. Most importantly, it should reflect the candidate's capacity for independent research. An oral dissertation defense is required.

Teaching experience is an integral part of graduate education in astronomy. All students are required to serve as teaching fellows for four terms. Both the level of teaching assignments and the scheduling of teaching are variable and partly determined by the needs of the department. Most students will teach in each of their first three terms and complete their fourth teaching assignment sometime after the qualifying exam. Students who require additional support from the graduate school must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

HONORS REQUIREMENT

Students must earn a grade of Honors in at least three classes by the end of the fourth term of full-time study and have a grade average of High Pass or better.

MASTER'S DEGREES

M.Phil. Upon application, the department will recommend for the award of the M.Phil. degree any student who has completed all the requirements of the Ph.D. degree except the Ph.D. dissertation. These requirements include taking and passing the qualifying exam and submission of the research projects' final written reports (one for each of the two ASTR 580 projects).

M.S. Students who withdraw from the Ph.D. program may be eligible to receive the M.S. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.S., students must successfully complete at least nine courses (not including ASTR 710 and ASTR 711) and at least one research project (ASTR 580). The student should have a grade average of High Pass in the courses and a grade of High Pass or above in the research project.

Program materials are available upon request to the Director of Graduate Studies, Department of Astronomy, Yale University, PO Box 208101, New Haven CT 06520-8101.

COURSES

ASTR 500a, The Physics of Astrophysics Sarbani Basu

Primarily for incoming students in the Ph.D. program in Astronomy. The basic physics and related mathematics needed to take the advanced graduate courses. Topics in mechanics, thermodynamics and statistical mechanics, fluid mechanics, special relativity, and electrodynamics with applications to astrophysical systems are covered. Open to undergraduates with permission of the instructor.

ASTR 518a, Stellar Dynamics Marla Geha

The study of dynamics in astronomy. Stellar dynamics attempts to answer what happens when a large number of particles (stars or galaxies) orbit under the influence of their mutual gravity. This course covers the dynamics of astronomical objects ranging from binary stars to globular clusters to galaxies. Particular emphasis is placed on direct applications to observational data.

ASTR 520a / EPS 538a, Computational Methods in Astrophysics and Geophysics Paolo Coppi

The analytic and numerical/computational tools necessary for effective research in astronomy, geophysics, and related disciplines. Topics include numerical solutions to differential equations, spectral methods, and Monte Carlo simulations. Applications are made to common astrophysical and geophysical problems including fluids and N-body simulations.

ASTR 530b, Galaxies Jeffrey Kenney

The structure and morphology of galaxies, stellar populations, interstellar media, star formation, central black holes, galaxy mergers, and galaxy properties as a function of environment.

ASTR 550b, Stellar Astrophysics Sarbani Basu

An introduction to the physics of stellar atmospheres and interiors. The basic equations of stellar structure, nuclear processes, stellar evolution, white dwarfs, and neutron stars.

ASTR 56ob, Interstellar Matter and Star Formation Hector Arce

The composition, extent, temperature, and density structure of the interstellar medium (ISM). Excitation and radiative processes; the properties of dust; the cold and hot ISM in the Milky Way and other galaxies. Dynamics and evolution of the ISM, including interactions between stars and interstellar matter. Physics and chemistry of molecular clouds and the process of star formation.

ASTR 565a, The Evolving Universe Pieter van Dokkum

Overview of cosmic history from the formation of the first star to the present day, focusing on direct observations of the high-redshift universe.

ASTR 575b, Exoplanets Malena Rice

In recent years hundreds of exoplanets have been discovered orbiting around other stars. This course reviews the physics of planetary orbits, current exoplanet detection techniques, recent progress in characterizing exoplanet interiors and atmospheres, and the implications of these findings for our understanding of planet formation and evolution.

ASTR 580a or b, Research Staff

By arrangement with faculty.

ASTR 585a, Radio Astronomy Hector Arce

Introduction to radio astronomy, theory, and techniques. Includes radiation fundamentals, antenna theory, and an introduction to radio interferometry. Discussion of spectral line radio emission and of thermal and nonthermal radio emission mechanisms in the context of galactic and extragalactic astronomical observations.

ASTR 666a / AMTH 666a / EPS 666a / MATH 666a, Classical Statistical Thermodynamics John Wettlaufer

Classical thermodynamics is derived from statistical thermodynamics. Using the multiparticle nature of physical systems, we derive ergodicity, the central limit theorem, and the elemental description of the second law of thermodynamics. We then develop kinetics, the origin of diffusion, transport theory, and reciprocity from the linear thermodynamics of irreversible processes. Topics of focus include Onsager reciprocal relations, the Fokker-Planck and Cahn-Hilliard equations, stability in the sense of Lyapunov, time invariance symmetry and maximum principles. We explore phenomena cross a range of problems in science and engineering. Prerequisites for Yale College students: PHYS 301, PHYS 410, MATH 246 or similar and/or permission of instructor.

ASTR 710a and ASTR 711b, Professional Seminar Staff

A weekly seminar covering science and professional issues in astronomy.

Biomedical Engineering

17 Hillhouse Avenue, 203.432.4220 M.S., M.Phil., Ph.D.

Chair James Duncan

Director of Graduate Studies

Richard Carson (richard.carson@yale.edu)

Professors Helene Benveniste,* Joerg Bewersdorf,* Richard Carson,† Nicholas Christakis,* Todd Constable,* Robin de Graaf,* James Duncan,† Rong Fan, Anjelica Gonzalez, Michelle Hampson,* Henry Hsia,* Jay Humphrey, Fahmeed Hyder,† Farren Issacs,* Themis Kyriakides,† Francis Lee,* Andre Levchenko, Chi Liu, Graeme Mason,* Evan Morris,* Xenophon Papademetris,* Douglas Rothman,† W. Mark Saltzman, Martin Schwartz,* Fred Sigworth,* Albert Sinusas,* Brian Smith,* Lawrence Staib,† Hemant Tagare,* John Tsang,* Paul Van Tassel,* Jiangbing Zhou*, Steven Zucker†

Associate Professors Fadi Akar,* Stuart Campbell, Julius Chapiro, Tarek Fahmy, Gigi Galiana,* Michael Higley,* Ansel Hillmer,* Chenxiang Lin,* Kathryn Miller-Jensen, Michael Murrell, Dana Peters,* Yibing Qyang*

Assistant Professors Sanjay Aneja,* Daniel Coman,* Purushottam Dixit,* Nicha Dvornek,* Evelyn Lake, Michael Mak, John Onofrey, Cristina Rodriguez, Shreya Saxena, Dustin Scheinost*

- * A secondary appointment with primary affiliation in another department or school.
- ⁺ A joint appointment with another department.

FIELDS OF STUDY

Biological and medical devices, biological signals and sensors, biomaterials, biophotonics, cellular biomechanics, computational biomechanics, computational medicine, computer vision, digital image analysis and processing, drug delivery, energy metabolism, experimental biomechanics, gene delivery, gene therapy, image analysis, Magnetic Resonance Imaging (MRI), Magnetic Resonance Spectroscopy (MRS), modeling in mechanobiology, molecular biomechanics, nanomedicine, network analysis, neuroreceptors, physics of image formation (MRI, optics, ultrasound, nuclear medicine, and X-ray), physiology and human factors engineering, Positron Emission Tomography (PET), regenerative medicine, signaling pathways, Single Photon Emission Computed Tomography (SPECT), systems biology, systems medicine, tissue engineering, tracer kinetic modeling, and vascular biology.

For degree requirements – including the joint M.D.-Ph.D. in Biomedical Engineering – and courses, see Engineering & Applied Science.

Cell Biology

Sterling Hall of Medicine C207, 203.737.5603 http://cellbiology.yale.edu M.S., M.Phil., Ph.D.

Chair James Rothman

Director of Graduate Studies

Karin Reinisch (SHM C214a, 203.785.6469, karin.reinisch@yale.edu)

Professors Joerg Bewersdorf, Christopher Burd, David Calderwood (*Pharmacology*), Michael Caplan (*Cellular and Molecular Physiology*), Daniel Colón-Ramos, Lynn Cooley (*Genetics*), Peter Cresswell (*Immunobiology*), Pietro De Camilli, Jorge Galán (*Microbial Pathogenesis*), Fred Gorelick, Valentina Greco (*Genetics*), Carl Hashimoto (*Emeritus*), Diane Krause (*Laboratory Medicine*), Thomas Lentz (*Emeritus*), Haifan Lin, Jun Liu (*Microbial Pathogenesis*), Vincent Marchesi (*Pathology*), Mark Mooseker (*Molecular*, *Cellular, and Developmental Biology*), Michael Nathanson (*Internal Medicine/Digestive Diseases*), Karla Neugebauer (*Molecular Biophysics and Biochemistry*), Karin Reinisch, James Rothman, Martin Schwartz (*Internal Medicine/Cardiology*), Derek Toomre, Felix Weiland (*Adjunct*), Sandra Wolin (*Emerita*)

Associate Professors Julien Berro (Molecular Biophysics and Biochemistry), Jonathan Bogan (Internal Medicine/Endocrinology), Shawn Ferguson, Shangqin Guo, Megan King, Chenxiang Lin, Patrick Lusk, Malaiyalam Mariappan, Thomas Melia, Christian Schlieker (Molecular Biophysics and Biochemistry), Julia von Blume, Min Wu, Yongli Zhang

Assistant Professors David Baddeley (*Adjunct*), Kallol Gupta, Xiaolei Su, Peter Takizawa, Siyuan Wang (*Genetics*), Shaul Yogev (*Neuroscience*)

FIELDS OF STUDY

Fields include membrane traffic and protein sorting, organelle biogenesis, epithelial cell polarity, membrane function in the nervous system (synapse formation and function), neural circuit development, cell biology of protozoan parasites and of pathogen/host interactions, cell biology of the immune response, mRNA biogenesis and localization, RNA folding, non-coding RNAs, stem cells, the cytoskeleton, nuclear structure and dynamics, DNA nanostructures, cellular signaling and motility, cytokinesis. Approaches to these topics include biochemistry, biophysics, molecular biology, crystallography, and single-particle electron microscopy; bacterial, yeast, *Drosophila*, *C. elegans*, and mouse genetics; immunocytochemistry and electron microscopy and tomography; live cell and super-resolution imaging.

To enter the Ph.D. program, students apply to an interest-based track, usually the Molecular Cell Biology, Genetics, and Development (MCGD) track or the Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BQBS) track, within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to take at least five graduate-level courses. No specific curriculum of courses is required, but CBIO 602 (Molecular Cell Biology) is recommended for all students to attain a solid foundation in molecular cell biology. Also recommended is a seminar course, such as CBIO 603 (Seminar in Molecular Cell Biology), in which students can develop the skill for critical analysis of research papers. Students design their own curriculum of courses to meet individual interests and needs, in consultation with the director of graduate studies. During the first year, students participate in three laboratory rotations. In the second year, a committee of faculty members determines whether each student is qualified to continue in the Ph.D. program. There is an oral qualifying examination by the end of the third term. In order to be admitted to candidacy, students must have met the graduate school Honors requirement, maintained a High Pass average in course work, passed the qualifying examination, submitted an approved prospectus, and received a positive evaluation of their laboratory work from the thesis committee. All students are required to present a talk at the departmental progress report series each year after passing the qualifying exam. The remaining degree requirements include completion of the dissertation project, submission for publication of at least one first-author paper to a peer-reviewed journal describing the dissertation research, the writing of the dissertation and its oral defense, the formal submission of copies of the written dissertation to the graduate school, and the deposit of an additional copy with the department.

An important aspect of graduate training in cell biology is the acquisition of teaching skills through participation in courses appropriate for the student's scientific interests. These opportunities can be drawn from a diverse menu of lecture, laboratory, and seminar courses given at the undergraduate, graduate, and medical school levels. Ph.D. students are required to participate in two terms (or the equivalent) of teaching. Students are not expected to teach during their first year.

In addition to all other requirements, students must successfully complete CBIO 900 and CBIO 901 (Research Skills and Ethics I and II) prior to the end of their first year of study. In their fourth year of study, all students must successfully complete B&BS 503 (RCR Refresher for Senior BBS Students).

M.D.-PH.D.

M.D.-Ph.D. students are required to take a total of five graduate-level courses for a grade, including the CBIO 501/CBIO 502 sequence (Molecules to Systems), CBIO 602 (Molecular Cell Biology), and a seminar course that involves the reading and class discussion of research papers. The remaining courses can be in areas such as genetics, neuroscience, immunology, microbiology, pharmacology, and physiology. Students must meet the graduate school requirement of a grade of Honors in two courses, if necessary taking additional courses beyond the five required in the department to fulfill this requirement. Students must also maintain an average grade of High Pass in all courses. One term of teaching is required.

MASTER'S DEGREES

M.Phil. Requirements for the M.Phil. degree are the same as for admission to candidacy (see above).

M.S. This degree is normally granted only to students who are withdrawing from the Ph.D. program. To be eligible for the degree, a student must have completed at least five graduate-level term courses at Yale, including CBIO 602 (Molecular Cell Biology) and a seminar course, with a grade of Pass and at least one grade of Honors or three of High Pass. In addition to these five courses, the student must have received a Satisfactory grade in the following five courses: CBIO 900 (Research Skills and Ethics I), CBIO 901 (Research Skills and Ethics II), CBIO 901 (Research Skills and Ethics II), CBIO 912 (Second Laboratory Rotation), and CBIO 913 (Third Laboratory Rotation). Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

Prospective applicants are encouraged to visit the BBS website (https:// medicine.yale.edu/bbs), MCGD and BQBS tracks. Program materials are available upon request to the Director of Graduate Studies, Department of Cell Biology, Yale University, PO Box 208002, New Haven CT 06520-8002.

COURSES

CBIO 501a and CBIO 502b, Molecules to Systems Peter Takizawa This full-year course (CBIO 501/CBIO 502) is designed to provide medical students with a current and comprehensive review of biologic structure and function at the cellular, tissue, and organ system levels. Areas covered include structure and organization of cells; regulation of the cell cycle and mitosis; protein biosynthesis and membrane targeting; cell motility and the cytoskeleton; signal transduction; cell adhesion; cell and tissue organization of organ systems. Clinical correlation sessions, which illustrate the contributions of cell biology to specific medical problems, are interspersed in the lecture schedule. Histophysiology laboratories provide practical experience with an understanding of exploring cell and tissue structure. The course is offered only to M.D. and M.D./Ph.D. students.

CBIO 600a and CBIO 601b, Science at the Frontiers of Medicine Staff This full-year graduate seminar (CBIO 600/CBIO 601) for first-year M.D./Ph.D. students – an elective course for M.D. students – matches the progression of topics in the eighteen-month preclinical medical school curriculum and emphasizes the connections between basic and clinical science, human physiology, and disease. It is directed by M.D./Ph.D. program faculty, and many class discussions are led by expert Yale School of Medicine faculty members who select the papers to be read. Students explore scientific topics in depth, learn about cutting-edge research, and improve their presentation skills. The curriculum provides a framework for critically reading and analyzing papers drawn broadly from the biomedical sciences; this breadth of knowledge is also leveraged in team-based exercises that promote peer-to-peer teaching and learning. Enrollment limited to students who have taken or are currently taking CBIO 501/CBIO 502.

CBIO 602a / MB&B 602a / MBIO TBD-2 / MCDB 602a, Molecular Cell Biology

Thomas Melia and Patrick Lusk A comprehensive introduction to the molecular and mechanistic aspects of cell biology for graduate students in all programs. Emphasizes fundamental issues of cellular organization, regulation, biogenesis, and function at the molecular level. Graduate Prerequisites: Some knowledge of basic cell biology and biochemistry is assumed. Students who have not taken courses in these areas can prepare by reading relevant sections in basic molecular cell biology texts. We recommend Pollard et al., *Cell Biology* (3rd ed., 2016), Alberts et al., *Molecular Biology of the Cell* (6th ed., 2014), or Lodish et al., *Molecular Cell Biology* (8th edition, 2016). Undergraduate Prerequisites: This is a graduate-level cell biology class. Any undergraduates wishing to enroll must have already taken MCDB 205. In addition, undergraduates are strongly encouraged to reach out to the course directors prior to enrollment.

CBIO 603a / MCDB 603a, Seminar in Molecular Cell Biology Megan King

A graduate-level seminar in modern cell biology. The class is devoted to the reading and critical evaluation of classical and current papers. The topics are coordinated with the CBIO 602 lecture schedule. Thus, concurrent enrollment in CBIO 602 is required. Prerequisites: Any undergraduates wishing to enroll must have already taken MCDB 205. In addition, undergraduates are strongly encouraged to reach out to the course directors prior to enrollment.

CBIO 606b, Advanced Topics in Cell Biology Xiaolei Su

This seminar course, which meets once weekly, covers advanced topics in cell biology. Each topic is spread over two or three sessions, which start with an introductory overview and are followed by a discussion of key papers led by an expert in the field.

CBIO 655a / GENE 655a, Stem Cells: Biology and Application In-Hyun Park This course is designed for first-year or second-year students to learn the fundamentals of stem cell biology and to gain familiarity with current research in the field. The course is presented in a lecture and discussion format based on primary literature. Topics include stem cell concepts, methodologies for stem cell research, embryonic stem cells, adult stem cells, cloning and stem cell reprogramming, and clinical applications of stem cell research. Prerequisites: undergraduate-level cell biology, molecular biology, and genetics.

CBIO 701b, Illuminating Cellular Function Derek Toomre

The focus of the course is on the technical treatment of light microscopy and its applications. The course provides biology and bioengineering students with the knowledge and skills necessary to design and undertake advanced light microscopy experiments. It covers conceptual elements of fluorescence microscopy imaging and analysis (without going too heavily into the theory and math); new advances in super-resolution modalities; biological applications; and hands-on practical work. Enrollment limited to fifteen.

CBIO 900a / GENE 900a / MCDB 900a, Research Skills and Ethics I Patrick Lusk This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the first and second laboratory rotations.

CBIO 901b / GENE 901b / MCDB 901b, Research Skills and Ethics II Chenxiang Lin This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the third laboratory rotation.

CBIO 911a / GENE 911a / MCDB 911a, First Laboratory Rotation Patrick Lusk First laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students. **CBIO 912a / GENE 912a / MCDB 912a, Second Laboratory Rotation** Patrick Lusk Second laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

CBIO 913b / GENE 913b / MCDB 913b, Third Laboratory Rotation Patrick Lusk Third laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

Cellular and Molecular Physiology

Sterling Hall of Medicine B147, 203.785.4041 http://medicine.yale.edu/physiology M.S., M.Phil., Ph.D.

Chair Michael Caplan

Director of Graduate Studies

David Zenisek (SHM B114, 203.785.6474, david.zenisek@yale.edu)

Professors Nadia Ameen (Pediatrics), Peter Aronson (Internal Medicine/Nephrology), Angelique Bordey (Neurosurgery), Cecilia Canessa, Lloyd Cantley (Internal Medicine/ Nephrology), Michael Caplan, Alan Dardik (Surgery), Jonathan Demb (Ophthalmology and Visual Science), Marie Egan (Pediatrics), Barbara Ehrlich (Pharmacology), Anne Eichmann, Tore Eid (Laboratory Medicine), Shuta Ishibe (Internal Medicine/Nephrology), Leonard Kaczmarek (Pharmacology), Richard Kibbey (Internal Medicine/Endocrinology), George Lister (Pediatrics), Pramod Mistry (Internal Medicine/Digestive Diseases; Pediatrics), Michael Nitabach, Vincent Pieribone, Patricia Preisig (Internal Medicine/ Nephrology), W. Mark Saltzman (Biomedical Engineering), Joseph Santos-Sacchi (Surgery/Otolaryngology), Gerald Shulman (Internal Medicine/Endocrinology), Fred Sigworth, Susumu Tomita, C. Shan Xu, Xiaoyong Yang (Comparative Medicine), Lawrence Young (Internal Medicine/Cardiology), David Zenisek, Z. Jimmy Zhou (Ophthalmology and Visual Science)

Associate Professors Nii Addy (*Psychiatry*), Sviatoslav Bagriantsev, Nigel Bamford (*Neurology*), Stuart Campbell (*Biomedical Engineering*), Jean-Ju Chung, Julie Goodwin (*Pediatrics/Nephrology*), Elena Gracheva, Erdem Karatekin, Jesse Rinehart, Matthew Rodeheffer (*Comparative Medicine*), Carson Thoreen

Assistant Professors Rui Chang, Ji Yeon Kim (*Urology*), Rachel Perry, Marc Schneeberger, Hongying Shen

FIELDS OF STUDY

Fields of study range from cellular and molecular physiology to integrative medical biology. Areas of current interest include: ion channels, transporters and pumps, membrane biophysics, cellular and systems neurobiology, protein trafficking, epithelial transport, signal transduction pathways, cardiovascular biology, sensory physiology, metabolism, organ physiology, genetic models of human disease, pathophysiology, structural biology of membrane proteins, and physiological genomics.

To enter the Ph.D. program, students typically enter via the Translational Molecular Medicine, Pharmacology, and Physiology (TMMPP) track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Formal requirements for the Ph.D. degree include two or three terms of course work, a qualifying examination taken by the end of the second year, submission of a thesis

prospectus, two terms of teaching, and completion and satisfactory defense of the thesis.

Students are expected to design a suitable program of courses in consultation with a faculty adviser. The director of graduate studies (DGS) will provide general oversight of the course selections. These courses will provide a coherent background for the expected area of thesis research and also satisfy the department's subject and proficiency requirements. Students must satisfactorily pass at least six graduate-level courses, including C&MP 550, C&MP 630, and either C&MP 560 or C&MP 580. Also during the first two terms, each student should explore research projects by performing rotations in at least three laboratories to create an informed basis upon which to select a thesis project by the end of the first year. There is no foreign language requirement. The qualifying examination, which must be passed by the end of the student's fourth term, will cover areas of physiology that complement the student's major research interest.

An important dimension of graduate training in Cellular and Molecular Physiology is the acquisition of teaching skills through participation in courses appropriate for the student's academic interests. Ph.D. students are expected to participate in two terms (or the equivalent) of teaching. Students are not expected to teach before passing the qualifying examination.

In addition to all other requirements, students must successfully complete C&MP 650, The Responsible Conduct of Research, prior to the end of their first year of study; and, in their fourth year of study, all students must successfully complete B&BS 503, RCR Refresher for Senior BBS Students.

After satisfying the departmental predissertation requirements, passing the qualifying examination, submitting a satisfactory thesis prospectus, and presenting a satisfactory report to the appropriate thesis advisory committee, students are admitted to candidacy. The completed dissertation must describe original research making a significant contribution to knowledge.

HONORS REQUIREMENT

Students must meet the Graduate School's Honors requirement by the end of the fourth term of full-time study. Students must also maintain an overall High Pass average. Student progress toward these goals is reviewed at the end of the second term. Note that Honors grades in C&MP 630 or Lab Rotations courses are not counted towards the Honors requirements.

SPECIAL REQUIREMENTS FOR M.D.-PH.D. STUDENTS

M.D.-Ph.D. students must pass at least three graduate-level courses that are not part of the Yale School of Medicine's regular M.D. program, including at least one C&MP course, preferably C&MP 560 or C&MP 580. Courses taken toward the M.D. degree can be counted toward the graduate school's Honors requirement, provided that the course carries a graduate course number and the student has registered for it as a graduate course. Two laboratory rotations, each lasting five weeks, and one term of teaching are required.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations. Awarded to students who have fulfilled all the requirements for the Ph.D. except the prospectus, teaching requirement, and dissertation, normally at the end of the second year. Students are not admitted for this degree.

M.S. Awarded only to students who are not continuing for the Ph.D. degree but who have successfully completed one year of the doctoral program (i.e., passing of at least four graduate-level courses, including two Honors grades, and three successful laboratory rotations). Students are not admitted for this degree. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

Program materials are available upon request to the Department Registrar, Department of Cellular and Molecular Physiology, Yale School of Medicine, PO Box 208026, New Haven CT 06520-8026.

COURSES

C&MP 506a / PATH 620a / PHAR 506a / PTB 620a, Lab Rotations Staff Students work in laboratories of faculty of their choice. The schedule for each rotation is announced at the beginning of the fall term.

C&MP 550a / ENAS 550a / MCDB 550a / PHAR 550a / PTB 550a, Physiological

Systems W. Mark Saltzman and Stuart Campbell

The course develops a foundation in human physiology by examining the homeostasis of vital parameters within the body, and the biophysical properties of cells, tissues, and organs. Basic concepts in cell and membrane physiology are synthesized through exploring the function of skeletal, smooth, and cardiac muscle. The physical basis of blood flow, mechanisms of vascular exchange, cardiac performance, and regulation of overall circulatory function are discussed. Respiratory physiology explores the mechanics of ventilation, gas diffusion, and acid-base balance. Renal physiology examines the formation and composition of urine and the regulation of electrolyte, fluid, and acid-base balance. Organs of the digestive system are discussed from the perspective of substrate metabolism and energy balance. Hormonal regulation is applied to metabolic control and to calcium, water, and electrolyte balance. The biology of nerve cells is addressed with emphasis on synaptic transmission and simple neuronal circuits within the central nervous system. The special senses are considered in the framework of sensory transduction. Weekly discussion sections provide a forum for in-depth exploration of topics. Graduate students evaluate research findings through literature review and weekly meetings with the instructor.

C&MP 600a and C&MP 601b, Medical Physiology Case Conferences Emile Boulpaep Two-term course taught in groups of ten to twelve students by the same group leader(s) throughout the year. Workshop format permits students to apply basic concepts of physiology to clinical syndromes and disease processes. Students are expected to participate actively in a weekly discussion of a clinical case that illustrates principles of human physiology and pathophysiology at the whole-body, system, organ, cellular, or molecular level. Prerequisites: C&MP 550 and permission of the instructor. Credit for full year only.

C&MP 610a / PTB 610a, Medical Research Scholars Program: Mentored Clinical Experience Yelizaveta Konnikova and Richard Pierce

The purpose of the Mentored Clinical Experience (MCE), an MRSP-specific course, is to permit students to gain a deep understanding of and appreciation for the interface between basic biomedical research and its application to clinical practice. The MCE is intended to integrate basic and translational research with direct exposure to clinical medicine and patients afflicted with the diseases or conditions under discussion. The course provides a foundation and a critically important forum for class discussion because each module stimulates students to explore a disease process in depth over four ninety-minute sessions led by expert clinician-scientists. The structure incorporates four perspectives to introduce the students to a particular disease or condition and then encourages them to probe areas that are not understood or fully resolved so they can appreciate the value and challenge inherent in using basic science to enhance clinical medicine. Students are provided biomedical resource material for background to the sessions as well as articles or other publicly available information that offers insight to the perspective from the non-scientific world. During this course students meet with patients who have experienced the disease and/or visit and explore facilities associated with diagnosis and treatment of the disease process. Students are expected to prepare for sessions, to participate actively, and to be scrupulously respectful of patients and patient facilities. Prior to one of the sessions students receive guidance as to what they will observe and how to approach the experience; and at the end of the session, the students discuss their thoughts and impressions. All students receive HIPAA training and appropriate training in infection control and decorum relating to patient contact prior to the course.

C&MP 629a and C&MP 630b / PATH 679a and PATH 680b / PHAR 501a and PHAR 502b / PTB 629a and PTB 630b, Seminar in Molecular Medicine, Pharmacology, and Physiology Staff

Readings and discussion on a diverse range of current topics in molecular medicine, pharmacology, and physiology. The class emphasizes analysis of primary research literature and development of presentation and writing skills. Contemporary articles are assigned on a related topic every week, and a student leads discussions with input from faculty who are experts in the topic area. The overall goal is to cover a specific topic of medical relevance (e.g., cancer, neurodegeneration) from the perspective of three primary disciplines (i.e., physiology: normal function; pathology: abnormal function; and pharmacology: intervention). Required of and open only to Ph.D. and M.D./Ph.D. students in the Molecular Medicine, Pharmacology, and Physiology track.

C&MP 650b / PATH 660b / PHAR 580b / PTB 650b, The Responsible Conduct of Research Staff

Organized to foster discussion, the course is taught by faculty in the Pharmacology, Pathology, and Physiology departments and two or three senior graduate students. Each session is based on case studies from primary literature, reviews, and two texts: Francis Macrina's *Scientific Integrity* and Kathy Barker's *At the Bench*. Each week, students are required to submit a reaction paper discussing the reading assignment. Students take turns leading the class discussion; a final short paper on a hot topic in bioethics is required.

C&MP 710b / MB&B 710b, Electron Cryo-Microscopy for Protein Structure Determination Staff

Understanding cellular function requires structural and biochemical studies at an ever-increasing level of complexity. The course is an introduction to the concepts and applications of high-resolution electron cryo-microscopy. This rapidly emerging new technique is the only method that allows biological macromolecules to be studied at all levels of resolution from cellular organization to near atomic detail. ¹/₂ Course cr

C&MP 711b / MB&B 711b, Practical cryo-EM Workshop Yong Xiong and Franziska Bleichert

This laboratory course provides hands-on training in the practical aspects of macromolecular structure determination by cryo-electron microscopy (cryo-EM). Topics include cryo-EM data collection, image preparation and correction, single-particle picking and 2-D classification, 3-D classification, refinement and post-processing, model building, refinement and evaluation. The course includes training in the use of computer programs used to perform these calculations. Prerequisite: MB&B 710/C&MP 710. ¹/₂ Course cr

Chemical and Environmental Engineering

17 Hillhouse Avenue, 203.432.4220 M.S., M.Phil., Ph.D.

Chair Jordan Peccia

Director of Graduate Studies

Mingjiang Zhong (mingjiang.zhong@yale.edu)

Professors Eric Altman, Paul Anastas,[†] Michelle Bell,^{*} Menachem Elimelech, John Fortner, Gary Haller (*Emeritus*), Edward Kaplan, Jaehong Kim, Michael Loewenberg, Jordan Peccia, Lisa Pfefferle, Daniel Rosner (*Emeritus*), W. Mark Saltzman,^{*} Udo Schwarz,^{*} T. Kyle Vanderlick, Paul Van Tassel, Julie Zimmerman[†]

Associate Professor Nicole Deziel,* Drew Gentner, Krystal Pollitt*

Assistant Professors Peijun Guo, Amir Haji-Akbari, Shu Hu, Lea Winter, Yuan Yao,* Mingjiang Zhong

Lecturer Yehia Khalil

- * A secondary appointment with primary affiliation in another department or school.
- [†] A joint appointment with another school.

FIELDS OF STUDY

Fields include nanomaterials, polymers, interfacial phenomena, energy, water and air quality, environmental microbiology, carbon capture, and sustainability.

For degree requirements and courses, see Engineering & Applied Science.

Chemistry

Sterling Chemistry Laboratory, 203.432.3915 http://chem.yale.edu M.S., Ph.D.

Chair Nilay Hazari (chemistry.chair@yale.edu)

Director of Graduate Studies Patrick Loria (patrick.loria@yale.edu)

Professors Victor Batista, Gary Brudvig, Robert Crabtree (*Emeritus*), Jason Crawford, Craig Crews,* R. James Cross, Jr. (*Emeritus*), Jonathan Ellman, John Faller (*Emeritus*), Nilay Hazari, Seth Herzon, Patrick Holland, Mark Johnson, William Jorgensen, J. Patrick Loria, James Mayer, J. Michael McBride (*Emeritus*), Scott Miller, Peter Moore (*Emeritus*), Timothy Newhouse, Anna Pyle,* James Rothman,* Martin Saunders (*Emeritus*), Dieter Söll (*Emeritus*),* David Spiegel, Scott Strobel,* John Tully (*Emeritus*), Patrick Vaccaro, Hailiang Wang, Elsa Yan, Frederick Ziegler (*Emeritus*), Kurt Zilm.

Associate Professors Stavroula Hatzios,* Sarah Slavoff

Assistant Professors Amymarie Bartholomew, Caitlin Davis, Stacy Malaker, Mingjiang Zhong,* Tianyu Zhu.

Lecturers Paul Anastas,* Paul Cooper, Christine DiMeglio, Laura Herder, Jonathan Parr.

* A secondary appointment with primary affiliation in another department.

FIELDS OF STUDY

Fields include biophysical chemistry, chemical biology, inorganic chemistry, materials chemistry, organic chemistry, physical chemistry, and theoretical chemistry.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

A foreign language is not required. Five term courses are required within the first two years of residence. Courses are chosen according to the student's background and research area. To be admitted to candidacy a student must (1) receive at least two term grades of Honors, exclusive of those for research and (2) pass the candidacy exam by the end of the second year of study. Remaining degree requirements include completing a formal independent proposal by the end of the fourth year, a written thesis describing the research, and an oral defense of the thesis. The ability to communicate scientific knowledge to others outside the specialized area is crucial to any career in chemistry. Therefore, all students are required to teach a minimum of two terms. Students who require additional support from the graduate school must teach additional terms, if needed, after they have fulfilled the academic teaching requirement. All students are required to take CHEM 590, Ethical Conduct and Scientific Research, in the fall term of their first year of study.

Ph.D. program materials are available online at https://chem.yale.edu/academics/ graduate-program/current-students/forms-steps-phd.

MASTER'S DEGREE

M.S. (en route to the Ph.D.) A student must pass at least five graduate-level term courses in the Department of Chemistry, exclusive of seminars and research. In addition, an overall average (exclusive of seminars and research) of High Pass must be maintained in all courses. One full year of residence is required.

COURSES

CHEM 502a, Fundamentals of Transition Metal Chemistry Patrick Holland This half-term course covers the structures and properties of coordination compounds, and strategies for the design and analysis of new compounds. Elements of chelating ligands, spectroscopic methods, and magnetism are addressed. Prerequisites: two terms of organic chemistry and one term of inorganic chemistry (CHEM 252 or equivalent). ½ Course cr

CHEM 503b, Fundamentals of Organometallic Chemistry Nilay Hazari A half-term survey of the main principles of organometallic chemistry that enables students to understand basic concepts in the field. It prepares students for CHEM 504, the second half of this course. Prerequisites: two terms of organic chemistry and one term of inorganic chemistry (CHEM 252) or equivalent experience. ¹/₂ Course cr

CHEM 504b, Applications of Organometallic Chemistry James Mayer A half-term survey of the applications of organometallic chemistry demonstrating the range of areas where organometallic reactions are important. It builds on the knowledge

learned in CHEM 503. Prerequisite: CHEM 503 or equivalent experience. ½ Course cr

CHEM 505b, Inorganic Reaction Mechanisms James Mayer

This half-term course covers the fundamentals of kinetics and mechanisms used by coordination compounds and transition-metal catalysts, and features analysis of papers from the recent literature. Prerequisites: two terms of organic chemistry, one term of inorganic chemistry, and CHEM 502 or equivalent. ¹/₂ Course cr

CHEM 506a, Bioinorganic Spectroscopy Gary Brudvig

This course is an advanced introduction to biological inorganic chemistry with an emphasis on the methods used to characterize the active sites of metalloproteins. The major physical methods used in the determination of molecular structure, bonding, and physical properties of metal ions in proteins are introduced. Prerequisite: a general knowledge of biochemistry and familiarity with both inorganic coordination chemistry and physical chemistry. ¹/₂ Course cr

CHEM 507a, Bioinorganic Mechanisms Gary Brudvig

This course is an advanced introduction to biological inorganic chemistry. An overview of the relevant geometric and electronic structures of metalloprotein active sites is presented and related to each protein's function. The objective is to define and understand the function of metals in biology in terms of structure. Prerequisite: CHEM 506 or permission of the instructor. It is assumed that students have a general knowledge of biochemistry and are familiar with both inorganic coordination chemistry and physical chemistry. ¹/₂ Course cr

CHEM 510A, Energy and Environmental Electrochemistry Hailiang Wang This course aims to serve graduate and senior undergraduate students from various academic departments who are interested in learning electrochemistry and its related materials chemistry for performing energy and environmental research. The most important task of this course is to discuss and understand how the properties of electrochemical energy storage and conversion devices are fundamentally determined by their chemistry. Battery and electrocatalytic reactions that are of current research focus are introduced and discussed in detail. State-of-the-art materials development, structural characterization, electrochemical reaction studies, mechanistic investigation, and reactor engineering related to these reactions are also be covered. Prerequisites: undergraduate-level general chemistry (CHEM 161 and CHEM 165 or CHEM 163 and CHEM 167), inorganic chemistry (CHEM 252), and thermodynamics/physical chemistry (CHEM 332) or equivalent level of knowledge. ¹/₂ Course cr

CHEM 513a, Electronic Structure in Inorganic Chemistry Patrick Holland This course covers a number of methods for analyzing the electronic structure of coordination complexes of the transition metals. It features the use of densityfunctional theory (DFT) to gain quantitative insight into properties, and critical analysis of the results. Prerequisite: CHEM 502 or equivalent. ¹/₂ Course cr

CHEM 516a, Organic Structure and Energetics William Jorgensen The course covers concepts in physical organic chemistry including molecular structure and bonding, conformational energetics, electronic effects, thermochemistry, ring strain, noncovalent interactions, molecular recognition, and host-guest chemistry. Prerequisites: two terms of organic chemistry and two terms of physical chemistry, or related courses, or permission of the instructor. ¹/₂ Course cr

CHEM 517a, Kinetics and Thermodynamics in Organic Systems Scott Miller The course generally follows CHEM 516. This module covers concepts in physical organic chemistry including acid-base chemistry, advanced issues in stereochemistry, kinetics, and thermodynamics, as well as experiments and techniques employed in mechanistic analysis. Issues in catalysis are addressed throughout. Prerequisites: CHEM 516, two terms of introductory organic chemistry, and two terms of physical chemistry. Permission of the instructor may be sought for potential exceptions. ½ Course cr

CHEM 519a, Proteomics and Chemical Glycobiology Stacy Malaker Chemical biology deals with how chemistry can be applied to manipulate and study biological problems using techniques from organic chemistry, analytical chemistry, biochemistry, molecular biology, biophysical chemistry, and cell biology. This course covers topics related to the structure of proteins and oligosaccharides, protein engineering and labeling, and glycosylated proteins/nucleic acids. These play important roles throughout biochemistry and human health. Prerequisites: two terms of organic chemistry. ¹/₂ Course cr

CHEM 521a, Protein Design and Catalysis Jason Crawford

The lecture component of this course largely focuses on protein function, catalysis, and the chemistry and biology of diverse small molecule products. The course also serves to support students in writing an effective NSF style research proposal in chemical biology and communicating its contents to a diverse scientific audience. Prerequisites: Two semesters of undergraduate organic chemistry (CHEM 174/175 and/or CHEM 220/221). A basic understanding of biochemistry and molecular biology is also assumed, but you can "catch up" by carefully and thoroughly reading the course materials and recommended books. ¹/₂ Course cr

CHEM 524a, Chemical Biology of Drug Discovery David Spiegel This course explores the design and enablement of medicines derived from a convergence of concepts and techniques from chemistry and biology. Topics include: small molecule drug discovery concepts and tools, drug metabolism, protein therapeutics, hybrid chemical/biologic drugs, and bi-functional molecules. Modern approaches for target discovery and validation are also discussed. The course is not organized around a textbook. Rather, material covered in lectures is the focus of the course and supplementary reading is recommended, mostly from modern research literature. Reading lists are distributed at the outset of the module. Prerequisites: two terms of undergraduate organic chemistry, biochemistry, and molecular biology. ½ Course cr

CHEM 529b, Total Synthesis Timothy Newhouse

This course is conducted as a seminar. The content focuses on modern strategies and tactics in natural product synthesis with a focus on alkaloids, terpenes, and polyketides. One objective of the course is to introduce strategy level decision making considering multiple approaches to retrosynthetic disconnection. Additionally, a wide variety of methodologies are described and discussed with respect to how they can be implemented in total synthesis. The course draws from primary sources in order for students to develop critical reading and writing skills. Prerequisite: one chemistry course at the 500 level or permission of the instructor. ¹/₂ Course cr

CHEM 532a, Synthetic Methods in Organic Chemistry I Jon Ellman Compound synthesis is essential to the discovery and development of new chemical entities with a desired property, whether for fundamental study or a more applied goal such as a new pharmaceutical, agrochemical, or material. In this course we emphasize key transformations and principles to provide a framework for the efficient design and synthesis of organic compounds. Prerequisites: two terms of organic chemistry and one term of introductory inorganic chemistry, or related course, or permission of the instructor. ¹/₂ Course cr

CHEM 533a, Synthetic Methods in Organic Chemistry II Jon Ellman Compound synthesis is essential to the discovery and development of new chemical entities with a desired property, whether that be for fundamental study or for a more applied goal such as a new pharmaceutical, agrochemical, or material. In this course we emphasize key transformations and principles to provide a framework for the efficient design and synthesis of organic compounds. This course builds on the knowledge learned in CHEM 532. Prerequisite: CHEM 532 or permission of the instructor. ½ Course cr

CHEM 534b, Synthetic Methods in Drug Discovery and Development Jon Ellman Synthetic methods that see extensive use in drug discovery and development but are not typically covered in undergraduate- or graduate-level courses are explored. We analyze common structural motifs in drugs and reactions for their preparation. Topics include common methods for the synthesis of amines, catalytic and non-catalytic methods for the formation of aromatic and heteroaromatic C-N and C-O bonds, properties of heterocycles and methods for their elaboration, annulations to common five- and six-membered heterocycles, and key attributes of the fluorine substituent in drugs along with practical methods for its introduction. Prerequisites: CHEM 532 and CHEM 533, or permission of the instructor. ½ Course cr

CHEM 535b, Fundamental Medicinal Chemistry William Jorgensen The course covers basic concepts of medicinal chemistry including drug structures, properties of drugs, methods of drug discovery, protein-ligand interactions, enzyme inhibition, assays, drug targets, anti-infective agents, virtual and high-throughput screening, structures to avoid (PAINS), structure-based drug design, and metabolism. Prerequisites: undergraduate organic and physical chemistry, or permission of the instructor. ¹/₂ Course cr

CHEM 566a, Introduction to Quantum Mechanics I Tianyu Zhu An introduction to quantum mechanics, starting with the Schrödinger equation and covering model systems such as particle-in-a-box and harmonic oscillator. The fundamental postulates and theorems of quantum mechanics are also covered. Prerequisite: physical chemistry, multivariable calculus or equivalent experience, or permission of the instructor. ¹/₂ Course cr

CHEM 567a, Introduction to Quantum Mechanics II Tianyu Zhu Continuation of an introduction to quantum mechanics, starting with angular momentum and the hydrogen atom, and then covering approximate methods such as the variation method and perturbation theory. The concepts of electron spin as well as Hartree-Fock theory and other electronic structure methods for describing molecules are also covered. Prerequisite: CHEM 566, multivariable calculus, or equivalent experience. ¹/₂ Course cr

CHEM 572a, Introduction to Statistical Mechanics I Victor Batista An introduction to modern statistical mechanics, starting with fundamental concepts of quantum statistical mechanics to establish a microscopic derivation of statistical thermodynamics. Topics include ensembles; Fermi, Bose, and Boltzmann statistics; density matrices; mean-field theories; phase transitions; chemical reaction dynamics; time-correlation functions; Monte Carlo simulations; and molecular dynamics simulations. Prerequisite: physical chemistry, multivariable calculus, or equivalent experience. ½ Course cr

CHEM 573a, Introduction to Statistical Mechanics II Victor Batista An introduction to modern statistical mechanics, starting with fundamental concepts of quantum statistical mechanics to establish a microscopic derivation of statistical thermodynamics. Topics include ensembles; Fermi, Bose, and Boltzmann statistics; density matrices; mean-field theories; phase transitions; chemical reaction dynamics; time-correlation functions; Monte Carlo simulations; and molecular dynamics simulations. Prerequisite: physical chemistry, multivariable calculus, or equivalent experience. ¹/₂ Course cr

CHEM 574a, Experimental Physical Methods in Molecular Sciences I Mark Johnson Applications of modern experimental physical methods to molecular science. Emphasis is placed on interpreting experimental data obtained by various physical methods to gain structural and dynamic information to solve problems at the molecular level. A wide range of methods are covered, such as nonlinear spectroscopy, optical imaging, vibrational spectroscopy, NMR, and electrochemical methods. Discussions focus on current and classic literature in the fields. Prerequisite: Undergraduate physical chemistry, or permission of instructor. Students enrolled in Chem 574 are expected to also enroll in Chem 575. $\frac{1}{2}$ Course cr

CHEM 576b, Fundamentals for Physical Chemistry Mark Johnson

This course reinforces the principles of physics that are most relevant to experimental and theoretical physical chemistry. These include classical electricity and magnetism (with emphasis on the nature of light and the interaction of light with matter), optics, lasers, angular momentum, and atomic structure, including the spin-orbit interaction. The basic theme of the course is to provide students with physical intuition that can bridge the observations of everyday experience to the abstract concepts required for the correct, quantum-mechanical description of atomic-scale phenomena. Prerequisites: two terms of undergraduate physical chemistry (CHEM 328 or CHEM 332, and CHEM 333; or equivalents); and physics course work covering classical mechanics and electrostatics. ¹/₂ Course cr

CHEM 578a, Molecules and Radiation I: Matrix Methods in Quantum Mechanics Kurt Zilm

A treatment of time-independent quantum mechanics especially aimed at applications in spectroscopy focusing on the use of matrix methods. Development of basis sets, time-independent perturbation theory, matrix mechanics, angular momentum, and basic group theory. Prerequisite: previous exposure to quantum mechanics at the level of physical chemistry, or permission of the instructor. ¹/₂ Course cr

CHEM 579a, Molecules and Radiation II: Time-Dependent Quantum Mechanics and Spectroscopy Kurt Zilm

A treatment of time-dependent quantum mechanics especially aimed at applications in spectroscopy. Sudden and adiabatic processes, interaction of radiation with electric and magnetic dipoles, Fermi's golden rule, two-level systems and Rabi cycling, spontaneous emission and relaxation kinetics, Bloch equations, line shapes and relaxation theory, illustrations chosen from optical and magnetic resonance. Prerequisite: CHEM 578 or permission of the instructor. ¹/₂ Course cr

CHEM 584b, Machine Learning and Quantum Computing in Chemistry and Materials Science Victor Batista

Machine learning and quantum computing have emerged as leading technologies of the twenty-first century and are expected to be increasingly applied to a wide variety of chemical and materials science challenges. This course introduces fundamental concepts of machine learning and quantum computing to chemists and materials science students through an overview of algorithms, computational methods, and applications. It is intended to empower students to engage with this emerging field and foster the growing field of artificial intelligence for accelerated scientific discoveries in the molecular and physical sciences. Prerequisites: introductory quantum mechanics and Python, or permission of the instructor. ¹/₂ Course cr

CHEM 585a, Protein NMR Spectroscopy J Patrick Loria

A theoretical treatment of solution NMR spectroscopy with emphasis on applications to proteins and biological macromolecules. This includes classical and quantum mechanical descriptions of NMR, product operator formalism, multidimensional NMR, phase cycling, gradient selection, relaxation phenomena, and protein resonance assignments. Prerequisite: physical chemistry that includes quantum mechanics; calculus and linear algebra are recommended but not required. ¹/₂ Course cr

CHEM 586a, Quantitative Biochemical Imaging Caitlin Davis

Theory of optical microscopy, imaging, and image analysis with emphasis on quantitative characterization of the structure, dynamics, and chemical reactions of proteins, nucleic acids, and other biopolymers. Topics include optics of microscope and image formation, interaction of light and matter, fluorescent probes and biosensors, digital image processing, modern approaches in light microscopy (including confocal and multiphoton), and a brief introduction to electron microscopy and scanning probe techniques. Prerequisite: physical chemistry that includes quantum mechanics; calculus and linear algebra are recommended but not required. ¹/₂ Course cr

CHEM 588b, Optical Spectroscopy: Applications in Biophysics E. Chui-Ying Yan The course covers basic theory of fluorescence and vibrational spectroscopies and their applications in biophysics. Emphasis is placed on quantitative interpretation of experimental data to gain structural and dynamic information to address biological questions at the molecular level. Topics include fluorescence correlation spectroscopy (FCS); Forster resonance energy transfer (FRET); fluorescence anisotropy; and Raman, infrared, and non-linear optical spectroscopies. Discussions of applications focus on current and classic literature. This course provides foundational knowledge for advanced courses on molecular optical imaging. Prerequisite: undergraduate upper-level physical chemistry or permission of the instructor. ¹/₂ Course cr

CHEM 590a, Ethical Conduct and Scientific Research Jonathan Parr A survey of ethical questions relevant to the conduct of research in the sciences with particular emphasis on chemistry. A variety of issues, including plagiarism, the falsification of data, and financial malfeasance, are discussed, using as examples recent cases of misconduct by scientists. Enrollment is restricted to graduate students in chemistry. o Course cr

CHEM 592b, Biochemical Rates and Mechanisms I J Patrick Loria An advanced treatment of enzymology. Topics include transition state theory and derivation of steady-state and pre-steady-state rate equations. The role of entropy and enthalpy in accelerating chemical reactions is considered, along with modern methods for the study of enzyme chemistry. These topics are supplemented with in-depth analysis of the primary literature. Prerequisites: CHEM 332 or equivalent, two terms of organic chemistry, and MATH 115. ¹/₂ Course cr

CHEM 593b, Biochemical Rates and Mechanisms II J Patrick Loria This course focuses on the role of molecular motions in enzyme function, and on biochemical and spectroscopic methods to interrogate these motions. Examples explore motions ranging from picoseconds to milliseconds and how the timescales and amplitudes of these motions impact catalysis and allostery. Prerequisite: CHEM 592 or permission of the instructor. ¹/₂ Course cr

CHEM 594b, Resonant and Non-Resonant Interaction of Light with Matter Mark Johnson

This course considers the interaction of light with individual molecules and collections of molecules in solutions and solids from the perspective of a classical radiation field interacting with the energy levels that arise from quantized motions. We begin with the generation of light by accelerated charges as described by Maxwell's equations for the electric and magnetic fields. We then consider the polarization states of light, how the oscillating electric field drives the motions of electrons, and how this results in scattering when off-resonant and then evolves into shifts in level populations as the frequency approaches that of the eigenenergies between levels. Classical analogies to quantum mechanical behavior are stressed in the context of the damped-driven electron in a harmonic potential (the so-called Drude model). The kinetics of absorption and emission are discussed in the context of the Einstein treatment that leads to light amplification and laser action. Finally, we develop the "selection rules" that describe what transitions can occur depending on the light polarization and the character of the electronic and nuclear motions. Prerequisite: an upper-level undergraduate physics course in electricity and magnetism or CHEM 576. ½ Course cr

CHEM 596b, Computational Chemistry William Jorgensen

An introduction to modern computational quantum chemistry methods. The lectures cover Hartree-Fock theory, density functional theory, geometry optimizations, thermochemistry, transition states, minimum energy paths, continuum solvation models, electron correlation methods, and modeling excited states. Special emphasis on the hands-on use of computational packages for current applications spanning organic, inorganic, and biochemical reactions. Prerequisite: physical chemistry or permission of the instructor. ¹/₂ Course cr

CHEM 600a, Research Seminar Staff

Presentation of a student's research results to the student's adviser and fellow research group members. Extensive discussion and literature review are normally a part of the series.

CHEM 720a and CHEM 721b, Current Topics in Organic Chemistry Jon Ellman A seminar series based on invited speakers in the general area of organic chemistry.

CHEM 730a and CHEM 731b, Theoretical Chemistry Seminar Staff A seminar series based on invited speakers in the areas of theoretical chemistry.

CHEM 740a and CHEM 741b, Seminar in Chemical Biology Jon Ellman

CHEM 750a and CHEM 751b, Biophysical and Physical Chemistry Seminar J Patrick Loria

A seminar series based on invited speakers in the areas of biophysical and physical chemistry.

CHEM 760a and CHEM 761b, Seminar in Inorganic Chemistry Patrick Holland

CHEM 980a and CHEM 981b, Introduction to Research for Long Rotations Staff During the fall term, first year chemistry graduate students in long rotations are introduced to research during their first laboratory rotation. At the end of the first rotation, students in the course present an oral presentation on their research. The presentation is no longer than ten minutes with a question-and-answer period of no longer than five minutes. Enrollment requires that a student be a first-year graduate student participating in long rotations.

CHEM 984b, Introduction to Research for Short Rotations Staff

First-year chemistry graduate students with short rotations have joined labs by the end of the fall term. During the spring term, each student is introduced to research by their dissertation research advisors. Towards the end of the spring term, students in the course present an oral presentation on their research. The presentation is no longer than ten minutes with a question-and-answer period of no longer than five minutes.
Enrollment requires that a student be a graduate student who has participated in short rotations.

CHEM 990a, Research Staff

Individual research for Ph.D. degree candidates in the Department of Chemistry, under the direct supervision of one or more faculty members.

Classics

402 Phelps Hall, 203.432.0977 http://classics.yale.edu M.A., Ph.D.

Chair Noel Lenski

Director of Graduate Studies Brad Inwood [F] (dgs.classics@yale.edu) Christina Kraus [Sp] (dgs.classics@yale.edu)

Professors Egbert Bakker, Kirk Freudenburg, Milette Gaifman (*Classics*; *History of Art*), Verity Harte (*Classics*; *Philosophy*), Brad Inwood (*Classics*; *Philosophy*), Christina Kraus, Noel Lenski (*Classics*; *History*), Pauline LeVen (*Classics*; *Humanities*), J.G. Manning (*Classics*; *History*)

Associate Professor Andrew Johnston

Assistant Professors Malina Buturović, Alexander Ekserdjian (*Classics*; *History of Art*), Benedek Kruchio, Jessica Lamont, Erika Valdivieso

Senior Lector and Language Program Coordinator James Patterson

Lecturers John Dillon, Timothy Robinson

Affiliated Faculty and Secondary Appointments David Charles (*Philosophy*; *Classics*), John Hare (*Divinity School*), Yii-Jan Lin (*Divinity School*), Susan Matheson (*Curator of Ancient Art, Yale Art Gallery*), Teresa Morgan (*Divinity School*), Laura Nasrallah (*Divinity School*), Kathryn Slanski (*Humanities; Near Eastern Languages and Civilizations*), George Syrimis (*Hellenic Studies*), Kevin van Bladel (*Near Eastern Languages and Civilizations*)

FIELDS OF STUDY

The degree programs in classics seek to provide an overall knowledge of Greek and Roman civilization, combined with specialized work in a number of fields or disciplines within the total area of classical antiquity.

GRADING AND GOOD STANDING

In addition to the graduate school's requirement of Honors grades in at least one yearlong course or two term courses, students must have a High Pass average in the remaining courses. Admission to candidacy for the Ph.D. is granted upon completion of all predissertation requirements not later than the end of the seventh term of study.

The faculty considers experience in the teaching of language and literature to be an important part of this program. Students in Classics typically teach in their third and fourth years of study.

REQUIREMENTS FOR THE PH.D. DEGREE IN CLASSICAL PHILOLOGY

- Practice translation exams in Greek and Latin on texts assigned from the Classical Philology Ph.D. reading lists; these are taken before the beginning of the first and third terms and are meant to help students prepare for the qualifying translation exams to be taken before the beginning of the fifth term in the program.
- 2. Departmental reading examinations in French (or Italian) and German, or approved Yale courses or examinations that demonstrate reading proficiency in these languages (e.g., by achieving a grade of A in "French/German/Italian for Reading Knowledge," or by passing proficiency exams administered by Yale's modern language departments). The department will also accept certain certificates of proficiency in French, German, or Italian in lieu of these exams, as listed in the Classics Graduate Handbook. One modern language exam is to be passed by the end of the first year in residence and the second by the end of the second year in residence.
- 3. A proseminar offering an introduction to the discipline of Classics and its various subdisciplines (not for credit), and a minimum of twelve term courses to include: (i) two yearlong survey courses in the history of Greek and Latin literature (four courses in total); (ii) at least four seminars, of which two have to be literary seminars in one language, and one in the other; (iii) one course in ancient history (either an 800-level seminar or a 600-level materials course), and one in classical art and archaeology; and (iv) two courses on Greek and Latin language, comprising composition, linguistics, and stylistics (currently GREK 703 and LATN 790).
- 4. Oral examinations in Greek and Latin literature, based on the syllabus covered by the survey courses, drawn from the Classical Philology Ph.D. reading lists. These are to be taken closely following the surveys in the respective literatures, as follows: the first, at the end of the second term (May of the first year), the second at the end of the fourth term (May of the second year).
- 5. Translation examinations in Greek and Latin, based on the Classical Philology Ph.D. reading lists, by the beginning of the fifth term in residence.
- 6. Special fields oral examinations will occur at the beginning of the sixth term, and consist of four areas of special concentration selected by the candidate in consultation with the DGS. One of the special fields should be related to the student's chosen dissertation topic; the three other fields are in each of the two ancient languages/cultures; one historical topic, or a topic with historical potential, is advised. In addition to the oral exam, the student will be asked to write a short summary of the dissertation topic and submit this summary and a working dissertation title to the special fields examiners and to the dissertation adviser (who may or may not have worked on the project as a "special topic" with the student). The summary should discuss where the student's work stands at the beginning of the term and how the student expects the research will progress over the course of the sixth term as the student writes the formal dissertation prospectus.
- 7. A dissertation prospectus by the end of the sixth term in residence.
- 8. A dissertation. Once dissertation writing has begun, students will present work in progress from the dissertation at least once per academic year. Research presentations will normally take the form of pre-circulation of a selection of work

from the dissertation and a discussion of it with interested faculty, or some other research presentation experience approved by the DGS. This is a requirement for remaining in good standing; exemptions from the requirement require support of the dissertation adviser and the approval of the graduate committee.

REQUIREMENTS FOR THE PH.D. DEGREE IN CLASSICAL ART AND ARCHAEOLOGY

The program is designed to give a general knowledge of the development of art and architecture in the classical world from the Bronze Age to Late Antiquity, combined with a detailed study of one particular period and area; and an acquaintance with the contribution made by field archaeology. The program has a strong art historical component, and it is expected that each student will take advantage of available opportunities to visit the major sites and monuments.

- 1. Practice translations in Greek and Latin; these are taken before the beginning of the first and third terms and are meant to assess the student's proficiency and progress in both languages.
- 2. A proseminar offering an introduction to the discipline of classics and its various subdisciplines (not for credit).
- 3. Departmental reading examinations in Italian (or French) and German, or approved Yale courses or examinations that demonstrate reading proficiency in these languages (e.g., by achieving a grade of A in "French/German/Italian for Reading Knowledge," or by passing proficiency exams administered by Yale's modern language departments). The department will also accept certain certificates of proficiency in French, German, or Italian in lieu of these exams, as listed in the Classics Graduate Handbook. One modern language exam is to be passed by the end of the first year in residence and the second by the end of the second year in residence.
- 4. A minimum of fourteen term courses: (i) a minimum of six courses should be in Greek and/or Roman art and/or archaeology (at least four must be seminars); (ii) a minimum of two courses should be in a related field of the history of art, for example Medieval or Renaissance; (iii) a minimum of two courses should be in Greek or Roman history, numismatics, or papyrology; (iv) of the remaining four courses, at least two should be seminars in Greek or Latin literature – students must demonstrate a competence in Greek and Latin, usually by passing at least one 400/700-level course in each language.
- 5. A written examination in classical art and archaeology, by the beginning of the sixth term. The examination consists of identifications of works of art and architecture and essays, followed by an oral exam in four areas of Greek and Roman art and architecture (time period, locale, genre, free choice), with specific topics within those categories agreed upon in advance by the candidate, adviser, and the DGS in Classics. Consideration is normally given to the probable dissertation topic and the way in which preparation for the orals might enhance the writing of the dissertation prospectus.
- 6. A dissertation prospectus, normally by the end of the sixth term in residence.
- 7. A dissertation. Once dissertation writing has begun, students will present work in progress from the dissertation at least once per academic year. Research presentations will normally take the form of pre-circulation of a selection of work

from the dissertation and a discussion of it with interested faculty, or some other research presentation experience approved by the DGS. This is a requirement for remaining in good standing; exemptions from the requirement require support of the dissertation adviser and the approval of the graduate committee.

COMBINED PROGRAMS Classics and Comparative Literature

REQUIREMENTS FOR THE PH.D. DEGREE IN CLASSICS AND COMPARATIVE LITERATURE

- Practice translation exams in Greek and Latin on texts assigned from the Classics and Philology Ph.D. reading lists; these are taken before the beginning of the first and third terms and are meant to help students prepare for the qualifying translation exams to be taken before the beginning of the fifth term in the program.
- 2. A minimum of fourteen term courses: (i) at least seven in Classics, which includes two yearlong surveys (four courses) in the history of Greek and Latin literature, two 800-level seminars, and the proseminar in Classics (not for credit); (ii) at least six courses in Comparative Literature; of these at least four courses should be on postclassical European literature; (iii) of these fourteen courses, twelve must be taken in the first two years of study; the last two, which must be Classics 800-level seminars, are to be taken in the third year, normally one in each term; (iv) the course work across the two programs should include at least two courses on literary theory or methodology, and at least one course each in poetry, narrative fiction, and drama.
- 3. Literary proficiency in German and in one other modern language, to be demonstrated by the end of the second year in residence.
- 4. Oral examinations in Greek and Latin literature, based on the syllabus covered by the survey courses, drawn from the Classical Philology Ph.D. reading lists. These are to be taken closely following the surveys in the respective literatures, as follows: the first, at the end of the second term (May of the first year), the second at the end of the fourth term (May of the second year).
- 5. Translation examinations in Greek and Latin, based on the Classical Philology Ph.D. reading lists, by the beginning of the fifth term in residence.
- 6. An oral examination in the Comparative Literature department on six topics appropriate to both disciplines, selected in consultation with the two directors of graduate studies, balancing a range of kinds of topics and including poetry, narrative fiction, and drama, and at least one significant cluster of postclassical texts, by the middle of the sixth term. One of the topics studied will be related to the student's dissertation topic.
- 7. A dissertation prospectus, by the end of the sixth term in residence. The prospectus must be approved by the DGS in each department (and by the Comparative Literature prospectus committee) by the end of the sixth term in residence. At least one dissertation director must come from the Comparative Literature core faculty.
- 8. A dissertation. Once dissertation writing has begun, students will present work in progress from the dissertation at least once per academic year. Research presentations will normally take the form of pre-circulation of a selection of work from the dissertation and a discussion of it with interested faculty, or some other

research presentation experience approved by the DGS. This is a requirement for remaining in good standing; exemptions from the requirement require support of the dissertation adviser and the approval of the graduate committee.

Classics and Early Modern Studies

Admission requirements are the same as for Classical Philology. Students are admitted to the Classics department first, and then apply during the second term of their first year to participate in the Combined Program in Classics and Early Modern Studies.

REQUIREMENTS FOR THE COMBINED PH.D. DEGREE IN CLASSICS AND EARLY MODERN STUDIES

- Practice translation tests in Greek and Latin on texts assigned from the Classical Philology reading lists; these are taken before the beginning of the first and third terms and are meant to help students prepare for the qualifying translation exams to be taken before the beginning of the fifth term in the program (7. below);
- 2. A proseminar offering an introduction to the discipline of Classics and its various subdisciplines, to be taken in the first year in residence;
- 3. Departmental reading examinations in French (or Italian) and German. The first (in either language) is to be passed by the end of the first year; the other may be passed at any time before submission of the dissertation; students are, however, encouraged to complete this requirement as early in the program as possible.
- 4. A minimum of twelve term courses, with the following stipulations: (i) two yearlong survey courses in the history of Greek and Latin literature (four courses in total); (ii) four courses prescribed by Early Modern Studies, including EMST 700, which counts for a single course; (iii) four other graduate courses in CLSS. In addition, EMST 800 (Early Modern Colloquium) must be taken concurrently with EMST 700; and EMST 900 (the prospectus workshop) is taken in the third year. Neither of these two courses (EMST 800 and EMST 900) count towards the minimum course requirement;
- Greek and Latin composition (this requirement may, but need not, be satisfied by courses taken under [4] above);
- 6. Oral examinations in Greek and Latin literature, based on the syllabus covered by the survey courses, drawn from the Classical Philology Ph.D. reading list. These are to be taken closely following the surveys in the respective literatures, as follows: the first, at the end of the second term (May of the first year), the second at the end of the fourth term (May of the second year);
- 7. Translation examinations in Greek and Latin, based on the Classical Philology Ph.D. reading list, by the beginning of the fifth term in residence;
- 8. Four special field exams to be taken in the fall of the third year (fifth term in residence); two of these must be at least partly in a classical field and two must be at least partly in an early modern field.
- 9. A dissertation prospectus by the end of the sixth term in residence. The procedures for approval of the prospectus are as for the Philology program, but at least one member of the EMS faculty, as approved by the DGS in Early Modern Studies, must be on the prospectus approval committee (which is a committee of the whole in Classics); the prospective thesis committee, the DGS and the EMS faculty member must approve of the prospectus.

10. A dissertation. Once dissertation writing has begun, students will present work in progress from the dissertation at least once per academic year. Research presentations will normally take the form of pre-circulation of a selection of work from the dissertation and a discussion of it with interested faculty, or some other research presentation experience approved by the DGS. This is a requirement for remaining in good standing; exemptions from it require the support of the dissertation adviser and the approval of the graduate committee.

Classics and History

The combined degree program in Classics and History, with a concentration in Ancient History, is offered by the Departments of Classics and History for students wishing to pursue graduate study in the history of the ancient Mediterranean and western Eurasia.

The combined degree in Classics and History offers students a comprehensive education in the fundamental skills and most current methodologies in the study of the ancient Greek and Roman Mediterranean and its interaction with Eurasian and African cultures and landscapes. Its object is to train leaders in research and teaching by preparing them to handle the basic materials of ancient history through mastery of the traditional linguistic and technical skills. At the same time the combined degree in Classics and History encourages students to rediscover, reshape, and repurpose traditional and nontraditional source materials using the most up-to-date and sophisticated tools at the historian's disposal.

Students are called on to complete course work in two ancient languages, historical theory, intra- and interdisciplinary skills, and fundamental research seminars. Interdisciplinary expertise is fostered through the annual seminar coordinated through the Yale Program for the Study of Ancient and Premodern Cultures and Societies (Archaia) and through required study in ancillary fields. Exams are rigorous and aimed at helping students hone skills and explore new terrain in ancient studies. Students are encouraged to take advantage of Yale's superior collections and library resources in order to explore new avenues in their learning and approaches to historical problems. Yale's outstanding faculty in Classics, History, and related disciplines, such as Near Eastern languages and cultures, religious studies, art history, and anthropology, work together to ensure broad and deep learning that will enable our students to become world leaders in the field.

REQUIREMENTS FOR THE COMBINED PH.D. DEGREE IN CLASSICS AND HISTORY

1. Classics proseminar offering an introduction to the discipline of Classics and its various subdisciplines, to be taken in the first year in residence (not for credit), and a minimum of twelve term courses, including: (i) the historical methods and theory course, Approaching History (HIST 500); (ii) Archaia core seminar (CLSS 815 or equivalent); (iii) two graduate-level courses in two separate ancient languages. For students who are admitted in Classics, these must be Greek and Latin. Students who are admitted in History must study either Greek or Latin, and they may study both but may also choose another ancient language to fulfill this requirement. The surveys of Greek and Latin literature offered by Classics are encouraged but not mandatory for fulfillment of this requirement; (iv) two skills courses. These may include topics selected from epigraphy (epigraphy courses

may be used to fulfill the language requirement concurrently); archaeology; art history; papyrology; numismatics; digital data, GIS, digital humanities, vel sim.; an advanced course in a non-classical ancient language (no more than one such course may be used in fulfillment of this requirement). Students are also encouraged to take advantage of educational opportunities outside of Yale (American Numismatic Society Summer Seminar; an archaeological excavation, e.g., the Gabii project); (v) four courses (at least two of which must be research seminars) in the history of the ancient Mediterranean world; historical courses that have a heavy skill component may be used concurrently to fulfill the skills requirement; (vi) two courses outside of ancient Mediterranean history, to be taken in programs outside of the Department of Classics; these are meant to introduce students to different historical periods, regions, and methodologies. Possibilities include (but are not limited to): social sciences (economics, anthropology, sociology, environmental science, statistics); religion (religious studies, Divinity School, Jewish studies); Near Eastern languages and civilizations (Egyptian language, Hebrew, Aramaic, Syriac, Arabic); anthropology and archaeology; physical and biological sciences (paleoclimatology, ecology and forestry, genetics, medicine).

- 2. Practice translation exams in Greek and/or Latin, depending on which languages are required for the student's program, based on texts assigned from the appropriate Classics and History Ph.D. reading lists. These exams are taken before the beginning of the first and third terms and are meant to help students prepare for the qualifying translation exams to be taken before the beginning of the fifth term in the program.
- 3. Departmental reading examinations in German, and in either French or Italian, or approved Yale courses or examinations that demonstrate reading proficiency in these languages (e.g., by achieving a grade of A in "German/French/Italian for Reading Knowledge," or by passing proficiency exams administered by Yale's modern language departments). The department will also accept certain certificates of proficiency in French, German, or Italian in lieu of these exams, as listed in the Classics Graduate Handbook. One modern language exam is to be passed by the end of the first year in residence and the second by the end of the second year in residence.
- 4. Translation examinations in two ancient languages. For students admitted through Classics, these must be Greek and Latin. For students admitted through History, at least one must be either Greek or Latin. Greek and Latin examinations will be based on the Classics and History Greek and Latin Ph.D. reading lists and will consist of a choice of eight passages in each language. For each language, students will be required to translate four of the eight passages, to include one verse passage, one documentary text (epigraphy/papyrology), and two passages of prose from literary sources. Some History students may find that expertise in another language such as Hebrew, Aramaic/Syriac, Demotic, Coptic, Classical Armenian, or Sanskrit is most beneficial for their research and teaching trajectory. Reading lists for these nonclassical languages will be devised by the student in collaboration with the faculty adviser and other relevant member(s) of the Yale faculty, and fixed in writing no later than the end of the fourth term in residence. Examinations in these languages will also consist of a choice of eight passages, of which students must translate four, to be set and evaluated by faculty expert in the given language.

Translation exams in all languages must be taken at the beginning of the fifth term in residence.

- 5. A general examination in Ancient History during the third year and no later than the end of the sixth term in residence. This is to be broken into one major and two minor fields. For the major field, students must prepare an 8,000-word essay in advance of the oral examination. For each of the minor fields, students must prepare a syllabus for an undergraduate class. The written essays and syllabi must be submitted by a fixed date, typically on the Friday before Thanksgiving or spring break. Oral exams will be completed shortly afterward to ensure time for the completion of the dissertation prospectus.
- 6. A dissertation prospectus by the end of the sixth term in residence.
- 7. A dissertation. By the end of their ninth term, students are required to submit a chapter of their dissertation, which will be discussed with the student by the committee in a chapter conference.

Classics and Philosophy

The Classics and Philosophy Program is a combined program, offered by the Departments of Classics and Philosophy, for students wishing to pursue graduate study in ancient philosophy. The combined program is overseen by an interdepartmental committee currently consisting of Verity Harte, David Charles, and Brad Inwood together with the DGS in Classics and the DGS in Philosophy.

REQUIREMENTS OF THE CLASSICS TRACK OF THE CLASSICS AND PHILOSOPHY PROGRAM

- Practice translation exams in Greek and Latin on texts assigned from the Classics and Philosophy Ph.D. reading lists; these are taken before the beginning of the first and third terms and are meant to help students prepare for the qualifying translation exams to be taken before the beginning of the fifth term in the program.
- 2. A proseminar offering an introduction to the discipline of Classics and its various subdisciplines (not for credit).
- 3. Departmental reading examinations in French (or Italian) and German, or approved Yale courses or examinations that demonstrate reading proficiency in these languages (e.g., by achieving a grade of A in "French/German/Italian for Reading Knowledge," or by passing proficiency exams administered by Yale's modern language departments). The department will also accept certain certificates of proficiency in French, German, or Italian in lieu of these exams, as listed in the Classics Graduate Handbook. One modern language exam is to be passed by the end of the first year in residence and the second by the end of the second year in residence.
- 4. A minimum of fourteen term courses, of which (i) at least four should be in ancient philosophy, including at least two involving original language work; (ii) of ten remaining courses, five should be in Classics, five in Philosophy, including (a) of five in Classics, either two terms of history of Greek literature or two terms of history of Latin literature are required, and two courses at 700/800-level in Greek or Latin; and (b) of five in Philosophy, one in history of philosophy other than ancient philosophy, three in nonhistorical philosophy. It is recommended that

students without formal training in logic take a logic course appropriate to their philosophical background.

- 5. Translation examinations in Greek and Latin, based on the Classics and Philosophy Ph.D. reading lists for the Classics track of the program, by the beginning of the fifth term in residence.
- 6. Oral examinations in Greek and Latin literature, based on the Classics and Philosophy Ph.D. reading lists for the Classics track of the program, by the end of the fifth term in residence and consisting of one hourlong oral examination on nonphilosophical Greek and Latin works from the list (which may be taken in two parts, one half-hour exam on Greek and one half-hour exam on Latin) and one hourlong oral examination on philosophical Greek and Latin works from the list, to be completed by the end of the fifth term in residence. Students may choose to take the nonphilosophical Greek and/or Latin half-hour component of their oral examination in conjunction with taking the history of Greek or Latin literature, along with the Classical Philology cohort, in May of the year in which the corresponding history is taken.
- 7. One of the two qualifying papers required for the Ph.D. in Philosophy by the end of the sixth term in residence; this paper should be on a philosophical topic other than ancient philosophy.
- 8. Oral examinations/special fields in two areas of concentration selected by the candidate in consultation with the DGS in Classics and the program committee, one of which must be in ancient philosophy and which will in addition include a written component, while the other must cover a classical topic other than ancient philosophy, by the end of the sixth term in residence.
- 9. A dissertation prospectus, by the end of the seventh term in residence.
- 10. A dissertation. For students on the Classics track: once dissertation writing has begun, students will present work in progress from the dissertation at least once per academic year. Research presentations will normally take the form of precirculation of a selection of work from the dissertation and a discussion of it with interested faculty, or some other research presentation experience approved by the DGS. This is a requirement for remaining in good standing; exemptions from the requirement require support of the dissertation adviser and the approval of the graduate committee.

THE CLASSICAL NEAR EAST

For information about the Ph.D. specialization in the Classical Near East, please contact Professor Kevin van Bladel in the Department of Near Eastern Languages and Civilizations.

ARCHAIA GRADUATE CERTIFICATE

The Yale Program for the Study of Ancient and Premodern Cultures and Societies (Archaia) offers a graduate certificate. For further information, see Archaia, under Non-Degree-Granting Programs, Councils, and Research Institutes.

MASTER'S DEGREE

M.A. The Department of Classics does not admit students for a terminal master's degree, nor does it award an M.A. en route to the Ph.D. degree. If, however, a student

admitted for the Ph.D. leaves the program prior to completion of the doctoral degree, the student may be eligible to receive a terminal master's degree upon completion of eight courses, ordinarily with a High Pass average in two successive terms.

Program materials are available upon request to the Director of Graduate Studies, Department of Classics, Yale University, PO Box 208266, New Haven CT 06520-8266.

COURSES

CLSS 601a / MDVL 571a, Introduction to Latin Paleography Agnieszka Rec Latin paleography from the fourth century CE to ca. 1500. Topics include the history and development of national hands; the introduction and evolution of Caroline minuscule, pre-gothic, gothic, and humanist scripts (both cursive and book hands); the production, circulation, and transmission of texts (primarily Latin, with reference to Greek and Middle English); advances in the technical analysis and digital manipulation of manuscripts. Seminars are based on the examination of codices and fragments in the Beinecke Library; students select a manuscript for class presentation and final paper.

CLSS 751a / PHIL 551a, Ancient Philosophy of Language Verity Harte and Zoltan Szabo

A seminar on central texts on topics in philosophy of language in the Greco-Roman philosophical tradition. The seminar does not attempt a full survey of the tradition on these topics but select texts and topics of special interest, including exploring points of comparison and contrast with contemporary discussions in philosophy of language. Topics to be covered include: linguistic categories, the nature of grammar, origins of language, naming, and meaning. Prerequisites: one prior course in the history of ancient Greco-Roman philosophy and at least one additional prior course in philosophy.

CLSS 803b, Problems in the History of the Late Republic Staff

This seminar explores a range of key questions and problems in the history of the late Roman Republic (from the death of G. Gracchus to the death of Cicero): growing anxieties over the definition(s) of Roman identity; the relationship of Rome to the Latins and Italians; attitudes toward Greek culture and imperial policy in the East; the nature of Republican imperialism in the western Mediterranean; the politics of elite self-representation; antiquarianism, intellectual culture, and the transformation of religion; social memory and the representation of the past; oratory, popular politics, and mass communication; retrospective views of the "Republic" from the empire; and others. The course takes a thematic approach, tackling a new question/problem each week, each building on the previous one. Discussion of trends in modern scholarship, both foundational works (Syme, Gruen, Taylor) as well as the cutting edge and important new directions. Close engagement with primary sources and their problems, especially Cicero and Caesar, as well as the fragments of Roman historiography and oratory, and inscribed documents; the use of archaeological evidence to answer historical questions.

CLSS 808a / ARCG 500a / NELC 500a, Environmental Archaeology of West Asia, Egypt, and the Mediterranean Harvey Weiss

The new linkages of high-resolution paleoclimate and archaeological and epigraphic records revise earlier historiography for the major disjunctions, including societal genesis, collapse, habitat tracking, and technological and ideological innovations, from 4000 to 40 BCE across west Asia, Egypt, and the Aegean. The seminar synthesizes

speleothem and lake, marine, and glacial core records for abrupt climate changes and coincident societal adaptations previously unexplained.

CLSS 811a / HIST 523a / HSHM 758a, Graeco-Roman Medicine Jessica Lamont and Malina Buturovic

This course offers a graduate-level introduction to the history and study of ancient Greek and Graeco-Roman medicine, beginning with the development of "Hippocratic" medical texts in Classical Greece; these writings are set in dialogue with earlier Babylonian and Egyptian medical traditions. In addition to Hellenistic Alexandria, where anatomical research on the human body flourished, the seminar examines the works of the doctor and philosopher Galen of Pergamon. We conclude in Late Antique Alexandria, where traditions of Graeco-Roman medicine, repackaged as "Galenism," begin a multi-century, cross-cultural journey into the medieval world. Throughout the course we consider: medical theories of human difference, regimen, gynecology and reproductive labor, pulse science, temple medicine and healing cults, anatomy and dissection, zoology, theories of contagion and epidemic, and natural philosophy. Classics students enrolled in the course are asked to read some texts in ancient Greek. However, knowledge of ancient Greek is *not* required for enrollment, and we welcome and encourage students with interests in the history of medicine and science beyond the Graeco-Roman world.

CLSS 815a / ANTH 531a / EALL 773a / HIST 502a / HSAR 564a / JDST 653a / NELC 533a / RLST 803a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

CLSS 829b / HIST 507b / LING 668b / NELC 809b, Historical Sociolinguistics of the Ancient World Kevin van Bladel

Social history and linguistic history can illuminate each other. This seminar confers the methods and models needed to write new and meaningful social history on the basis of linguistic phenomena known through traditional philology. Students learn to diagnose general historical social conditions on the basis of linguistic phenomena occurring in ancient texts. Prerequisite: working knowledge of at least one ancient language.

CLSS 846a / HSAR 639a, Approaching Sacred Space: Places, Buildings, and Bodies in Ancient Italy Alexander Ekserdjian

This graduate-level seminar approaches sacred space in ancient Italy (ca. 500 BCE– 100 CE) from several evidential and methodological perspectives. The class probes how different kinds of sacred artifacts (places, buildings, and bodies) textured ritual space, forming its recognizable character then and now. While assessing the available evidence (material, literary, epigraphic) for each of these categories, we devote time to untangling the ways that modern scholars and Roman authors have written about ancient holy places. The emphasis on "approach" also provides an avenue to begin to reconstruct the lived experiences of sacred space, moving from the realia of locations, structures, and objects to the possible responses of ancient people.

CLSS 847a / HIST 508a, Climate, Environment, and Ancient History Joseph Manning

An overview of recent work in paleoclimatology with an emphasis on new climate proxy records and how they are or can be used in historical analysis. We examine in detail several recent case studies at the nexus of climate and history. Attention is paid to critiques of recent work as well as trends in the field.

CLSS 871a, Roman Nobility: Concept and Performance Kirk Freudenburg An exploration of "nobility" in the Roman world, with special emphasis on the construction and constitution of the concept and how it was performed and enacted in Mediterranean antiquity.

CLSS 881a, Proseminar: Classical Studies Jessica Lamont

An introduction to the bibliography and disciplines of classical scholarship. Faculty address larger questions of method and theory, as well as specialized subdisciplines such as linguistics, papyrology, epigraphy, paleography, and numismatics. Required of all entering graduate students.

CLSS 882a, Graduate Works in Progress Colloquium Noel Lenski

Students precirculate work-in-progress material from their prospectus or dissertation and present it to the class. Open to all students in years 3 and above.

CLSS 896a, History of Greek Literature I Egbert Bakker

A comprehensive treatment of Greek literature from Homer to the imperial period, with an emphasis on archaic and Hellenistic poetry. The course prepares for the comprehensive oral qualifying examinations. The student is expected to read extensively in the original language, working toward familiarity with the range and variety of the literature.

CLSS 897b, History of Greek Literature II Staff

A continuation of CLSS 896a.

CLSS 900a and CLSS 910a, Directed Reading Staff

By arrangement with faculty.

GREK 703a, The History and Structure of Ancient Greek: From Word to Text Egbert Bakker

This course provides a brief introduction to the comparative-historical study of Greek verbs and nouns; sentence-level grammatical training based on "composition" exercises; and awareness of "syntax beyond the sentence": the linguistic means ancient Greek speakers and writers had at their disposal to create "cohesion" of their discourse as a means for the text to achieve its communicative or rhetorical goals. The course provides a thorough grounding in the structure of ancient Greek words, sentences, and texts. It fulfills the graduate course requirements for Greek prose composition and historical or comparative linguistics.

GREK 719a, Helen after Troy Pauline LeVen

Focus on the representation of Helen of Troy in Homer, Sappho, and other lyric poets. Readings from Gorgias's *Encomium of Helen*, Euripides' *Helen*, and Longus. Attention to problems of aesthetics, rhetoric, and poetics.

GREK 750b, Euripides Staff

Close reading of Euripidean tragedy, varying by semester. Form and structure of tragedy; Euripides' literary and dramatic technique; issues of myth, geography, and cultural and personal identity; reception of tragedy in modernity.

LATN 721a, Vergil's Aeneid Erika Valdivieso

An in-depth study of Vergil's Aeneid within its political context.

LATN 732b / PHIL 729b, Seneca: Letters on Ethics Brad Inwood

Lucius Annaeus Seneca was one of the most distinguished writers of Latin prose and also an important Stoic philosopher. This course focuses on readings in his most important and best known works, the *Epistulae Morales*. Most of the letters we read deal with themes of broad general interest, but some include the more challenging philosophical topics in Stoic ethics that form the culmination of the work. We aim to read the letters included in *Seneca: Selected Letters*, ed. Catharine Edwards (2019), which has an excellent literary and philological commentary; a few additional letters are read with the more philosophical commentary found in the instructor's *Seneca: Selected Philosophical Letters* (2007).

LATN 748a, Latin Epigraphy Andrew Johnston

Introduction to the study of Latin prose and verse inscriptions on stone and bronze. Texts from Rome, Italy, and the provinces, ranging from the sixth century B.C.E. to the third century C.E. Emphasis both on the methodology of epigraphy and on close reading of the texts situated in their social, cultural, historical, and monumental contexts.

LATN 790b, Latin Syntax and Stylistics John Dillon

A systematic review of syntax and an introduction to Latin style. Selections from Latin prose authors are read and analyzed, and students compose short pieces of Latin prose. For students with some experience reading Latin literature who desire a better foundation in forms, syntax, idiom, and style.

Comparative Literature

Humanities Quadrangle, 3rd floor, 203.432.2760 http://complit.yale.edu M.A., M.Phil., Ph.D.

Chair Jing Tsu

Director of Graduate Studies Marta Figlerowicz

Professors Rüdiger Campe, Martin Hägglund, Hannan Hever, Pericles Lewis, Ayesha Ramachandran, Shawkat Toorawa, Katie Trumpener, Jing Tsu, Jane Tylus, Jesús Velasco

Associate Professors Robyn Creswell, Marta Figlerowicz, Moira Fradinger

Assistant Professor Samuel Hodgkin

Lecturers Peter Cole, Jan Hagens, Matthew Morrison, Candace Skorupa

Emeritus Dudley Andrew, Peter Brooks, Peter Demetz, Carol Jacobs, David Quint

Affiliated Faculty R. Howard Bloch (French), Francesco Casetti (Film and Media Studies), Michael Denning (American Studies), Alice Kaplan (French), Tina Lu (East Asian Languages and Literatures), John MacKay (Slavic Languages and Literatures), Jane Mikkelson, Maurice Samuels (French), Ruth Bernard Yeazell (English)

FIELDS OF STUDY

The Department of Comparative Literature introduces students to the study and understanding of literature beyond linguistic or national boundaries; the theory, interpretation, and criticism of literature; and its interactions with adjacent fields like visual and material culture, linguistics, film, psychology, law, and philosophy. The comparative perspective invites the exploration of such transnational phenomena as literary or cultural periods and trends (Renaissance, Romanticism, Modernism, postcolonialism) or genres and modes of discourse. Students may specialize in any cultures or languages, to the extent that they are sufficiently covered at Yale. The Ph.D. degree qualifies candidates to teach comparative literature as well as the national literature(s) of their specialization.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students must successfully complete fourteen term courses, including the departmental proseminar (CPLT 515) and at least six further courses listed under the departmental heading. The student's overall schedule must fulfill the following requirements: (1) at least one course in literature before 1300, philology, or linguistics; one course in literature between 1300 and 1800; one course in literature after 1800 ; (2) three courses in literary theory or methodology; (3) at least one course each in poetry, narrative fiction, and drama; (4) course work that deals with texts from three literatures, one of which may be anglophone; and (5) a substantive focus on one or two national

or language-based literatures. Any course may be counted for several requirements simultaneously.

In their fourth term, students must submit a revised seminar paper, selected in consultation with the DGS, no later than April 1. These papers will be circulated to all members of the faculty. The DGS will assign the paper to one faculty member who will write a short evaluation, shared with the student, focused on the questions of whether it shows an ability to: (a) write clearly; (b) conduct independent research at a high level; and (c) develop coherent scholarly arguments.

Languages Students must develop literary proficiency in four languages, including English and at least one other modern language. Students are also expected to meet a philological requirement in one of three ways: by learning to read an ancient or medieval language (such as Latin, Greek, Sanskrit, classical Chinese, Old Church Slavonic, etc.); by learning to read an Indigenous or Aboriginal language (Nahuatl, Quechua, Tlingit, Alyawarr, etc.); or by proficiency from languages from three different language families besides English (e.g. German plus Russian plus Arabic; Hindi plus Igbo plus Swahili; Chinese plus Hebrew plus Portuguese, etc.) The fulfillment of the requirement will be demonstrated for each language by a written exam consisting of a translation of a literary or critical text, to be held by the end of the sixth term; or by an equivalent level in the student's coursework.

Orals An oral examination to be taken in the third year of studies, demonstrating both the breadth and specialization as well as the comparative scope of the student's acquired knowledge. The examination consists of six topics that include texts from at least three national literatures and several historical periods (at least one modern and one premodern). The texts discussed should also include representatives of the three traditional literary genres (poetry, drama, narrative fiction).

Having passed the orals, the student will identify a dissertation committee of three members, at least one of whom must belong to the department's core or affiliate faculty.

Prospectus The dissertation prospectus will be submitted to the DGS by April 1 of the student's sixth term, after having been reviewed and approved by the student's dissertation committee. A standing faculty committee will hold a conference with the student before the end of the term. Any revisions required by that committee must be submitted before the beginning of the student's fourth year.

Ph.D. Dissertation After submission of the prospectus, the student's time is devoted mainly to the dissertation, which completes the degree. It is expected that students will periodically pass their work along to members of their dissertation committee. The first chapter must be submitted to the committee by February 1 of the fourth year of study, followed by a chapter conference before the end of that year.

Admission to candidacy for the Ph.D. is granted after six terms of residence and the completion of all requirements (courses, languages, orals, prospectus) except the dissertation and teaching.

Teaching Training in teaching, through teaching fellowships, is an important part of every student's program. Normally students will teach in their third and fourth years. If needed, teaching is also available in the sixth year.

COMBINED PH.D. PROGRAMS Comparative Literature and Classics

Coursework Students concentrating in Comparative Literature and Classics are required to complete fourteen graduate term courses (including the proseminars in Classics and in Comparative Literature). In Classics, at least seven courses, including the Classics proseminar, four courses (two yearlong sequences) in the history of Greek and Latin literature (usually taken in successive years, each to be followed by the respective oral in that field), and two 800-level Classics seminars. In Comparative Literature courses, including at least four courses in postclassical European literature. The course work across the two programs should also include at least two courses in literary theory or methodology, and at least one course each in poetry, narrative fiction, and drama. At least twelve of the fourteen required courses are to be taken in the first two years; the last two, which must be Classics 800-level seminars, are to be taken in the third year, normally one in each term, as necessary.

Languages To assess each student's proficiency and progress in both key languages, two diagnostic sight translation examinations each in Greek and Latin are to be taken before the beginning of the first and third terms. Literary proficiency in German and one other modern language must be passed by the end of the second year. Literary proficiency in English, Greek, and Latin must be demonstrated by course work.

Orals *Classics:* oral examinations in Greek and Latin literature, based on the Classics Ph.D. reading list. These are to be taken closely following the surveys in the respective literatures, as follows: the first, at the end of the second term (May of the first year), the second at the end of the fourth term (May of the second year). By the end of the fifth term, translation examinations in Greek and Latin literature, based on the Classics Ph.D. reading list. *Comparative Literature:* oral examination (six topics appropriate to both disciplines, balancing a range of kinds of topics and including poetry, narrative fiction, and drama, and at least one significant cluster of postclassical texts), to be taken by the middle of the sixth term, usually in mid-January. Lists will be worked out with individual examiners, primarily under the guidance of the Comparative Literature DGS, but also with the approval of the Classics DGS, and must be submitted by the end of the fourth term. One of the topics studied will be relevant to the student's planned dissertation topic.

Prospectus and Dissertation The prospectus must be approved by the DGS in each department (and by the Comparative Literature prospectus committee) by the end of the sixth term in residence. At least one dissertation director must come from the Comparative Literature core faculty. At the end of each term, each dissertation student will presubmit, then discuss their work in progress in a Classics "chapter colloquium" discussion with interested faculty.

Comparative Literature and Early Modern Studies

The Department of Comparative Literature offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in Comparative Literature and Early Modern Studies. For further details, see Early Modern Studies.

Comparative Literature and Film and Media Studies

Applicants to the combined program must indicate on their application that they are applying both to the program in Film and Media Studies and to Comparative Literature. All documentation within the application should include this information.

Coursework Students in the combined program are required to complete fifteen graduate term courses. In Comparative Literature, the proseminar and at least five further courses, including at least one course in literary theory or methodology beyond the proseminar; at least one course each in poetry, narrative fiction, and drama; two courses before 1900, including at least one before 1800; a wide range of courses with a focus on one or two national or language-based literatures; and at least two courses with the grade of Honors. In Film and Media Studies, two core seminars (FILM 601 and FILM 603) and four additional seminars.

Languages At least two languages (besides English) with excellent reading ability.

Orals By October 1 of the third year, students must have fulfilled an assignment related to foundational texts and films. During this third year, they must also pass the six-field Comparative Literature oral examination, with at least one examiner from the core Comparative Literature faculty; at least three fields involving literary topics, and readings including poetry, fiction, and drama; the other topics may be on film or film-related subjects; some lists may combine film and literature.

Prospectus and Dissertation At least one dissertation director must be from Comparative Literature and at least one from Film and Media Studies (in some cases, a single adviser may fulfill both roles). The prospectus must be approved by the Comparative Literature subcommittee and ratified by the Film and Media Studies Executive Committee. Before it is submitted, the dissertation must pass a defense of method (with at least one examiner from the graduate Film and Media Studies committee, and at least one member from Comparative Literature).

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete ten courses with at least two grades of Honors and a maximum of three grades of Pass and the demonstration of proficiency in two of the languages, ancient or modern, through course work or departmental examinations. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

Program materials are available upon request to the Director of Graduate Studies, Department of Comparative Literature, Yale University, PO Box 208251, New Haven CT 06520-8251, or sabrina.whiteman@yale.edu.

COURSES

CPLT 502a / EMST 502a, Always Compare! Marta Figlerowicz and Ayesha Ramachandran

This course interrogates the conceptual frameworks and challenges of cross-cultural comparison. The discipline of comparative literature has its roots in comparative anthropology, linguistics, history, and religion – which are themselves imbricated in the long history of colonialism and in Eurocentric philosophies of history that describe Western cultures as superior to, and superseding, all others. In this course, we move across all these disciplines to ask why, and under what conditions, cross-cultural comparison can still be illuminating in our day and age. We introduce and model innovative new forms of comparative study that are currently reshaping and expanding our field and the humanities more broadly.

CPLT 503a / ANTH 553a / GMAN 553a / SOCY 661a, Karl Marx's Capital Paul North A careful reading of Karl Marx's classic critique of capitalism, *Capital* volume 1, a work of philosophy, political economy, and critical social theory that has had a significant global readership for over 150 years. Selected readings also from *Capital* volumes 2 and 3.

CPLT 504a, Proseminar in Translation Studies Serena Bassi

This graduate proseminar combines a historically minded introduction to Translation Studies as a field with a survey of its interdisciplinary possibilities. The proseminar is composed of several units (Histories of Translation; Geographies of Translation; Scandals of Translation), each with a different approach or set of concerns, affording the students multiple points of entry to the field. The Translation Studies coordinator provides the intellectual through-line from week to week, while incorporating a number of guest lectures by Yale faculty and other invited speakers to expose students to current research and practice in different disciplines. The capstone project is a conference paper-length contribution of original academic research. Additional assignments throughout the term include active participation in and contributions to intellectual programming in the Translation Initiative.

CPLT 507a / ER&M 647a / SPAN 780a, Biopolitics in the Carceral Archipelago: The Case of the Philippines Aurelie Vialette

This seminar examines the racial, ethical, political, environmental, and social implications of the penal colonization process in the Philippines. We analyze archival documents (manuscripts) from the Philippines and engage with theoretical and historical texts on prison labor, racial capitalism, ecocriticism, indigenous studies, carceral studies, gender studies, and law and the humanities. Overseas incarceration was a method employed by empires to dispose of criminals, the poor, sex workers, and vagrants. In the Philippines (a Spanish colony until 1898), the dispossession of indigenous people of their land and the implication of intensive farming were also consequences of the colonial project. We see that labor and procreation were crucial to the project of using prisoners to build the colonial structure and strengthen the Spanish presence in the archipelago. We discover the centrality of this transnational and transhistorical approach to understanding the contemporary treatment of imprisoned people. Spanish reading knowledge is required.

CPLT 510a or b / GMAN 604a or b, The Mortality of the Soul: From Aristotle to Heidegger Martin Hagglund

This course explores fundamental philosophical questions of the relation between matter and form, life and spirit, necessity and freedom, by proceeding from Aristotle's analysis of the soul in *De Anima* and his notion of practical agency in the *Nicomachean Ethics*. We study Aristotle in conjunction with seminal works by contemporary neo-Aristotelian philosophers (Korsgaard, Nussbaum, Brague, and McDowell). We in turn pursue the implications of Aristotle's notion of life by engaging with contemporary philosophical discussions of death that take their point of departure in Epicurus (Nagel, Williams, Scheffler). We conclude by analyzing Heidegger's notion of constitutive mortality, in order to make explicit what is implicit in the form of the soul in Aristotle.

CPLT 515a, Proseminar in Comparative Literature Rudiger Campe Introductory proseminar for all first- and second-year students in comparative literature (and other interested graduate students). An introduction to key problems in the discipline of comparative literature, its disciplinary history, and its major theoretical and methodological debates (including philology; Marxist, structuralist, and poststructuralist approaches; world literature; translation). Emphasis on wide reading and intense discussion, in lieu of term paper. Graded Satisfactory/Unsatisfactory. Offered every other year.

CPLT 551b, World Literature in Theory and Practice Samuel Hodgkin "World literature studies" has emerged over the past generation at institutions across the U.S. as a pedagogical alternative to comparative literature, although whether it constitutes a real conceptual challenge to the discipline or a mere rebranding remains to be seen. In scholarship, the phrase "world literature" originally stood for the effort to make Western comparative literature less Eurocentric, but it is used by its advocates and critics to refer to a bewildering array of incompatible methods and objects of study, from world systems theory to translation and reception studies and the stakes of the concept of a world as such. This seminar prepares participants to enter an academic and publishing sphere in which the idea of world literature is everywhere, but its meaning is an object of general contestation. Theorists discussed include Apter, Brouillette, Casanova, Cheah, Damrosch, Even-Zohar, Goethe, Gorky, Herder, Mahler, Moretti, Orsini, Pollock, Spivak, and the Warwick Research Collective. Literary case studies include Ismailov, Kadare, Pavic, and a range of literary anthologies from the past two centuries. Over the course of the semester, students work together to trace their chosen writers and literary movements through a variety of reception and translation contexts.

CPLT 552a / MDVL 619a / NELC 619a, The Medieval Court Shawkat Toorawa What are the features of the medieval court? To answer this, we look at courts in Western Europe, Byzantium, the Islamic world, and East Asia to learn about courtly culture, court poetry, and court society. Readings include van Berkel et al., *Crisis and Continuity in the Caliphate of al-Muqtadir*; Castiglione, *Book of the Courtier*; Duinden, *Vienna and Versailles*; Elias, *The Court Society*; Maguire, *Byzantine Court Culture*; Miner, *Introduction to Japanese Court Poetry*; al-Washshā, *al-Muwashshā*. Knowledge of French desirable.

CPLT 557a / FILM 655a / GMAN 555a, Habit and Habitation: On Walter Benjamin's Media Aesthetics and Philosophy of Technology Staff

In recent years, Walter Benjamin has become one of the most quoted media theorists. His philosophy of technology is not as widely known as the concept of aura he developed in his essay *The Work of Art in the Age of Its Technological Reproducibility*. The contemporary relevance of his philosophy of technology lies in the fact that Benjamin establishes a connection between technology and different forms of habitation and between the latter and the concept of habit (Gewohnheit), which is etymologically related to the concept of habitation (Wohnen). This enables a comparison of Benjamin's approach with the philosophies of technology developed by Heidegger, Deleuze/Guattari, and Simondon, all of whom associate technology with the shaping of environments and the problem of poesis. In our seminar, we reconstruct Benjamin's media anthropology of technology through a close reading of his diaries and essays and compare it to philosophies of technology very much being discussed today.

CPLT 566a / FILM 632a / GMAN 532a, Paper: Material and Medium Austen Hinkley Paper is one of the most ubiquitous and indispensable media of the modern era. Although we are (still) surrounded by it, paper tends to recede into the background, working best when we do not notice it at all. This course sets out to challenge our understanding of paper as a neutral or passive bearer of inscriptions by foregrounding its material quality. Our focus will rest in equal parts on the media history of paper and on paper works of art – among them many literary texts – that reflect or take advantage of their medium. Studying materials and histories from the early modern period to the present, we will uncover paper's status as a commodity bound up in a complex web of economic processes, as an instrument of political power, as a gendered and racialized object, and as a material that can be cut, shuffled, and even eaten. Ultimately, we will investigate the ways in which paper is still central to our lives, even in the age of tablets and PDFs. Readings will include Emily Dickinson's envelope poems, Robert Walser's "Microscripts," and M. NourbeSe Philip's "Zong!" The class will make several visits to the Beinecke Library for hands-on work with paper materials.

CPLT 582b / ENGL 6545b / FREN 802b / MDVL 502b, Chaucer and Translation Ardis Butterfield

An exploration of the works of Geoffrey Chaucer (ca. 1340–1400), brilliant writer and translator. Using modern postcolonial as well as medieval theories of translation, memory, and bilingualism, we investigate how texts in French, Latin, and Italian are transformed, cited, and reinvented in his writings. Some key questions include: What happens to language under the pressure of crosslingual reading practices? What happens to the notion of translation in a multilingual culture? How are ideas of literary history affected by understanding Chaucer's English in relation to the other more prestigious language worlds in which his poetry was enmeshed? Texts include material in French, Middle English, Latin, and Italian. Proficiency in any one or more of these languages is welcome, but every effort is made to use texts available in modern English translation, so as to include as wide a participation as possible in the course. Formerly ENGL 545.

CPLT 597b / ENGL 6768b, The Birth of Aesthetics Jonathan Kramnick This is a course on the emergence of aesthetic theory in Enlightenment and Romantic era Europe. We'll examine how a new language of art and nature focused on the *experience* of the beholder and track evolving categories of the sublime, beautiful, and picturesque in key texts of philosophy and literature. We'll connect ideas of aesthetic judgment and autonomy to central institutions and ideologies of the modern era, including the public sphere, secularism, the private subject, racial capitalism, and the market. Readings begin with empirical philosophies of perception and early accounts of the aesthetic in Locke, Addison, Hutcheson, Pope, Hume, and Burke and continue through the watershed moment of Wordsworth, Coleridge, Kant, and Schiller. The seminar ends with a consideration of aesthetic theory in the long contemporary period of Adorno, Scarry, Rancière, and Ngai. Previously ENGL 768.

CPLT 605b / ENGL 5805b, Edward Said as Public Intellectual Robyn Creswell This seminar focuses on Edward Said's reflections on the role and responsibilities of the intellectual, paying particular attention to his writings on Palestine, the politics and culture of the Arab world, and the discourse of expertise. We also examine the reception of Said's ideas and example among Arab thinkers. Texts include *Orientalism, The Question of Palestine, After the Last Sky, Representations of the Intellectual*, and numerous essays. Previously ENGL 905.

CPLT 612a / EALL 588a / EAST 616a / RSEE 605a / RUSS 605a, Socialist '80s: Aesthetics of Reform in China and the Soviet Union Jinyi Chu

This course offers an interdisciplinary introduction to the study of the complex cultural and political paradigms of late socialism from a transnational perspective by focusing on the literature, cinema, and popular culture of the Soviet Union and China in 1980s. How were intellectual and everyday life in the Soviet Union and China distinct from and similar to that of the West of the same era? How do we parse "the cultural logic of late socialism?" What can today's America learn from it? Examining two major socialist cultures together in a global context, this course queries the ethnographic, ideological, and socio-economic constituents of late socialism. Students analyze cultural materials in the context of Soviet and Chinese history. Along the way, we explore themes of identity, nationalism, globalization, capitalism, and the Cold War. Students with knowledge of Russian and Chinese are encouraged to read in original. All readings are available in English.

CPLT 614b / FILM 77ob / GMAN 594b, East German Literature and Film Katie Trumpener

The German Democratic Republic (1949–89) was a political and aesthetic experiment that failed, buffeted by external pressures and eroded by internal contradictions. For forty years, in fact, its most ambitious literary texts and films (some suppressed, others widely popular) explored such contradictions, often in a vigilant, Brechtian spirit of irony and dialectics. This course examines key texts both as aesthetic experiments and as critiques of the country's emerging cultural institutions and state censorship, recurrent political debates, and pressing social issues. Texts by Brecht, Uwe Johnson, Heiner Müller, Christa Wolf, Johannes Bobrowski, Franz Fühmann, Wolf Biermann, Thomas Brasch, Christoph Hein; films by Slatan Dudow, Kurt Maetzig, Konrad Wolf, Heiner Carow, Frank Beyer, Jürgen Böttcher, Volker Koepp. Knowledge of German desirable but not crucial; all texts available in English.

CPLT 622a / AMST 622a and AMST 623b, Working Group on Globalization and Culture Michael Denning

A continuing yearlong collective research project, a cultural studies "laboratory." The group, drawing on several disciplines, meets regularly to discuss common readings, develop collective and individual research projects, and present that research publicly. The general theme for the working group is globalization and culture, with three principal aspects: (1) the globalization of cultural industries and goods, and its consequences for patterns of everyday life as well as for forms of fiction, film, broadcasting, and music; (2) the trajectories of social movements and their relation to patterns of migration, the rise of global cities, the transformation of labor processes, and forms of ethnic, class, and gender conflict; (3) the emergence of and debates within transnational social and cultural theory. The specific focus, projects, and directions of the working group are determined by the interests, expertise, and ambitions of the members of the group, and change as its members change. The working group is open to doctoral students in their second year and beyond. Graduate students interested in participating should contact michael.denning@yale.edu.

CPLT 648b / EMST 718b, European Drama I: From the Greek Polis to the French Revolution Rudiger Campe and Katie Trumpener

This seminar is designed as a graduate-level survey of European drama from antiquity to 1800. Our emphasis is on historically-informed discussion of primary texts; on mapping key epochs in dramatic history (including Greek tragedy and comedy, Elizabethan/ Jacobean; Spanish "Golden Age"; French neo-classicism; German Storm and Stress) in relationship to one another, across time, languages, and cultures; and on changing performance practices and conceptions of theater. Plays by Aeschylus, Sophocles, Euripides, Aristophanes; Hrotsvitha von Gandersheim; Shakespeare, Marlowe, Jonson, Middleton, Congreve; Lope de Vega, Calderon; Racine, Corneille, Moliere, Goldoni, Marivaux, Beaumarchais; Goethe, Schiller. Short classic texts by Aristotle, Nietzsche, Goethe, Bulgakov, Goldman, Leroy Ladurie, Barthes, Kott, alongside contemporary theater critics and historians.

CPLT 657a / PORT 652a, Clarice Lispector: The Short Stories Kenneth David Jackson This course is a seminar on the complete short stories of Clarice Lispector (1920–1977), a master of the genre and one of the major authors of twentieth-century Brazil known for existentialism, mysticism, and feminism.

CPLT 665b / ENGL 5865b / WGSS 665b, African Feminism and African Women Writers Helen Yitah

This course looks at how major African women writers such as Ama Ata Aidoo, Mariama Ba, Bessie Head, Nawal El Saadawi, Grace Ogot, and Chimamanda Adichie have represented African feminist concerns and aesthetics in their works. We explore some of their interrogation of sexism and patriarchal social structures, the thematization of gender relations, a rethinking of marginality, and the presentation of alternative frames of reference for (re)defining female subjectivities and identities by reading selected works through the lens of African feminist thought, including Molara Ogundipe-Leslie's stiwanism, Catherine Acholonu's motherism, Obioma Nnaemeka's nego-feminism, and Mary Kolawole's and Chikwenye Ogunyemi's versions of womanism.

CPLT 666b / EMST 565b / GMAN 665b, Birth of the Political: Early Modern and Twentieth Century Rudiger Campe

Early modern European works on colonial war, sovereignty, and politics, sixteenth to seventeenth centuries (by Sepúlveda, Grotius, Machiavelli, Lipsius [neo-Stoicism], Hobbes) are read in conjunction with twentieth century debates from the inter-war period to circa 1968 (by Schmitt, Kantorowicz, Benjamin, Oestreich, Foucault, authors who refer back to the modern early works and have importantly shaped our modern understanding of "the political" and, with it, the notion of the "early modern"). The course is interested in critically tracing the echoes regarding "the political" between early modernity and our own times.

CPLT 689a / E&RS 629a / RSEE 613a / RUSS 613a / SLAV 613a, Art and Resistance in Belarus, Russia, and Ukraine Andrei Kureichyk

This interdisciplinary seminar is devoted to the study of protest art as part of the struggle of society against authoritarianism and totalitarianism. It focuses on the example of the Soviet and post-Soviet transformation of Belarus, Russia, and Ukraine. The period under discussion begins after the death of Stalin in 1953 and ends with the art of protest against the modern post-Soviet dictatorships of Alexander Lukashenka in Belarus and Vladimir Putin in Russia, the protest art of the Ukrainian Maidan, and the anti-war movement of artists against the Russian-Ukrainian war. The course begins by looking at the influence of the "Khrushchev Thaw" on literature and cinema, which opened the way for protest art to a wide Soviet audience. We explore different approaches to protest art in conditions of political unfreedom: "nonconformism," "dissidence," "mimicry," "rebellion." The course investigates the existential conflict of artistic freedom and the political machine of authoritarianism. These themes are explored at different levels through specific examples from the works and biographies of artists. Students immerse themselves in works of different genres: films, songs, performances, plays, and literary works.

CPLT 705a / ITAL 781a, The Decameron Millicent Marcus

An in-depth study of Boccaccio's text as a journey in genre in which the writer surveys all the storytelling possibilities available to him in the current repertory of short narrative fiction – ranging from ennobling example to flamboyant *fabliaux*, including hagiography, aphorisms, romances, anecdotes, tragedies, and practical jokes – and self-consciously manipulates those forms to create a new literary space of astonishing variety, vitality, and subversive power. In the relationship between the elaborate framestory and the embedded tales, theoretical issues of considerable contemporary interest emerge – questions of gendered discourse, narratology, structural pastiche, and reader response among them. *The Decameron* is read in Italian or in English. Close attention is paid to linguistic usage and rhetorical techniques in this foundational text of the vernacular prose tradition.

CPLT 707b / AFAM 707b / MHHR 707b, What Is An Archive? Melissa Barton This graduate seminar seeks to answer the question in the course's title by looking closely at professional archival descriptive practices and broader, looser uses of the term in cultural and literary studies, art history, history, and beyond. By looking at these distinct but curiously, even suspiciously, concurrent genealogies, we seek to explain why the term "archive" has become so demonstrably popular, in multiple senses of the word, even as archival practice has become more professionalized and specialized. Put differently, many humanistic fields have undergone "archival turns" in recent decades, and many cultural and performance theorists, critics, and historians have advanced arguments about "the archive" as a monolithic concept, perhaps "the archives" as an abstract location where the work begins (e.g., "I've been in the archives"), or perhaps "my archive" as the group of texts I interpret and cite. Meanwhile, professional archivists regularly publish tweets, articles, and blog posts asking them to stop it. This course hopes to ponder and maybe even find a way toward an answer to the question: What is up with this? We explore archives in theory and practice, as both figurative and literal, both concrete and abstract, repositories for "primary" inquiry into the past. We consider theories of archives from humanities fields and the archival profession (including the emerging subfield "critical archival studies"), and we discuss how

archives are made, how they are used, how they are made usable, what may be assumed or elided in the making and use of archives, and the popularity of, and tensions around, "the archive" as a concept. Topics and keywords include: what is primary or original? What is order or process? What is a trace, and how is it made distinct from the great mass of human traces? What does it mean to collect, to curate? What is an archival silence, and what might be comparable notions of archival noise? What does it mean to recover or discover? In addition to readings, students complete two assignments: a provenance research assignment and a descriptive project in the form of a survey of an existing collection at Yale or a subject guide to a collection or group of collections.

CPLT 734a / FREN 930a, Fiction and the Archives Alice Kaplan

What can be learned about 20th-century French literature from literary archives? This course investigates fiction by Proust, Céline, Guilloux, Sartre, Sarraute, Wittig, studying finished books in the light of manuscripts, letters, and historical sources. An exploration in particular of the idea of the "genesis" of a literary work. A number of classes will take place in the Beinecke Rare Book and Manuscript Library. Conducted in English.

CPLT 754a / ENGL 915a, Western and Postcolonial Marxist Cultural Theory Joe Cleary

An introduction to classic twentieth-century Western and postcolonial Marxist theorists and texts focusing on historical and intellectual exchange between these critical formations. Reading theoretical works in conjunction with some selected literary texts, the course tracks how key Marxian concepts such as capital and class consciousness, modes of production, praxis and class struggles, reification, commodification, totality, and alienation have been developed across these traditions and considers how these concepts have been used to rethink literary and other cultural forms and their ongoing transformation in a changing world system. Writers discussed may include G.W.F. Hegel, Karl Marx, Friedrich Engels, Georg Lukács, Mikhail Bakhtin, Theodor Adorno, Max Horkheimer, Walter Benjamin, Jean-Paul Sartre, Simone de Beauvoir, Toril Moi, C.L.R. James, W.E.B. Du Bois, Frantz Fanon, Paul Gilroy, Antonio Gramsci, Raymond Williams, Fredric Jameson, Perry Anderson, Giovanni Arrighi, Cornel West, and others. The object of the seminar is to provide students with a solid intellectual foundation in these still-developing hermeneutic traditions.

CPLT 822b / AMST 623b, Working Group on Globalization and Culture Michael Denning

A continuing yearlong collective research project, a cultural studies "laboratory." The group, drawing on several disciplines, meets regularly to discuss common readings, develop collective and individual research projects, and present that research publicly. The general theme for the working group is globalization and culture, with three principal aspects: (1) the globalization of cultural industries and goods, and its consequences for patterns of everyday life as well as for forms of fiction, film, broadcasting, and music; (2) the trajectories of social movements and their relation to patterns of migration, the rise of global cities, the transformation of labor processes, and forms of ethnic, class, and gender conflict; (3) the emergence of and debates within transnational social and cultural theory. The specific focus, projects, and directions of the working group are determined by the interests, expertise, and ambitions of the members of the group, and change as its members change. There are a small number of openings for second-year graduate students. Students interested in participating should contact michael.denning@yale.edu.

CPLT 889a / AFST 889a / ENGL 889a, Postcolonial Ecologies Cajetan Iheka This seminar examines the intersections of postcolonialism and ecocriticism as well as the tensions between these conceptual nodes, with readings drawn from across the global South. Topics of discussion include colonialism, development, resource extraction, globalization, ecological degradation, nonhuman agency, and indigenous cosmologies. The course is concerned with the narrative strategies affording the illumination of environmental ideas. We begin by engaging with the questions of postcolonial and world literature and return to these throughout the semester as we read primary texts, drawn from Africa, the Caribbean, and Asia. We consider African ecologies in their complexity from colonial through post-colonial times. In the unit on the Caribbean, we take up the transformations of the landscape from slavery, through colonialism, and the contemporary era. Turning to Asian spaces, the seminar explores changes brought about by modernity and globalization as well as the effects on both humans and nonhumans. Readings include the writings of Zakes Mda, Aminatta Forna, Helon Habila, Derek Walcott, Jamaica Kincaid, Ishimure Michiko, and Amitav Ghosh. The course prepares students to respond to key issues in postcolonial ecocriticism and the environmental humanities, analyze the work of the major thinkers in the fields, and examine literary texts and other cultural productions from a postcolonial perspective. Course participants have the option of selecting from a variety of final projects. Students can craft an original essay that analyzes primary text from a postcolonial and/or ecocritical perspective. Such work should aim at producing new insight on a theoretical concept and/or the cultural text. They can also produce an undergraduate syllabus for a course at the intersection of postcolonialism and environmentalism or write a review essay discussing three recent monographs focused on postcolonial ecocriticism.

CPLT 895a / SPAN 865a, Translation in Latin American and Latinx Literature Staff Involving languages, cultures, nations, and publishing markets of varying power, translation is a highly charged zone where hierarchies may be established, reinforced, or toppled. This graduate seminar offers an overview of how translation has functioned, in site-specific fashion, as theoretical program and experimental mode within "original" Latin American and the US Latinx literatures. We examine texts from much of the twentieth and twenty-first centuries that engage translation (interlinguistic, intralinguistic, intersemiotic) as trope, form, or material apparatus. These featured works include pseudotranslations, unreliable self-translations, transcreations, translingual texts, and fictions with translator-protagonists. We read these materials alongside essential theory and criticism that surface distinctly Latin(x) American itineraries for translation and that provide students with an analytical toolbox for attending to translation in original and unoriginal writing alike. This course is taught in English, with materials provided in the original Spanish or Portuguese when available.

CPLT 909b, Joyce and Proust Marta Figlerowicz

This course is devoted mostly to the close reading of Joyce's *Ulysses* and parts of Proust's *In Search of Lost Time*. We read Proust in translation, but special guidance is given for students who can read French.

CPLT 913a / FILM 690a / SPAN 691, Radical Cinemas of Latin America Moira Fradinger

An introductory overview of Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required.

CPLT 933a / ENGL 928a / FILM 751a, British Cinema Katie Trumpener Key films and topics in British cinema. Special attention to the provincial origins of British cinema; overlaps between filmic, literary, and visual modernism; attempts to build on the British literary and dramatic tradition; cinema's role in the war effort and in redefining national identity; postwar auteur and experimental filmmaking; "heritage" films and alternative approaches to tradition. Accompanying readings in British film theorists, film sociology (including Mass Observation), and cultural studies accounts of film spectatorship and memories. Films by Mitchell and Kenyon, Maurice Elvey, Anthony Asquith, Len Lye, John Grierson, Alfred Hitchcock, Alberto Cavalcanti, Humphrey Jennings, Michael Powell, Carol Reed, David Lean, Karel Reisz, Lindsay Anderson, Richard Lester, Peter Watkins, Stanley Kubrick, Laura Mulvey, Ken Loach, Mike Leigh, Terence Davies, Terry Gilliam, Peter Greenaway, Michael Winterbottom, Patrick Keiller, Steve McQueen.

CPLT 953b / EALL 823b / EAST 623b, Topics in Sinophone and Chinese Studies Jing Tsu

This recurring graduate research seminar and symposium examines different areas, periods, genres, and conceptual frameworks in Chinese and Sinophone studies. The topic this year is 1950s–2020. Prerequisite: reading fluency in modern and semiclassical Chinese. Enrollment is restricted; no auditors.

CPLT 965a / ER&M 681 / SPAN 904a, Latin American Political Thought I: Neocolonial, Anticolonial, Decolonial: 1800–1930 Moira Fradinger

This seminar consists of two parts. The first part is taught in the fall and the second one in the spring. The year-long plan introduces students to two centuries of Latin American political thought in the form of social and literary essays produced since the times of independence. It studies how Latin American writers and politicians have theorized the political/cultural heritage of the colony. The fall seminar starts with the Haitian constitution and contemporary Haitian authors who assess the legacy of the Haitian revolution. It ends with the anarchist movements and socialist thought of the turn of the twentieth century. The second part (spring) starts with the 1930s and the rise of populism and ends with writings on current indigenous movements across the region. The fall engages nineteenth-century debates over "American identity" that were foundational to the newly constituted nation-states (authors include Bolívar, Lastarria, Alamán, Martí, Sarmiento, Echeverría, Hostos, Montalvo, Burgos, Rodó, da Cunha, Mariategui, Gonzalez Prada, Zapata). The spring explores twentiethcentury debates over cultural independence, the movement of "indigenismo," mestizaje, transculturation and heterogeneity, the Caribbean movement of "negritude," the metaphor of "cannibalism" to account for the cultural politics of the region, concepts such as "internal colonialism" and "motley society," and the polemics over the region's capitalist modernity and postmodernity (authors include Ortiz, Moreno Fraginals, Lezama Lima, Vasconcelos, Reyes, de Andrade, Antenor Orrego, Zapata, J.L. Borges,

J.M. Arguedas, Sérgio Buarque de Holanda, Caio Prado Júnior, Jean Price-Mars, Jacques Roumain, Aimé Césaire, George Lamming, C.L.R. James, Fanon, Léon Damas, Paulo Freire, Angel Rama, Retamar, Edmundo O'Gorman, Antonio Candido, Darcy Ribeiro, Pablo González Casanova, León-Portilla, R. Kusch, René Zavaleta Mercado, A. Quijano, Rita Segato, Bolívar Echeverría, Silvia Rivera Cusicanqui, Viveiros de Castro). Weekly sessions are conducted in Spanish, and most of the readings are Spanish, French, and Portuguese materials (with a few Anglo-Caribbean sources). Students are provided with English translations if they prefer and are allowed to write their papers in English.

CPLT 985a / AFST 969a / FREN 969a, Islands, Oceans, Deserts Jill Jarvis This seminar brings together literary and theoretical works that chart planetary relations and connections beyond the paradigm of francophonie. Comparative focus on the poetics and politics of spaces shaped by intersecting routes of colonization and forced migrations: islands (Sri Lanka, Mauritius, Martinique), oceans (Indian, Mediterranean, Atlantic), and deserts (Sahara, Sonoran). Prerequisite: reading knowledge of French; knowledge of Arabic and Spanish invited. Conducted in English.

Computational Biology and Biomedical Informatics

100 College St., cbb-registrar@yale.edu http://cbb.yale.edu M.S., Ph.D.

Directors of Graduate Studies

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Professors Frederick Altice (Internal Medicine; Infections Diseases; Epidemiology of Microbial Diseases), Marcus Bosenberg (Dermatology; Pathology), Cynthia Brandt (Emergency Medicine; Anesthesiology), Joseph Chang (Statistics and Data Science), Kei-Hoi Cheung (Emergency Medicine; Anesthesiology), Ronald Coifman (Mathematics; Computer Science), Stephen Dellaporta (Molecular, Cellular, and Developmental Biology), Rong Fan (Biomedical Engineering; Pathology), Richard Flavell (Immunobiology), Joel Gelernter (Psychiatry; Genetics), Mark Gerstein (Biomedical Informatics; Molecular Biophysics and Biochemistry; Computer Science; Statistics and Data Science), Antonio Giraldez (Genetics), Jeffrey Gruen (Genetics; Investigative Medicine; Pediatrics), Murat Gunel (Neurosurgery; Genetics), Ira Hall (Genetics), Amy Justice (Internal Medicine; Public Health), Naftali Kaminski (Internal Medicine), Steven Kleinstein (Pathology; Immunobiology), Yuval Kluger (Pathology), Harlan Krumholz (Internal Medicine; Investigative Medicine; Public Health), Haifan Lin (Cell Biology; Genetics), Shuangge (Steven) Ma (Biostatistics), Zongming Ma (Statistics and Data Science), Andrew Miranker (Molecular Biophysics and Biochemistry; Chemical and Environmental Engineering), James Noonan (Genetics; Neuroscience), Corey O'Hern (Mechanical Engineering and Materials Science; Applied Physics; Physics), Xenophon Papademetris (Biomedical Informatics and Data Science; Radiology and Biomedical Imaging), Lajos Pusztai (Internal Medicine), Anna Pyle (Molecular, Cellular, and Developmental Biology; Chemistry), David Stern (Pathology), Hemant Tagare (Radiology and Biomedical Imaging; Biomedical Engineering), Jeffrey Townsend (Public Health; Ecology and Evolutionary Biology), John Tsang (Immunobiology), Hua Xu (Biomedical Informatics and Data Science), Heping Zhang (Biostatistics; Statistics and Data Science), Hongyu Zhao (Biostatistics; Statistics and Data Science), Steven Zucker (Computer Science; Electrical Engineering; Biomedical Engineering)

Associate Professors Julien Berro (Molecular Biophysics and Biochemistry), Sidi Chen (Genetics; Neurosurgery), Forrest Crawford (Biostatistics; Ecology and Evolutionary Biology), Samah Jarad (Emergency Medicine; Biostatistics), Smita Krishnaswamy (Genetics; Computer Science), Bluma Lesch (Genetics), Jun Lu (Genetics), Ted Melnick (Biostatistics; Emergency Medicine), Kathryn Miller-Jensen (Engineering and Applied Science), John Murray (Psychiatry; Neuroscience; Physics), Renato Polimanti (Psychiatry), Edward Stites (Laboratory Medicine), Andrew Taylor (Emergency Medicine), Zuoheng (Anita) Wang (Biostatistics), Yize Zhao (Biostatistics)

Assistant Professors Arnaud Augert (Pathology), David Braun (Medical Oncology), Purushottam Dixit (Biomedical Engineering), Salil Garg (Laboratory Medicine; Pathology), Leying Guan (Biostatistics), Mary-Anne Hartley (Biomedical Informatics and Data Science), Albert Higgins-Chen (Psychiatry; Pathology), Jeffrey Ishizuka (Internal Medicine; Medical Oncology; Pathology), Rohan Khera (Internal Medicine, Cardiovascular Medicine; EPH Biostatistics), Monkol Lek (Genetics), Benjamin Machta (Physics), Robert McDougal (Biostatistics), Jacob Musser (Molecular, Cellular, and Developmental Biology), C. Brandon Ogbunu (Ecology and Evolutionary Biology), Carlos Oliveira (Pediatrics; Infectious Diseases), Steven Reilly (Genetics), Wade Schulz (Laboratory Medicine), Serena Tucci (Anthropology), David van Dijk (Internal Medicine, Cardiology; Computer Science), Rex Ying (Computer Science), Jack Zhang (Molecular Biophysics and Biochemistry)

FIELDS OF STUDY

Computational biology and biomedical informatics (CB&B) is a rapidly developing multidisciplinary field. The past two decades have witnessed a revolution in the biological and biomedical sciences driven by the development of technologies such as high-dimensional phenotypic profiling, next-generation sequencing, macromolecular structure determination and high-resolution imaging, wearable sensor devices, and large-scale electronic health records. These data-generation technologies demand new computational analysis approaches, which, in turn, have given rise to the field of computational biology and biomedical informatics (CB&B).

The Yale Computational Biology and Biomedical Informatics program combines research training opportunities in a range of different fields within the biological and biomedical sciences, in addition to the computational sciences, applied mathematics, statistics, and data science. The scope and balance of a student's program are highly individualized. Each student in the CB&B program develops, with the assistance of faculty advisers, a specific program of coursework, independent reading, and research that gives a depth of coverage and fits their background, interests, and career goals.

To enter the Ph.D. program, students apply to the CB&B Track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to one of the tracks of the Biological and Biomedical Sciences program may simultaneously apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

With the help of a faculty advisory committee, each student plans a program that includes courses, seminars, laboratory rotations, and independent reading. Students are expected to gain competence in three core areas: (1) computational biology and biomedical informatics, (2) biological sciences, and (3) informatics (including computer science, applied mathematics, statistics, and data science). While the courses taken to satisfy the core areas of competency may vary considerably, all students are required to take the following courses: CB&B 740 and CB&B 752. CB&B requires a minimum of ten course credits. Completion of the core curriculum will typically

take three to four terms, depending in part on the prior training of the student. With approval of the CB&B director of graduate studies (DGS), students may take one or two undergraduate courses to satisfy areas of minimum expected competency. Students will typically take two to three courses each term and three research rotations (CB&B 711, CB&B 712, CB&B 713) during the first year. In addition to all other requirements, students must successfully complete CB&B 601, Fundamentals of Research: Responsible Conduct of Research, (or another course that covers the material) prior to the end of their first year of study. After the first year, students will start working in the laboratory of their Ph.D. thesis supervisor. Students must pass a qualifying examination normally given no later than the end of the third year. There is no foreign language requirement. Students will serve as teaching assistants in two terms. In their fourth year of study, all students must successfully complete B&BS 503, RCR Refresher for Senior BBS Students.

M.D.-PH.D. STUDENTS

Students pursuing the joint M.D.-Ph.D. degrees must satisfy the course requirements listed above for Ph.D. students. With approval of the DGS, some courses taken toward the M.D. degree can be counted toward the ten required course credits. Such courses must have a graduate course number, and the student must register for them as graduate courses (in which grades are received). Laboratory rotations are available but not required. One teaching assistantship is required.

MASTER'S DEGREE

Terminal Master's Degree Program Students can be admitted for a terminal M.S. degree in Computational Biology and Biomedical Informatics with the goal of gaining competency in three core areas: (1) computational biology and biomedical informatics, (2) biomedical sciences, (3) informatics (including computer science, applied mathematics, statistics, and data science). This is a two-year program. Students must complete nine courses at Yale, including at least three graduate CB&B courses (including CB&B 740 and CB&B 752), two graduate courses in the biological sciences, two graduate courses in areas of informatics, and two additional courses in any of the three core areas. In addition, M.S. students must take a one-term graduate seminar on research ethics and attend a CB&B seminar series. Finally, students must meet all of the Graduate School's requirements for the two-year terminal M.S. degree.

Terminal M.S. degree students are also expected to complete an M.S. project, write a research paper describing it, and defend the project in a seminar where they present the project and answer questions about the project as well as demonstrate breadth knowledge of their coursework and track of study. The paper is evaluated by the student's research supervisor and a second reader from the CB&B faculty. Students are expected to identify a faculty member to supervise the M.S. project by the end of the first year or early in the second year. Completion of the research paper is facilitated by enrolling in CB&B 650.

M.S. (en route to the Ph.D.) Students enrolled in the Ph.D. program may be awarded an M.S. degree en route as they satisfy the requirements for the Ph.D. degree. To qualify for the awarding of the en route M.S. degree a student must (1) complete two years (four terms) of study in the Ph.D. program; (2) complete the required course work for the Ph.D. program, with ten required course credits taken at Yale

including three successful research rotations; and (3) meet the Graduate School's grade requirements.

CB&B 523a / ENAS 541a / MB&B 523a / PHYS 523a, Biological Physics Yimin Luo This course has three aims: (1) to introduce students to the physics of biological systems, (2) to introduce students to the basics of scientific computing, and (3) to familiarize students with characterization methods and analysis tools. We focus on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, entropic forces, membranes, and cell motion using computational tools and methods. We provide intensive tutorials for Matlab including basic syntax, arrays, functions, plotting, and importing and exporting data.

CB&B 562b / AMTH 765b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

CB&B 568b, Applied Artificial Intelligence in Healthcare Andrew Taylor and Wade Schulz

Recent advances in machine learning (ML) offer tremendous promise to improve the care of patients. However, few ML applications are currently deployed within healthcare institutions and even fewer provide real value. This course is designed to empower students to overcome common pitfalls in bringing ML to the bedside and aims to provide a holistic approach to the complexities and nuances of ML in the healthcare space. The class focuses on key steps of model development and implementation centered on real-world applications. Students apply what they learn from the lectures, assignments, and readings to identify salient healthcare problems and tackle their solutions through end-to-end data engineering pipelines.

CB&B 570b, Privacy-Enhancing Technologies in Biomedical Data Science Hoon Cho Biomedical data science increasingly depends upon access to large and diverse collections of sensitive human subject data. Conventional data sharing frameworks offer limited privacy protection, often resulting in isolated data silos that hinder scientific collaboration. This course explores Privacy-Enhancing Technologies (PETs) as a solution to these challenges. Specific technologies covered include secure multiparty computation, homomorphic encryption, differential privacy, federated learning, and trusted execution environments. We examine the landscape of privacy risks in biomedicine and study the conceptual and mathematical foundations of PETs as well as their applications in a range of biomedical domains, including genomics and health informatics. Additional special topics delve into the latest developments in this field, concerning both technical and social aspects of PETs. Students engage in hands-on experiences throughout the course, including privacy attack demonstration, literature survey, and the implementation of PET algorithms for various biomedical tasks. Prerequisites: We expect students to have some level of mathematical maturity, including an understanding of probability/statistics and experience writing proofs. We

also expect students to be comfortable with Python programming; homeworks include hands-on programming components in Python. A basic understanding of biology and genetics is helpful but not required. Feel free to contact us if you have any questions regarding the requirements.

CB&B 574a or b, Biomedical Natural Language Processing: Methods and Applications Staff

This course examines current natural language processing (NLP) methods and their applications in the biomedical domain. It provides a systematic introduction to basic knowledge on NLP and AI (e.g., linguistics, machine learning, and deep learning algorithms), advanced NLP tasks (e.g., information extraction, information retrieval, question answering), and corresponding approaches including the recent large language models (LLMs) and hands-on experience in developing biomedical NLP systems for different applications, ranging from biomedical literature mining to clinical decision support. Assessment in this course consists of technical exercises, exams, and projects, to demonstrate the applicability of skills learned during the course.

CB&B 575a, Bioinformatics Applications in Biomedicine Jihoon Kim

This course covers the latest advances in bioinformatics in the context of human diseases. Students learn background knowledge and practical skills to analyze omics data for human disease research. By the end of this course, students should be able to: (1) process bioinformatics data with linux-based pipelines and data tools, (2) apply exploratory data analysis techniques in Python and R, (3) perform analysis of DNA, RNA, and protein data, and (4) conduct a biobank-scale analysis using the platform such as the All of Us Research Workbench.

CB&B 601b, Fundamentals of Research: Responsible Conduct of Research Staff A weekly seminar presented by faculty trainers on topics relating to proper conduct of research. Required of first-year CB&B students, first-year Immunobiology students, and training grant-funded postdocs. Pass/Fail.

CB&B 634a, Computational Methods for Informatics Robert McDougal This course introduces the key computational methods and concepts necessary for taking an informatics project from start to finish: using APIs to query online resources, reading and writing common biomedical data formats, choosing appropriate data structures for storing and manipulating data, implementing computationally efficient and parallelizable algorithms for analyzing data, and developing appropriate visualizations for communicating health information. The FAIR data-sharing guidelines are discussed. Current issues in big health data are discussed, including successful applications as well as privacy and bias concerns. This course has a significant programming component, and familiarity with programming is assumed. Prerequisite: CPSC 223 or equivalent, or permission of the instructor.

CB&B 638a, Clinical Database Management Systems and Ontologies Kei-Hoi Cheung and George Hauser

This course introduces database and ontology in the clinical/public health domain. It reviews how data and information are generated in clinical/public health settings. It introduces different approaches to representing, modeling, managing, querying, and integrating clinical/public health data. In terms of database technologies, the course describes two main approaches – SQL database and non-SQL (NoSQL) database – and shows how these technologies can be used to build electronic health records

(EHR), data repositories, and data warehouses. In terms of ontologies, it discusses how ontologies are used in connecting and integrating data with machine-readable knowledge. The course reviews the major theories, methods, and tools for the design and development of databases and ontologies. It also includes clinical/public health use cases demonstrating how databases and ontologies are used to support clinical/public health research.

CB&B 647a / GENE 645a, Statistical Methods in Human Genetics Hongyu Zhao Probability modeling and statistical methodology for the analysis of human genetics data are presented. Topics include population genetics, single locus and polygenic inheritance, linkage analysis, quantitative trait analysis, association analysis, haplotype analysis, population structure, whole genome genotyping platforms, copy number variation, pathway analysis, and genetic risk prediction models. Offered every other year. Prerequisites: genetics; BIS 505; S&DS 541 or equivalent; or permission of the instructor.

CB&B 711a and CB&B 712b and CB&B 713b, Lab Rotations Steven Kleinstein Three 2.5–3-month research rotations in faculty laboratories are required during the first year of graduate study. These rotations are arranged by each student with individual faculty members.

CB&B 740a, Introduction to Health Informatics Andrew Taylor

The course provides an introduction to clinical and translational informatics. Topics include (1) overview of biomedical informatics, (2) design, function, and evaluation of clinical information systems, (3) clinical decision-making and practice guidelines, (4) clinical decision support systems, (5) informatics support of clinical research, (6) privacy and confidentiality of clinical data, (7) standards, and (8) topics in translational bioinformatics. Permission of the instructor required.

CB&B 750b, Core Topics in Biomedical Informatics Samah Jarad

The course focuses on providing an introduction to common unifying themes that serve as the foundation for different areas of biomedical informatics. It is designed for students with programming experience who plan to build databases and computational tools for use in biomedical research. Emphasis is on understanding basic principles underlying informatics approaches to interoperation among biomedical databases and software tools, standardized biomedical vocabularies and ontologies, biomedical natural language processing, predictive analytics, information extraction, deep learning, and other related topics.

CB&B 752b / CPSC 752b / MB&B 752b and MB&B 753b and MB&B 754b / MB&B 753b and MB&B 754b / MB&B 754b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon

Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

Computer Science

A.K. Watson Hall, 203.432.1246 http://cpsc.yale.edu M.S., M.Phil., Ph.D.

Chair Holly Rushmeier

Directors of Graduate Studies Lin Zhong (lin.zhong@yale.edu) Vladimir Rokhlin

Professors Dana Angluin (*Emerita*), James Aspnes, Dirk Bergemann,* Abhishek Bhattacharjee, Ronald Coifman,* Aaron Dollar,* Julie Dorsey, Joan Feigenbaum, Michael Fischer, Robert Frank,* David Gelernter, Mark Gerstein,* John Lafferty,* Rajit Manohar,* Vladimir Rokhlin,† Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao, Avi Silberschatz, Daniel Spielman, Phillipp Strack,* Leandros Tassiulas,* Nisheeth Vishnoi, Y. Richard Yang, Lin Zhong, Steven Zucker†

Associate Professors Yang Cai, Amin Karbasi,* Theodore Kim, Smita Krishnaswamy,† Sahand Negahban,* Charalampos Papamanthou, Ruzica Piskac, Robert Soule, Jakub Szefer*

Assistant Professors Ian Abraham,* Kim Blenman,* Arman Cohan, Yongshan Ding, Benjamin Fisch, Tesca Fitzgerald, Julian Jara-Ettinger,* Anurag Khandelwal, Quanquan Liu, Tom McCoy,* Daniel Rakita, Katerina Sotiraki, David van Dijk,* Marynel Vázquez, Andre Wibisono, Alex Wong, Zhitao Ying, Manolis Zampetakis

Senior Lecturers James Glenn, Stephen Slade

Lecturers Timos Antonopoulos, Timothy Barron, Ozan Erat, Kyle Jensen,* Janet Kayfetz, Jay Lim, Dylan McKay, Cody Murphey, Sohee Park, Scott Petersen, Brad Rosen, Alan Weide, Cecillia Xie

* A secondary appointment with primary affiliation in another department or school.

⁺ A joint appointment with another department.

FIELDS OF STUDY

Algorithms and computational complexity, artificial intelligence, data networking, databases, graphics, machine learning, programming languages, robotics, scientific computing, security and privacy, and systems.

RESEARCH FACILITIES

The department operates a high-bandwidth, local-area computer network-based mainly on distributed workstations and servers with internet connections. Laboratory contains specialized equipment for graphics, robotics, systems, and vision research. Various printers, including color printers, as well as image scanners, are also available. The primary educational facility consists of a large cluster of personal computers. This facility is used for courses and unsponsored research by computer science majors and first-year graduate students. Access to computing, through both the workstations and remote login facilities, is available to everyone in the department.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

There is no foreign language requirement. To be admitted to candidacy, a student must

- 1. pass ten courses (including CPSC 690 and CPSC 691) with at least two grades of Honors, the remainder at least High Pass, including three advanced courses in an area of specialization;
- 2. take six advanced courses in areas of general computer science;
- 3. successfully complete a research project in CPSC 690, CPSC 691, and submit a written report on it to the faculty;
- 4. pass a qualifying examination in an area of specialization;
- 5. be accepted as a thesis student by a regular department faculty member;
- 6. serve as a teaching assistant for two terms; and
- 7. submit a written dissertation prospectus, with a tentative title for the dissertation.

Grades of Pass will not count toward the Ph.D. To satisfy the distribution requirement (requirement 2 above), the student must take one course in programming languages or systems, one programming-intensive course, two theory courses, and two in application areas. In order to gain teaching experience, all graduate students are required to serve as teaching assistants for two terms during their first three years of study. All requirements for admission to candidacy must be completed prior to the end of the third year. In addition to all other requirements, students must successfully complete CPSC 991, Ethical Conduct of Research, prior to the end of their first year of study. This requirement must be met prior to registering for the second year of study.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. (en route to the Ph.D.) To qualify for the M.S., the student must pass eight courses at the 500 level or above from an approved list. An average grade of at least High Pass is required, with at least one grade of Honors.

Terminal Master's Degree Program Students may also be admitted to a terminal master's degree program directly. There are two options for the terminal master's degree:

- *Terminal Master's Degree Program (coursework-only option)* The requirements are the same as for the M.S. en route to the Ph.D. This program is normally completed in one year, but a part-time program may be spread over as many as four years.
- Terminal Master's Degree Program (thesis option) To qualify for the M.S. thesis option the student must (1) pass six courses at the 500 level or above from an approved list with an average grade of at least High Pass and with at least one grade of Honors;
 (2) complete a research thesis, generally in the second year; and (3) serve as a teaching assistant for four terms. This program is normally completed in two years.
Please use the links provided for additional information about the department, faculty, courses, and facilities online; You may also reach out to the departmental registrar at cs-admissions@cs.yale.edu.

COURSES

CPSC 513a, Computer System Security Timothy Barron

Overview of the principles and practice behind analyzing, designing, and implementing secure computer systems. The course covers problems that have continued to plague computer systems for years as well as recent events and research in this rapidly evolving field. Students learn to think from the perspective of an adversary, to understand systems well enough to see how their flaws could be exploited, and to consequently defend against such exploitation. The course offers opportunities for hands-on exploration of attacks and defenses in the contexts of web applications, networks, and system-level software. It also addresses ethical considerations and responsibilities associated with security research and practice.

CPSC 516a, Lattices and Post-Quantum Cryptography Katerina Sotiraki This course explores the role of lattices in modern cryptography. In the last decades, novel computational problems, whose hardness is related to lattices, have been instrumental in cryptography by offering: (a) a basis for "post-quantum" cryptography, (b) cryptographic constructions based on worst-case hard problems, and (c) numerous celebrated cryptographic protocols unattainable from other cryptographic assumptions. This course covers the foundations of lattice-based cryptography from fundamental definitions to advanced cryptographic constructions. More precisely, we introduce the Learning with Error (LWE) and the Short Integer Solutions (SIS) problems and study their unique properties, such as the fact that their average-case hardness is based on the worst-case hardness of lattice problems. Next, we cover lattice constructions of advanced cryptographic primitives, such as fully homomorphic encryption and signature schemes. Finally, we introduce some notions of quantum cryptography and explore the role of lattices in this area. Overall, this course offers insights on the foundations and recent advancements in lattice-based cryptography. Prerequisites: CPSC 467/567 or equivalent and linear algebra.

CPSC 517a, Advanced Topics in Cryptography: Cryptography and Computation Charalampos Papamanthou

Traditional cryptography is mostly concerned with studying the foundations of securing communication via, for example, encryption and message authentication codes. This class studies the applications of cryptography in securing *computation*. Topics include, but not limited to, fundamental results and most recent progress in oblivious computation and private information retrieval (PIR), zero-knowledge proofs, secure computation, consensus algorithms, searchable encryption, and lattice-based cryptography. The class focuses both on theory and applications. This is an advanced course, which requires mathematical maturity as well as comfort with programming. The course also assumes prior knowledge of fundamental notions in cryptography. Prerequisite: CPSC 467 or equivalent.

CPSC 521a, Compilers and Interpreters Jay Lim

Compiler organization and implementation: lexical analysis, formal syntax specification, parsing techniques, execution environment, storage management, code

generation and optimization, procedure linkage, and address binding. The effect of language-design decisions on compiler construction.

CPSC 526a, Building Distributed Systems Y. Richard Yang

Ubiquitous services such as Google, Facebook, and Amazon run on the back of massive distributed systems. This course covers the fundamental principles, abstractions, and mechanisms that inform the design of such systems, as well as the practical details of real-world implementations. Technical topics covered include properties such as consistency, availability, durability, isolation, and failure atomicity; as well as protocols such as RPC, consensus, consistent hashing, and distributed transactions. The final project involves implementing a real-world distributed service.

CPSC 527a, **C++ Programming for Stability, Security, and Speed** Michael Fischer Computer programming involves both abstraction and practice. Lower-level programming courses focus on learning how to correctly implement algorithms for carrying out a task. This course treats a computer program as an artifact with additional attributes of practical importance including execution efficiency, clarity and readability, redundancy, safety in the face of unexpected or malicious environments, and longevity – the ability to evolve over time as bugs are discovered and requirements change. This course is taught using modern C++.

CPSC 529a, Principles of Computer System Design Lin Zhong

Humans are stupid; computers are limited. Yet a collaboration of humans and computers has led to ever more powerful and complex computer systems. This course examines the limitations of humans and computers in this endeavor and how they shape the design, implementation, and evaluation of computer systems. It surveys the empirical knowledge reported by scholars and practitioners who overcome such limitations. The lectures, reading assignments, and classroom discussions travel through psychology and philosophy and revisit important results from theoretical computer systems research and development. Prerequisite: CPSC 323 or equivalent. Students should have the ability to write significant system programs in at least one system programming language (e.g., C, C++ and Rust).

CPSC 531a, Computer Music: Algorithmic and Heuristic Composition Scott Petersen Study of the theoretical and practical fundamentals of computer-generated music. Music and sound representations, acoustics and sound synthesis, scales and tuning systems, algorithmic and heuristic composition, and programming languages for computer music. Theoretical concepts are supplemented with pragmatic issues expressed in a high-level programming language.

CPSC 537a, Database Systems Avi Silberschatz

An introduction to database systems. Data modeling. The relational model and the SQL query language. Relational database design, integrity constraints, functional dependencies, and natural forms. Object-oriented databases. Implementation of databases: file structures, indexing, query processing, transactions, concurrency control, recovery systems, and security.

CPSC 539a, Software Engineering Timos Antonopoulos

Introduction to building a large software system in a team. Learning how to collect requirements and write a specification. Project planning and system design. Increasing

software reliability: debugging, automatic test generation. Introduction to type systems, static analysis, and model checking.

CPSC 540a, Database Design and Implementation Robert Soule This course covers advanced topics in Database Systems, explaining on the material covered in CPSC 437/537. Topics covered include complex data types, application development, big data, data analytics, parallel and distributed storage, parallel and distributed query processing, advanced indexing techniques, advanced relational database design, and object-based databases.

CPSC 546a, Data and Information Visualization Holly Rushmeier

Visualization is a powerful tool for understanding data and concepts. This course provides an introduction to the concepts needed to build new visualization systems, rather than to use existing visualization software. Major topics are abstracting visualization tasks, using visual channels, spatial arrangements of data, navigation in visualization systems, using multiple views, and filtering and aggregating data. Case studies to be considered include a wide range of visualization types and applications in humanities, engineering, science, and social science. Prerequisite: CPSC 223.

CPSC 547a, Introduction to Quantum Computing Yongshan Ding

This course introduces the fundamental concepts in the theory and practice of quantum computing. Topics covered include information processing, quantum programming, quantum compilation, quantum algorithms, and error correction. The objective of the course is to engage students in applying fresh thinking to what computers can do. We establish an understanding of how quantum computers store and process data, and we discover how they differ from conventional digital computers. We anticipate this course will be of interest to students working in computer science, electrical engineering, physics, or mathematics. Students must be comfortable with programming, discrete probability, and linear algebra. Prior experience in quantum computing is useful but not required.

CPSC 554a, Software Analysis and Verification Ruzica Piskac

Introduction to concepts, tools, and techniques used in the formal verification of software. State-of-the-art tools used for program verification; detailed insights into algorithms and paradigms on which those tools are based, including model checking, abstract interpretation, decision procedures, and SMT solvers.

CPSC 555a, Economics and Computation Yang Cai

A mathematically rigorous investigation of the interplay of economic theory and computer science, with an emphasis on the relationship of incentive-compatibility and algorithmic efficiency. Particular attention to the formulation and solution of mechanism-design problems that are relevant to data networking and Internet-based commerce.

CPSC 564a, **Algorithms and their Societal Implications** Nisheeth Vishnoi Today's society comprises humans living in an interconnected world that is intertwined with a variety of sensing, communicating, and computing devices. Human-generated data is being recorded at unprecedented rates and scales, and powerful AI and ML algorithms, which are capable of learning from such data, are increasingly controlling various aspects of modern society: from social interactions. These data-driven decisionmaking algorithms have a tremendous potential to change our lives for the better, but, via the ability to mimic and nudge human behavior, they also have the potential to be discriminatory, reinforce societal prejudices, violate privacy, polarize opinions, and influence democratic processes. Thus, designing effective tools to govern modern society which reinforce its cherished values such as equity, justice, democracy, health, privacy, etc. has become paramount and requires a foundational understanding of how humans, data, and algorithms interact. This course is for students who would like to understand and address some of the key challenges and emerging topics at the aforementioned interplay between computation and society. On the one hand, we study human decision-making processes and view them through the lens of computation, and on the other hand we study and address the limitations of artificial decision-making algorithms when deployed in various societal contexts. The focus is on developing solutions through a combination of foundational work such as coming up with the right definitions, modeling, algorithms, and empirical evaluation. The current focus is on bias and privacy, with additional topics including robustness, polarization, and democratic representation. The grade will be based on class participation and a project. The project grade will be determined by a midterm and endterm report/ presentation. The course has four primary modules: (1) Data: human-generated data; data collection and aggregation; (2) Decision-Making Algorithms: human decision-making algorithms; traditional algorithmic decision-making models and methods; machine learning-based decision-making models and methods; (3) Bias: socio-technical contexts and underlying computational problems; definitions of fairness; interventions for ensuring fairness; human biases through the lens of computation; privacy; need for definitions of privacy; differential privacy; beyond differential privacy; (4) Other topics: robustness; polarization; elections and social choice. Solid mathematical and programming background is necessary to enroll in this course. CPSC 365 and S&DS 251 are recommended.

CPSC 566a, Blockchain and Cryptocurrency Fan Zhang

This course is an introduction to blockchain systems, such as Bitcoin and Ethereum. We begin with a brief history of blockchains and an overview of how they are being used today before launching into foundational topics, including distributed consensus, smart contracts, cryptographic building blocks from signatures to authenticated datastructures, and the economics of blockchains. We then cover advanced topics including the scalability and interoperability of blockchain systems and applications such as "decentralized finance" (DeFi). The lectures and assignments engage students in both theoretical and applied aspects of blockchain systems. The course assumes background in various fundamental areas of CS, including discrete math, probability, algorithms, data structures, cryptography, and networks.

CPSC 568a, Computational Complexity Dylan McKay

Introduction to the theory of computational complexity. Basic complexity classes, including polynomial time, nondeterministic polynomial time, probabilistic polynomial time, polynomial space, logarithmic space, and nondeterministic logarithmic space. The roles of reductions, completeness, randomness, and interaction in the formal study of computation.

CPSC 570b, Artificial Intelligence Stephen Slade

Introduction to artificial intelligence research, focusing on reasoning and perception. Topics include knowledge representation, predicate calculus, temporal reasoning, vision, robotics, planning, and learning.

CPSC 573a, Intelligent Robotics Laboratory Brian Scassellati

Students work in small teams to construct novel research projects using one of a variety of robot architectures. Project topics may include human-robot interaction, adaptive intelligent behavior, active perception, humanoid robotics, and socially assistive robotics.

CPSC 574a, Computational Intelligence for Games James Glenn

A seminar on current topics in computational intelligence for games, including developing agents for playing games, procedural content generation, and player modeling. Students read, present, and discuss recent papers and competitions, and complete a term-long project that applies some of the techniques discussed during the term to a game of their choice.

CPSC 575a / ENAS 575a / INP 575a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students.

CPSC 578a, Computer Graphics Theodore Kim

Introduction to the basic concepts of two- and three-dimensional computer graphics. Topics include affine and projective transformations, clipping and windowing, visual perception, scene modeling and animation, algorithms for visible surface determination, reflection models, illumination algorithms, and color theory.

CPSC 581b, Introduction to Machine Learning Alex Wong

This course focuses on fundamental topics in machine learning. We begin with an overview of different components of machine learning and types of learning paradigms. We introduce a linear function, discuss how one can train a linear function on a given dataset, and utilize it to tackle classification and regression problems. We then consider kernel methods to enable us to solve nonlinear problems. Additionally, we introduce the concept of generalization error and overfitting. We discuss the role of regularization and extend linear regression to ridge regression. We also cover topics in optimization, beginning from gradient descent and extending it to stochastic gradient descent and its momentum variant. We also cover the concept of alternating optimization and topics within it. We introduce the curse of dimensionality and discuss topics on dimensionality reduction. Finally, we conclude the course with neural networks: how to build them using the topics discussed, how to optimize them, and how to apply them to solve a range of machine learning tasks. Prerequisites: Courses in data structures and object-oriented programming (e.g. CPSC 223a or equivalent courses), foundational mathematical tools such as discrete math and linear algebra (e.g. CPSC 202 or equivalent courses), calculus (e.g. MATH 112, MATH 115, MATH 120, or equivalent courses), linear algebra (e.g. MATH 225, or equivalent courses), and artificial intelligence (e.g. CPSC 370/570). A background in statistics is useful but not required. Experience in programming with Python and familiarity with Google Colab and numerical and image processing packages (i.e. NumPy, SciPy) is helpful.

CPSC 583a, Deep Learning on Graph-Structured Data Rex Ying Graph structure emerges in many important domain applications, including but not limited to computer vision, natural sciences, social networks, languages, and knowledge graphs. This course offers an introduction to deep learning algorithms applied to such graph-structured data. The first part of the course is an introduction to representation learning for graphs and covers common techniques in the field, including distributed node embeddings, graph neural networks, deep graph generative models, and non-Euclidean embeddings. The first part also touches upon topics of real-world significance, including auto-ML and explainability for graph learning. The second part of the course covers important applications of graph machine learning. We learn ways to model data as graphs and apply graph learning techniques to problems in domains including online recommender systems, knowledge graphs, biological networks, physical simulations and graph mining. The course covers many deep techniques (graph neural networks, graph deep generative models) catered to graph structures. We cover basic deep learning tutorials in this course. Knowledge of graphs as a data structure, and understanding of basic graph algorithms are essential for applying machine learning to graph-structured data. Familiarity with Python and important libraries such as Numpy and Pandas are helpful. A foundation of deep neural networks is highly recommended. Experience in machine Learning and Graph Theory are welcomed as well.

CPSC 611a, Topics in Computer Science and Global Affairs Joan Feigenbaum and Ted Wittenstein

This course focuses on "socio-technical" problems in computing and international relations. These are problems that cannot be solved through technological progress alone but rather require legal, political, or cultural progress as well. Examples include but are not limited to cyber espionage, disinformation, ransomware attacks, and intellectual-property theft. This course is offered jointly by the SEAS Computer Science Department and the Jackson School of Global Affairs. It is addressed to graduate students who are interested in socio-technical issues but whose undergraduate course work may not have addressed them; it is designed to bring these students rapidly to the point at which they can do research on socio-technical problems. Prerequisites: Basics of cryptography and computer security (as covered in Yale's CPSC 437) helpful but not required.

CPSC 612b, Topics in Algorithmic Game Theory Yang Cai

The course focuses on algorithms and the complexity of equilibrium computation as well as its connection with learning theory and optimization. As many recent machine learning approaches have moved from an optimization perspective to an "equilibration" perspective, where a good model is framed as the equilibrium of a game. The intersection of game theory, learning theory, and optimization is becoming increasingly relevant. The goal of the course is to cover the fundamentals and bring students to the frontier of this active research area. Prerequisite: A course in algorithms (CPSC 365 or 366) and a course in probability theory (MATH/S&DS 241). A course in algorithmic game theory (CPSC 455/555) is helpful but not required.

CPSC 640b / AMTH 640b / MATH 640b, Topics in Numerical Computation Vladimir Rokhlin

This course discusses several areas of numerical computing that often cause difficulties to non-numericists, from the ever-present issue of condition numbers and ill-posedness to the algorithms of numerical linear algebra to the reliability of numerical software. The course also provides a brief introduction to "fast" algorithms and their interactions with modern hardware environments. The course is addressed to Computer Science graduate students who do not necessarily specialize in numerical computation; it assumes the understanding of calculus and linear algebra and familiarity with (or willingness to learn) either C or FORTRAN. Its purpose is to prepare students for using elementary numerical techniques when and if the need arises.

CPSC 646a, Combinatorial Optimization and Approximation Algorithms Staff The course covers the design and analysis of approximation algorithms via combinatorial techniques. We start with classical polynomial time combinatorial optimization problems, including matchings, flows, cuts, and submodular functions. In the latter half, we discuss techniques for designing approximation algorithms for NP-hard problems, including the primal-dual method, randomized rounding, iterative relaxations, and local search. Prerequisites: some background in algorithms and discrete mathematics as well as familiarity with linear programming.

CPSC 648a, Quantum Codes and Applications to Complexity Staff

The course covers the theory of quantum error correction and its applications to quantum complexity theory. We start with basic quantum codes and then progress towards more advanced code constructions, in particular good LDPC codes. In the later half, we discuss various intriguing applications of quantum codes in quantum complexity, in particular how they are used in NLTS construction. This course should be accessible to students without any background in quantum computing and complexity theory. Students with no such background are provided with additional reading material to catch up. Please reach out to the instructor if you have any questions.

CPSC 690a, Independent Project I Staff By arrangement with faculty.

CPSC 691a, Independent Project II Staff By arrangement with faculty.

CPSC 692a, Independent Project Holly Rushmeier

Individual research for students in the M.S. program. Requires a faculty supervisor and the permission of the director of graduate studies.

CPSC 752b / CB&B 752b / MB&B 752b and MB&B 753b and MB&B 754b / MB&B 753b and MB&B 754b / MB&B 754b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon

Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

CPSC 776b, Topics in Industrial AI Applications Xiuye (Sue) Chen Techniques developed in AI research are now used in many industrial applications, ranging from voice assistants to scientific modeling to generative AI. The goal of this seminar is for students to acquire familiarity with current topics relevant to industry, and to apply related approaches to problems in their respective areas of expertise. Each year the course covers several different topics in industrial AI research, broadly defined. These topics may include edge ML, speech recognition, natural language processing, computer vision, ambient intelligence, generative AI, and applications to life sciences and healthcare. In most meetings, one or more key papers are discussed, and one student is chosen in advance to present the main ideas in the paper and guide the discussion. We also have guest speakers from industry to present or lead discussions on current industrial research topics. Periodically, we devote meeting sessions to discuss formulation of new research directions that leverage students' ongoing research in other areas. Grades are based in equal parts on discussion leadership, discussion participation, and research-problem formulation.

CPSC 990a, Ethical Conduct of Research for Master's Students Inyoung Shin This course forms a vital part of research ethics training, aiming to instill moral research codes in graduate students of computer science, math, and applied math. By devling into case studies and real-life examples related to research misconduct, students will grasp core ethical principles in research and academia. The course also offers an opportunity to explore the societal impacts of research in computer science, math, and applied math. This course is designed specifically for first-year graduate students in computer science/applied math/math. Successful completion of the course necessitates in-person attendance on eight occasions; virtual participation will not fulfill this requirement. In cases where illness, job interviews, or unforeseen circumstances prevent attendance, makeup sessions will be offered. This course is o credits for YC students. o Course cr

CPSC 991a / MATH 991a, Ethical Conduct of Research Inyoung Shin This course forms a vital part of research ethics training, aiming to instill moral research codes in graduate students of computer science, math, and applied math. By delving into case studies and real-life examples related to research misconduct, students grasp core ethical principles in research and academia. The course also offers an opportunity to explore the societal impacts of research in computer science, math, and applied math. This course is designed specifically for first-year graduate students in computer science, applied math, and math. Successful completion of the course necessitates in-person attendance on eight occasions; virtual participation does not fulfill this requirement. In cases where illness, job interviews, or unforeseen circumstances prevent attendance, makeup sessions are offered. o Course cr

CPSC 992a, Academic Writing Janet Kayfetz

This course is an intensive analysis of the principles of excellent writing for Ph.D. students and scientists preparing a range of texts including research papers, conference posters, technical reports, research statements, grant proposals, correspondence, science and industry blogs, and other relevant documents. We look at the components of rhetorical positioning in the development of a clear, interesting, and rigorous science research paper. Some of the sub-genres we analyze and practice include the introduction, literature review, methodology, data commentary, results/discussion, conclusion, and abstract. In addition to the research paper, we practice other types of texts including research statements, requests for funding, bio-data statements, and blogs. We also discuss how writers can develop content and fluency as well as strategies for redrafting and editing. Students receive detailed feedback on their writing with a focus on clarity, precision, tone, and readability. o Course cr

Early Modern Studies

Humanities Quadrangle, Rooms 431 and 436, 203.432.0672 http://earlymodern.yale.edu M.A., M.Phil., Ph.D.

Chair Marisa Bass

Director of Graduate Studies Erika Valdivieso

Affiliated Faculty Marisa Bass, Lauren Benton, Paola Bertucci, Dominique Brancher, Paul Bushkovitch, Rudiger Campe, Allison Caplan, Edward Cooke, Ivano Dal Prete, Michael Della Rocca, Fabian Drixler, Maura Dykstra, Carlos Eire, Paul Freedman, Supriya Gandhi, Alessandro Giammei, Bruce Gordon, Samuel Hodgkin, K. David Jackson, Nicholas Jones, Christina Kraus, Noel Lenski, Volker Leppin, Tina Lu, Alan Mikhail, Jane Mikkelson, Feisal Mohammed, Isaac Nakhimovsky, Morgan Ng, Catherine Nicholson, Jessica Peritz, Mark Peterson, Ayesha Ramachandran, Kishwar Rizvi, Pierre Saint-Amand, Stuart Schwartz, Nicole Sheriko, Nicola Suthor, Shawkat Toorawa, Katie Trumpener, Jane Tylus, Erika Valdivieso, Jesús Velasco, Lisa Voigt, Mimi Yiengpruksawan

FIELDS OF STUDY

Early Modern Studies offers a combined Ph.D. degree that integrates concentration in a partner department with interdisciplinary study of the historical period between 1350 and 1800, a temporal range that recognizes "early modernity" as manifested differently and at different times across the world. The program's scope is global, transnational, transcultural, and committed to a vision of an interlinked world with many, varied, locally-inflected transitions to modernity. Inclusive in scholarship and teaching, the combined degree encourages students to forge connections to diverse disciplinary frameworks, geographic conjunctures, and institutional structures. Current partner departments are: Classics, Comparative Literature, English Language and Literature, French, Germanic Languages and Literatures, History, History of Science and Medicine, History of Art, Music, Italian Studies, Near Eastern Languages and Literatures, and Spanish and Portuguese.

Admissions This is a combined degree program. Students must first apply to the doctoral program of one of the partner departments; if accepted, they can then apply to the Program in Early Modern Studies during their second term of graduate study at Yale. Admission to the combined degree in early modern studies thus occurs after the student has already matriculated in the graduate school. Upon acceptance to the combined degree, students are normally enrolled as such from their second year of graduate study.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are subject to the combined Ph.D. supervision of the Early Modern Studies program and the relevant partner department. The student's course of study is decided in consultation with an adviser, the director of graduate studies (DGS) in early modern studies, and the DGS in the partner department.

As detailed below, requirements for the combined degree vary slightly to accommodate the requirements of the individual partner departments, but all candidates for the combined degree are expected to meet the following requirements:

Timing and Completion of Courses The total number of courses for the combined degree in Early Modern Studies remains the same as that of the partner department's Ph.D. program. Students in the combined degree have the option of taking some of their coursework in their third year in the program. Within that scope, students must incorporate the courses listed below:

- 1. EMST 700/EMST 701, Workshop in Early Modern Studies: This year-long seminar to be taken as two half-credit courses, offers a historiographic, theoretical, and methodological introduction to key questions in the field through a dynamic engagement with a series of research presentations by scholars within and beyond Yale.
- 2. EMST 800, EMST 801, Early Modern Colloquium: This year-long colloquium, taken as two half-credit courses, must be taken concurrently with EMST 700/EMST 701. Students attend regular research presentations by scholars within and beyond Yale, which complements EMST 700/701. This course does not typically count towards the total number of courses required for the Ph.D. by the partner department.
- 3. Three elective courses in early modern studies of which at least *one* course must be taken outside the student's primary department. One of the courses may be an interdisciplinary course (i.e. a relevant course in the sciences, social sciences, or other relevant topic outside the traditional humanities).
- 4. EMST 900, Prospectus Workshop for Early Modern Studies: This course is typically taken in spring of the student's third year of graduate study as a one-semester course designed to support students as they begin to form their dissertation projects. Skills covered include abstract writing, preparing fellowship applications, interviewing, and presenting, with a focus on how to communicate the contribution of an interdisciplinary dissertation project to a range of audiences. This funded workshop also culminates in a conference and offers each student the opportunity to invite one scholar to campus from outside Yale for one-on-one mentoring on their developing research and career goals.

In general, it is expected that courses in early modern studies constitute about one-third of the student's doctoral coursework. We expect that most students in the combined degree will take more courses in the field as relevant to their specific area of research specialization.

Language Requirement The language requirement follows the student's primary department requirements. However, students in the combined degree have flexibility with regard to the completion of language requirements, in negotiation with the partner department.

Qualifying Exams Qualifying exams will follow the student's primary department; however, a significant portion of the student's exam lists must be on early modern topics. See guidelines for individual partner departments below.

Prospectus and Admission to Candidacy Procedures for the submission and approval of prospectuses follow the student's primary department; at least one faculty member affiliated with the Program in Early Modern Studies must be on the committee. Upon completion of all predissertation requirements, including the prospectus, students are admitted to candidacy for the combined Ph.D. degree. Admission to candidacy must be completed by the beginning of the fourth year.

Dissertation The parameters for the dissertation will follow the student's primary department. At least one faculty member affiliated with the Program in Early Modern Studies must be on the committee. Students in the joint degree are also generally encouraged to have at least one faculty adviser outside their home department.

Teaching Student's teaching assignments will primarily be determined by the home department. However, all students in the combined degree will be permitted additional flexibility in the completion of teaching requirements: students may complete their required four terms of teaching in years two, three, or four of their graduate program. In addition, students will typically assist in the teaching of *at least one* course in early modern studies. A Graduate Professional Development Opportunity in a relevant area (museums, libraries, collections, etc.) may be substituted for this requirement.

SPECIFIC REQUIREMENTS BY PARTNER DEPARTMENT

Students currently pursuing doctoral degrees in music or Spanish and Portuguese who seek admission to the combined degree program with EMST for the fall of 2025 should consult with the DGS of EMST. Details for the combined degrees in classics, comparative literature, English, French, history of art, and history of science and medicine are listed below.

Classics

Students are admitted to the Classics department first, and then apply during the second term of graduate study to participate in the Combined Program in Classics and Early Modern Studies.

REQUIREMENTS FOR THE PH.D. IN CLASSICS AND EARLY MODERN STUDIES

- Practice translation tests in Greek and Latin on texts assigned from the Classical Philology reading lists; these are taken before the beginning of the first and third terms and are meant to help students prepare for the qualifying translation exams to be taken before the beginning of the fifth term in the program.
- 2. A proseminar offering an introduction to the discipline of Classics and its various subdisciplines, to be taken in the first year in residence.
- 3. Departmental reading examinations in French (or Italian) and German. The first (in either language) is to be passed by the end of the first year; the other may be passed at any time before submission of the dissertation; students are, however, encouraged to complete this requirement as early in the program as possible.
- 4. A minimum of twelve term courses, with the following stipulations: (a) two yearlong survey courses in the history of Greek and Latin literature (four courses in total); (b) four courses prescribed by Early Modern Studies, including EMST 700/EMST 701, which counts for a single course; (c) four other graduate courses in CLSS. In addition, EMST 800/EMST 801, Early Modern

Colloquium, must be taken concurrently with EMST 700/EMST 701, and EMST 900, Professional Skills Workshop, and is taken in the third year. Neither of these two courses (EMST 800/EMST 801, and EMST 900) count towards the minimum course requirement.

- 5. Greek and Latin composition. This requirement may, but need not, be satisfied by courses taken under (4) above.
- 6. Oral examinations in Greek and Latin literature, based on the syllabus covered by the survey courses, drawn from the Classical Philology Ph.D. reading list. These are to be taken closely following the surveys in the respective literatures, as follows: the first, at the end of the second term (May of the first year), the second at the end of the fourth term (May of the second year).
- 7. Translation examinations in Greek and Latin, based on the Classical Philology Ph.D. reading list, by the beginning of the fifth term in residence.
- 8. Four special field exams to be taken in the fall of the third year (fifth term in residence); two of these must be at least partly in a classical field and two must be at least partly in an early modern field.
- 9. A dissertation prospectus by the end of the sixth term in residence. The procedures for approval of the prospectus are as for the Philology program, but at least one member of the EMST faculty, as approved by the DGS in Early Modern Studies, must be on the prospectus approval committee (which is a committee of the whole in Classics); the prospective thesis committee, the DGS and the EMST faculty member must approve of the prospectus.
- 10. A dissertation. Once dissertation writing has begun, students will present work in progress from the dissertation at least once per academic year. Research presentations will normally take the form of pre-circulation of a selection of work from the dissertation and a discussion of it with interested faculty, or some other research presentation experience approved by the DGS. This is a requirement for remaining in good standing; exemptions from it require the support of the dissertation adviser and the approval of the graduate committee.

Comparative Literature

Coursework Students are required to complete fourteen term courses, at least seven of these (including CPLT 515, Proseminar in Comparative Literature) in the Department of Comparative Literature. Students must take at least four courses in Early Modern Studies (offered in several departments), including the core seminar (EMST 700/EMST 701); at least one of these courses must be taken outside Comparative Literature. At least three of a student's overall list of courses must be in literary theory, criticism, or methodology; at least one course each in poetry, narrative fiction, and drama; and at least one course each in ancient or medieval literature and Enlightenment or modern literature. These requirements can overlap with the requirements of the Early Modern Studies program. At least two courses must be completed with the grade of Honors. In general, students should take a wide range of courses with a focus on one or two national or language-based literatures.

Languages Students must demonstrate proficiency in three languages apart from English, one of which must fulfil the philological requirement in Comparative Literature. The languages chosen should be relevance to the student's chosen area of

research and should be determined in consultation with the DGSs in Comparative Literature and Early Modern Studies.

Orals Qualifying exams follow the format in Comparative Literature; however, a significant portion of the student's exam lists must be on early modern topics. The exact number will be determined in consultation with the DGSs in Comparative Literature and Early Modern Studies.

Prospectus and Dissertation The prospectus should be completed in September of the fourth year. Procedures regarding the dissertation will follow departmental practice, however at least one member of the dissertation committee must be an affiliate of the Program in Early Modern Studies.

English Language and Literature

Doctoral students in English Language and Literature may apply in the second term of graduate study to the Program in Early Modern Studies, to pursue a combined Ph.D. degree in English and Early Modern Studies. All requirements for the Ph.D. in English apply, with the following adjustments.

Coursework In years one and two, a student in the combined program will complete ten seminars in English, including ENGL 990, The Teaching of English, two courses on early modern texts and/or topics, one course in each of two out of three additional historical periods (medieval, eighteenth- and/or nineteenth- century, twentieth- and/or twenty-first century), and two seminars in Early Modern Studies, including EMST 700/EMST 701, Workshop in Early Modern Studies, and one seminar outside of English. Students also participate in EMST 800/EMST 801, the Early Modern Studies Colloquium.

Qualifying Examination Students will follow the usual procedures for oral qualifying exams in English, with the additional requirement that at least two of their four lists must concentrate on early modern texts and topics.

Prospectus In addition to enrolling in ENGL 993, the English Department Prospectus Workshop, in fall, third-year students in the combined program will enroll in EMST 900.

Dissertation Committee At least one faculty member affiliated with the Program in Early Modern Studies must be on the committee. The chair of the committee will be from the English Department, but students in the combined program are encouraged to include at least one faculty member from outside of English on their committees.

French

Students are admitted to the French Department first and then apply during the second term of the first year to participate in the combined program.

Coursework Sixteen courses at the graduate level are required. These correspond to the requirements of the Department of French and those of the Early Modern Studies Program. Of the courses taken in French, one must be FREN 610, Introduction to Old French. Three others (elective) must fall within early modern periods (1350 to 1800) including one course outside of the department (History, History of Art, Music, Religious Studies, Philosophy, etc.). There are three required Early Modern Studies courses: EMST 700/EMST 701, Workshop in Early Modern Studies; EMST 800/EMST 801, Early Modern Colloquium; and EMST 900, a professional skills workshop to be taken in the third year.

Languages Two languages appropriate to the field are required and can be satisfied in the variety of ways presented in the French Department Rules and Regulations and following the timeline outlined in the document.

Qualifying Examination An oral qualifying examination must take place as early as possible in the third year of study, before spring recess at the latest. The examination will consist of five topics; at least three must be in the early modern field.

Dissertation A formal prospectus is to be presented by the end of the sixth term (third year) of study. The prospectus committee will consist of three faculty members, including the dissertation director(s) and at least one member in the field outside of French. Once approved by the committee, the prospectus will be submitted to the graduate faculty of the Department of French for a vote on final approval and advancement to candidacy. More than one dissertation adviser is permitted and indeed encouraged, but the principal adviser will normally be in the Department of French. The official readers of the finished dissertation need not be members of the original prospectus committee but will include at least one member of the Department of French and one member of EMST.

Germanic Languages and Literatures

Coursework The required number of courses and timeline for coursework follows the Department of Germanic Languages and Literature guidelines. Students also enroll in EMST 700/EMST 701 and EMST 800/EMST 801 during the second year of coursework, and they enroll in EMST 900 during the spring of year three. These courses do not count towards the total number of courses required for the Ph.D. in Germanic Languages and Literature.

Language Requirement The language requirement follows the Germanic Languages and Literature department requirements.

Qualifying Examination Qualifying exams follow the Germanic Languages and Literature department requirements with the added requirement that two out of the four exam fields must be on early modern topics.

Dissertation At least one faculty member affiliated with the Program in Early Modern Studies must be on the dissertation committee.

Teaching A student's teaching assignments are determined by the Department of Germanic Languages and Literature, with every effort made to assign a student to at least one course (or course equivalent) in early modern studies.

History

Coursework The required number of courses and timeline for coursework follows the Department of History guidelines for history students in the combined program. In general, it is expected that courses in early modern studies constitute about one-third of the student's doctoral coursework, and at least one course with an early modern focus must be taken outside the student's primary department. Students will also enroll in

EMST 700/EMST 701 and EMST 800/EMST 801 during the second year, neither of which count towards the total number of courses required for the Ph.D. in history. In the spring of third year, students in the Department of History are also encouraged, but not required, to enroll in EMST 900.

Advising A student's academic adviser is a member in the Department of History. A student may also choose to have as co-adviser a faculty member affiliated with the Program in Early Modern Studies who is not affiliated with History.

Language Requirement The language requirement follows the Department of History requirements.

Qualifying Exams Qualifying exams will follow the Department of History requirements with one added requirement that at least half the exam content must be about early modern subjects (the equivalent of one and a half fields if the student completes three fields, two fields if the student completes four fields).

Prospectus and Admission to Candidacy Procedures for the prospectus follow Department of History guidelines. At least one faculty member affiliated with the Program in Early Modern Studies must be on the committee. Upon completion of all predissertation requirements, including the prospectus, students are admitted to candidacy for the combined Ph.D. degree.

Dissertation At least one faculty member affiliated with the Program in Early Modern Studies must be on the dissertation committee.

Teaching A student's teaching assignments are determined by the Department of History, with every effort made to assign a student to at least one course (or course equivalent) in early modern studies.

History of Art

Doctoral students in the history of art may apply in the second term of graduate study to the Program in Early Modern Studies to pursue a combined Ph.D. degree in the history of art and early modern studies. All requirements for the Ph.D. in the history of art apply, with the following adjustments.

Coursework History of art students in the combined program take the same number of courses as those on the regular history of art track. In years one and two, a student in the combined program completes ten seminars in the history of art, including HSAR 500, the First Year Seminar, and three seminars on early modern topics, as well as EMST 700/EMST 701, the Workshop in Early Modern Studies. Students also participate in EMST 800/EMST 801, the Early Modern Studies Colloquium.

Second-Year Paper Requirement The qualifying paper is to be submitted for consideration according to the policies of the Department of the History of Art, typically in the second term of the second year.

Languages The language requirement will follow the History of Art department requirements.

Qualifying Examination Students will follow the usual procedures for oral qualifying exams in History of Art, with the additional requirement that three of their four lists must concentrate on early modern texts and topics (between 1350 and 1800).

Prospectus Students in the combined program enroll in EMST 900, the Early Modern Studies Prospectus Workshop, during the spring of their third year in support of their development of the dissertation prospectus.

Dissertation Committee At least one faculty member affiliated with the Program in Early Modern Studies must be on the committee. The chair of the committee will be in the History of Art, but students in the combined program are encouraged to include at least one faculty member from outside of History of Art on their committees.

History of Science and Medicine

Admission to the HSHM/EMST is a competitive process. HSHM Ph.D. students who wish to enroll in the Program in Early Modern Studies apply during their second term at Yale. They need their adviser's approval and a letter of support from the HSHM DGS.

REQUIREMENTS FOR THE HSHM/EMST PH.D. DEGREE

- 1. In addition to fulfilling the HSHM requirements as specified in this bulletin, students in the combined program will take:
 - a. EMST 700/EMST 701, Workshop in Early Modern Studies: This core, yearlong seminar to be taken as two half-credit courses, offers a historiographic, theoretical, and methodological introduction to key questions in the field through a dynamic engagement with a series of research presentations by scholars within and beyond Yale.
 - b. EMST 800/EMST 801, Early Modern Colloquium: This year-long colloquium, taken as two half-credit courses, must be taken concurrently with EMST 700. Students will attend regular research presentations by scholars within and beyond Yale, which will complement EMST 700. This course does not typically count towards the total number of courses required for the Ph.D.
 - c. Three elective courses in early modern studies, of which at least one course must be taken outside the student's primary department. One of the courses may be an interdisciplinary course (i.e., a relevant course in the sciences or social sciences or other relevant topic outside the traditional humanities). These three courses can count toward the HSHM requirements, whether as electives or HSHM seminars.
 - d. EMST 900, Prospectus Workshop for Early Modern Studies: This course is typically taken in spring of the student's third year of graduate study as a one-semester course designed to support students as they begin to form their dissertation projects. Skills covered include abstract writing, preparing fellowship applications, interviewing, and presenting, with a focus on how to communicate the contribution of an interdisciplinary dissertation project to a range of audiences. This funded workshop also culminates in a conference and offers each student the opportunity to invite one scholar to campus from outside Yale for one-on-one mentoring on their developing research and career goals.

2. Other EMST Requirements:

a. Language Requirement: same as HSHM language requirementsb. Qualifying Exams: Qualifying exams will follow the student's primary department. A significant portion of the student's exam lists must be on early modern topics.

c. Prospectus and Admission to Candidacy: At least one faculty member affiliated with the Program in Early Modern Studies must be on the committee d. Dissertation: At least one faculty member affiliated with the EMST Program must be on the committee.

e. Teaching: Student's teaching assignments will primarily be determined by the home department. However, all students in the combined degree will be permitted additional flexibility in the completion of teaching requirements: students may complete their required four terms of teaching in years two, three, or four of their graduate program. In addition, students will typically assist in the teaching of *at least one course* in early modern studies.

Italian Studies

Coursework The required number of courses and timeline for coursework follows the Department of Italian Studies guidelines. Of the required courses taking for Italian studies, two must fall within the early modern period (1350–1800), and students are also encouraged to take an additional course toward the departmental requirements in another field (e.g history, history of art, music, religious studies, philosophy, etc.). Students also enroll in EMST 700/EMST 701, and EMST 800/EMST 801 during year two of coursework, neither of which count towards the total number of courses required for the Ph.D. in Italian studies. In the spring of year three, Italian studies students are strongly encouraged to participate in EMST 900.

Language Requirement The language requirement follows the Department of Italian Studies requirements.

Qualifying Examination Qualifying exams follow the Department of Italian Studies requirements with one added requirement that two out of the three exam fields must be on early modern topics.

Dissertation At least one faculty member affiliated with the Program in Early Modern Studies must be on the dissertation committee.

Teaching A student's teaching assignments are determined by the Department of Italian Studies, with every effort made to assign a student to at least one course (or course equivalent) in early modern studies.

Near Eastern Languages and Literatures

Coursework The required number of courses and timeline for coursework follows the NELC Department guidelines. Students also enroll in EMST 700/EMST 701 and EMST 800/EMST 801 during the second year of coursework and in EMST 900 during the spring of year three. These courses do not count towards the total number of courses required for the Ph.D. in NELC. **Advising** A student's academic adviser will be a member in NELC. A student may also choose to have as co-adviser a faculty member affiliated with the Program in Early Modern Studies who is not affiliated with NELC.

Language Requirement The language requirement follows the NELC department requirements.

Qualifying Examination Qualifying exams follow the NELC department requirements for the Arabic humanities track, with the added requirement that one of the fields be focused on an early modern topic.

Dissertation At least one faculty member affiliated with the Program in Early Modern Studies must be on the dissertation committee.

Teaching A student's teaching assignments are determined by NELC, with every effort made to assign a student to at least one course (or course equivalent) in early modern studies.

MASTER'S DEGREES

M.Phil. The combined M.Phil. degree may be requested after all requirements but the dissertation are met.

M.A. Students who withdraw from the Ph.D. program may be eligible for the M.A. degree if they have met the following requirements: successful completion of eight term courses, at least two of which must be in early modern studies, and with at least three grades of Honors. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

COURSES

EMST 502a / CPLT 502a, Always Compare! Marta Figlerowicz and Ayesha Ramachandran

This course interrogates the conceptual frameworks and challenges of cross-cultural comparison. The discipline of comparative literature has its roots in comparative anthropology, linguistics, history, and religion – which are themselves imbricated in the long history of colonialism and in Eurocentric philosophies of history that describe Western cultures as superior to, and superseding, all others. In this course, we move across all these disciplines to ask why, and under what conditions, cross-cultural comparison can still be illuminating in our day and age. We introduce and model innovative new forms of comparative study that are currently reshaping and expanding our field and the humanities more broadly.

EMST 541a / ENGL 551a, Spenser's Readers Catherine Nicholson

This course has two complementary, though sometimes divergent, objects of interest: the first is the poetry of Edmund Spenser, particularly his immense allegorical epic-romance, *The Faerie Queene*; the second is that poem's varied and often vexed reception history, from the late sixteenth century through the present. *The Faerie Queene* is a poem about interpretation – its pleasures and its discontents – and we often find ourselves reading over the shoulders of readers in the poem. But it is also possible to read the poem through the eyes of other historical readers, adopting their (often alien) expectations, ambitions, and preoccupations as a way of discovering new things in the text and of reflecting on the biases and assumptions of our own critical practices. In this

sense, this is a course about readerly methods and the history of reading as well as a course about Spenser, and participants whose primary interests lie outside the English Renaissance are warmly welcomed.

EMST 565b / CPLT 666b / GMAN 665b, Birth of the Political: Early Modern and Twentieth Century Rudiger Campe

Early modern European works on colonial war, sovereignty, and politics, sixteenth to seventeenth centuries (by Sepúlveda, Grotius, Machiavelli, Lipsius [neo-Stoicism], Hobbes) are read in conjunction with twentieth century debates from the inter-war period to circa 1968 (by Schmitt, Kantorowicz, Benjamin, Oestreich, Foucault, authors who refer back to the modern early works and have importantly shaped our modern understanding of "the political" and, with it, the notion of the "early modern"). The course is interested in critically tracing the echoes regarding "the political" between early modernity and our own times.

EMST 572a / ENGL 722a, Transatlantic Literature, 1688–1818 Jill Campbell Study of multiple genres in the literatures of Great Britain, North America, and the Caribbean from the late seventeenth to the early nineteenth century, with twentyfirst-century creative and critical works providing a range of contemporary responses. Special focus on the role of literature in advancing and contesting concepts of race and gender as features of identity and systems of power, with attention to the circulation of goods, people, ideas, and literary works among regions. Readings from the long eighteenth century to include works by Aphra Behn, Phillis Wheatley, Samson Occam, Olaudah Equiano, Omar Ibn Said, Leonora Sansay, and Maria Edgeworth. Twentyfirst-century creative works by Biyi Bandele, Yaa Gyasi, Mary Kathryn Nagle, Honorée Fanonne Jeffers, Rhiannon Giddens and Michael Abel; with critical selections from Édouard Glissant, Sylvia Wynter, Dionne Brand, Christina Sharpe, and Habiba Ibrahim.

EMST 660a / HIST 560a / RLST 691a, Society and the Supernatural in Early Modern Europe Carlos Eire

Readings in primary texts from the period 1500–1700 that focus on definitions of the relationship between the natural and supernatural realms, both Catholic and Protestant. Among the topics covered: mystical ecstasy, visions, apparitions, miracles, and demonic possession. All assigned readings in English translation.

EMST 661a / FREN 861a, Margins of the Enlightenment Pierre Saint-Amand This course proposes a critical examination of the French Enlightenment, with a focus on issues of progress, universalism, empire, and race. We confront these notions with approaches that have emerged in the postcolonial field of studies as well as gender and sexuality studies. Canonical authors are reinterpreted in that light along with lesser-known works. We are assisted by contemporary historians and critics of the Enlightenment, principally Michel Foucault, Lynn Hunt, and Robert Darnton. Readings by Mme. de Graffigny, Mme. de Stael, Mme. de Duras, Voltaire, Diderot, and Rousseau, Raynal and Cugoano. Conducted in French.

EMST 689a / EAST 889a / HIST 889a, Research in Japanese History Fabian Drixler and Hannah Shepherd

After a general introduction to the broad array of sources and reference materials available for conducting research related to the history of Japan since ca. 1600, students

prepare original research papers on topics of their own choosing in a collaborative workshop environment. Prerequisite: reading knowledge of Japanese.

EMST 695b / HIST 958b / MUSI 852b, Temporalities: Early, Modern, and Otherwise Maura Dykstra and Marlene Daut

What is the relationship between history and temporality? Perhaps a better question might be: what different relationships *have there been* between histories and temporalities, and how can interrogating those epistemic shifts generate new ways of "doing" history in the present? This interdisciplinary graduate seminar undertakes a critical genealogy of "history" itself, approaching the Enlightenment and the early-mid-twentieth century as two pivotal moments in the conceptual solidification of the relationship between time (singular) and capital-H history. Readings describing and utilizing foundational theories about time, periodization, and historicism, are juxtaposed against critiques and alternative imaginings in post/de-colonial studies, gender and sexuality studies, performance studies, and various traditions outside of (or opposed to) the canon of modernity. The syllabus includes texts by early modern theorists of history, twentieth-century social theorists, and the critical theoretical engagements that assailed and critiqued them.

EMST 700a and EMST 701b, Workshop in Early Modern Studies Erika Valdivieso What is the nature of the "early modern" as a temporal, conceptual, and socio-political category in humanistic study? How did it emerge as an interdisciplinary framework and how does it relate to concepts of the medieval, the Renaissance, classicism, and modernity? Can "early modern" be usefully deployed to speak of non-Western geographic and political formations, and if not, why? Broadly focused on the historical period between 1350 and 1800, this seminar considers the many transitions to modernity across the globe and explores how scholars across the disciplines have crafted narratives to highlight its significance. Taken over an entire academic year, as two half-credit courses, the workshop provides a historiographic, theoretical, and methodological introduction to key questions in the field through a dynamic engagement with a series of research presentations by scholars within and beyond Yale (must be taken concurrently with EMST 800a/801b). Required for students in the combined degree. ½ Course cr per term

EMST 710a / **EAST 512a** / **HSAR 520a**, **Chinese Art Modernity** Quincy Ngan This seminar uses the visual and material cultures of China to examine the notion of "modernity" and the relations among the "medieval," "early modern," and "modern" periods. By comparing these concepts with the historiographical frameworks of "Song-Yuan-Ming transition" and "late imperial China," we will become familiar with the methodological concerns and contradictions that complicate these relativized temporal frameworks. Works by Craig Clunas, Jonathan Hay, and Wu Hung, along with the insights from historians, inform our discussions of Chinese prints, paintings, ceramics, and other decorative objects in the long-term development of global art history. This class is most suitable for graduate students who have background in Asian art history, the history of China, East Asian studies, or early modern studies.

EMST 718b / CPLT 648b, European Drama I: From the Greek Polis to the French Revolution Rudiger Campe and Katie Trumpener

This seminar is designed as a graduate-level survey of European drama from antiquity to 1800. Our emphasis is on historically-informed discussion of primary texts; on

mapping key epochs in dramatic history (including Greek tragedy and comedy, Elizabethan/ Jacobean; Spanish "Golden Age"; French neo-classicism; German Storm and Stress) in relationship to one another, across time, languages, and cultures; and on changing performance practices and conceptions of theater. Plays by Aeschylus, Sophocles, Euripides, Aristophanes; Hrotsvitha von Gandersheim; Shakespeare, Marlowe, Jonson, Middleton, Congreve; Lope de Vega, Calderon; Racine, Corneille, Moliere, Goldoni, Marivaux, Beaumarchais; Goethe, Schiller. Short classic texts by Aristotle, Nietzsche, Goethe, Bulgakov, Goldman, Leroy Ladurie, Barthes, Kott, alongside contemporary theater critics and historians.

EMST 720a / HSAR 620a, The Mind of the Book Marisa Bass

This seminar offers an art-historical approach to the early modern book from the dawn of the printing press through the seventeenth century. We cover the interrelation of manuscript and print, collaborations among publishers, authors, and artists, and major early modern genres of visual and intellectual production (such as emblem books, natural history treatises, and cartographic atlases). Topics include the role of frontispieces, paratexts, illustration, annotation, and the idea of the book as a "body" of thought. All meetings are in Beinecke Library and centered on close firsthand study of the books themselves. The focus is on early modern Europe, but students are welcome to pursue research topics on early modern books from any cultural sphere.

EMST 7444 / HSAR 764a, Advanced Topics in Italian Renaissance Art Morgan Ng This seminar explores recent scholarship on Italian visual culture and architecture, c. 1400–1600. Potential themes include the relationship between art and the environment; transmedial approaches that exceed conventional definitions of painting, sculpture, and architecture; artistic production, patronage, and reception in relation to dynamics of gender, race, labor, and class; the movement of artists and materials; and expanding notions of artistic geography both within and beyond the peninsula. While sessions focus on secondary literature from recent decades, they also put newer scholarship in dialogue with longer historiographic traditions and primary sources. The course is a chance for graduate students not only to inform themselves about trends in the field but also to debate and situate their own voices in relation to them.

EMST 800a and EMST 801b, Early Modern Colloquium Erika Valdivieso This year-long colloquium, taken as two half-credit courses, must be taken concurrently with EMST 700a/701b. Students attend regular research presentations each semester by scholars within and beyond Yale, which will complement EMST 700. To be taken SAT/ UNSAT. ¹/₂ Course cr per term

EMST 826a, Reading Calvin's Institutes Bruce Gordon

This course is a close reading of almost the whole John Calvin's *Institutes of the Christian Religion* (1559). Seminar discussion focuses on the structure, arguments, and contexts of the text. Particular attention is given to the analysis of the theological, literary, and historical aspects of the the book, and students are challenged to formulate their analysis of Calvin's methods and intentions.

Earth and Planetary Sciences

Kline Geology Laboratory, 203.432.3124 http://earth.yale.edu M.S., M.Phil., Ph.D.

Chair Maureen Long

Director of Graduate Studies Mary-Louise Timmermans

Professors Jay Ague, David Bercovici, Ruth Blake, Mark Brandon, Derek Briggs, David Evans, Alexey Fedorov, Debra Fischer, Jacques Gauthier, Shun-ichiro Karato, Jun Korenaga, Maureen Long, Jeffrey Park, Noah Planavsky, Peter Raymond, James Saiers, Mary-Louise Timmermans, John Wettlaufer

Associate Professors Bhart-Anjan Bhullar, Matthew Eisaman, Pincelli Hull

Assistant Professors Juan Lora, Alan Rooney, Lidya Tarhan, Jordan Wostbrock, Elizabeth Yankovsky

FIELDS OF STUDY

Fields include geochemistry and petrology, geophysics, ice physics, mineral physics, seismology and geodynamics, structural geology and tectonics, paleontology and paleoecology, oceanography, meteorology, cryospheric dynamics, and climatology.

Students admitted in 2020 or earlier have the option of receiving a degree in either geology and geophysics or Earth and planetary sciences. Students admitted in 2021 and subsequent years will receive a degree in Earth and planetary sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

There is no formal language requirement and no required curriculum. Students plan their course of study in consultation with their adviser to meet individual interests and needs and to lay the foundations for dissertation research. At the end of the first year the faculty reviews the standing of each student. A student recommended for continuation in the Ph.D. program will be so notified. Some students may be encouraged at that time to pursue only the M.S. degree. At the end of the second year the faculty reviews each student's overall performance to determine whether the student is qualified to continue for the Ph.D. degree. In order to qualify, a student must have met the graduate school Honors requirement and maintained a better than passing record in the areas of concentration. Also, a student must have satisfied the requirements of the Qualifying Exam by having completed two Research Discourses termed (according to their degree of development) the Minor and the Major Discourses. The Major Discourse will be presented at the Qualifying Presentation, followed by an extended question period wherein the student must successfully defend both Discourses. Remaining degree requirements include a dissertation review in the third year; the preparation and defense of the dissertation; and the submission of the dissertation to the graduate school.

Teaching experience is regarded as an integral part of the graduate training program in Earth and Planetary Sciences. For this reason, all students are required to serve as teaching fellows for two terms during the course of their predoctoral training. Students who require additional support from the graduate school must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

In addition to all other requirements, students must successfully complete EPS 710, Responsible and Ethical Conduct of Research, prior to the end of their first year of study.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Awarded only to students who are not continuing for the Ph.D. Students are not admitted for this degree. See Degree Requirements under Policies and Regulations. Additional requirements include a research essay or thesis and M.S. defense with the approval of the DGS and the student's thesis committee.

Program materials are available at http://earth.yale.edu or upon request to the Director of Graduate Studies, Department of Earth and Planetary Sciences, Yale University, PO Box 208109, New Haven CT 06520-8109; email, dgs@eps.yale.edu.

COURSES

EPS 510a, Introduction to Isotope Geochemistry Alan Rooney and Jordan Wostbrock An overview of the fundamental principles of stable and radiogenic isotope geochemistry. Emphasis is placed on applications to specific geologic problems, including petrogenesis, geochronology, geothermometry, surface processes, hydrology, and biogeochemistry.

EPS 512a, Structural Geology Mark Brandon

An introduction to the origin and structure of the lithosphere and continental and oceanic crust. Topics include what controls the solid versus fluid behavior of rocks during deformation, and what controls the character and motion of tectonic plates. Laboratory exercises and field trips.

EPS 525a, Vertebrate Paleontology Jacques Gauthier

Phylogeny and evolution of the major clades of vertebrates from Cambrian to Recent, as inferred mainly from the fossilized remains of the musculoskeletal system (cranial, axial, and appendicular skeletons). Special attention given to the evolution of vertebrate feeding, locomotor, and sensory systems.

EPS 529a, Introduction to Geodynamics Jun Korenaga

This introductory course starts with the basics of continuum mechanics and covers a range of topics in geodynamics and relevant fields including the structure and dynamics of lithosphere, thermal convection and magmatism, Rayleigh-Taylor instability and plume dynamics, geoid and dynamic topography, and the thermal history of the core and geodynamo.

EPS 535a, Physical Oceanography Alexey Fedorov

An introduction to ocean dynamics and physical processes controlling the large-scale ocean circulation, ocean stratification, the Gulf Stream, wind-driven waves, tides, tsunamis, coastal upwelling, and other oceanic phenomena. Equations of motion. Modern observational, theoretical, and numerous other techniques used to study the ocean. The ocean role in climate and global climate change.

EPS 538a / ASTR 520a, Computational Methods in Astrophysics and Geophysics Paolo Coppi

The analytic and numerical/computational tools necessary for effective research in astronomy, geophysics, and related disciplines. Topics include numerical solutions to differential equations, spectral methods, and Monte Carlo simulations. Applications are made to common astrophysical and geophysical problems including fluids and N-body simulations.

EPS 555a, Rock Formation in Mountain Belts Jay Ague

The fundamental principles governing the formation of metamorphic and igneous rocks during mountain building. Topics include processes of heat and mass transfer in orogenic belts, generation of igneous rocks in continental and subduction settings, ultrahigh pressure and ultrahigh temperature metamorphism, spatial and temporal patterns of petrologic processes throughout geologic time, and pressure-temperature-time paths of metamorphic and igneous rocks.

EPS 620a, Essentials of Earth and Planetary Sciences Staff

EPS faculty take turns to teach what they think everyone in the EPS department should know about their own field (geophysics, geology, geochemistry, atmospheric, ocean, climate dynamics, and paleontology).

EPS 650a, Deformation of Earth Materials Shun-ichiro Karato

Microscopic physics of deformation of minerals and rocks and its applications to global geophysics.

EPS 655a, Extraordinary Glimpses of Past Life Derek Briggs

Study of exceptionally well preserved fossil deposits (*lagerstaetten*) that contain nonmineralized animal skeletons and casts of the soft parts of organisms. Examples such as the Burgess Shale and Solnhofen limestones; what they can reveal about the history and evolution of life, ancient lifestyles and environments, and preservational processes.

EPS 659a, Data Analysis in Earth and Environmental Sciences Jeffrey Park Introductory course in geoscience data analysis and time series methods, with emphasis on multiple-taper time series techniques. Examples drawn from seismological, paleoclimate, and historical climate data. Weekly computer assignments. Python proficiency helpful.

EPS 666a / AMTH 666a / ASTR 666a / MATH 666a, Classical Statistical Thermodynamics John Wettlaufer

Classical thermodynamics is derived from statistical thermodynamics. Using the multiparticle nature of physical systems, we derive ergodicity, the central limit theorem, and the elemental description of the second law of thermodynamics. We then develop kinetics, the origin of diffusion, transport theory, and reciprocity from the linear thermodynamics of irreversible processes. Topics of focus include Onsager reciprocal relations, the Fokker-Planck and Cahn-Hilliard equations, stability in the sense of Lyapunov, time invariance symmetry and maximum principles. We explore phenomena cross a range of problems in science and engineering. Prerequisites for Yale College students: PHYS 301, PHYS 410, MATH 246 or similar and/or permission of instructor.

EPS 690a, Directed Research in Earth and Planetary Sciences Staff By arrangement with faculty.

EPS 691a, Independent Research Staff

Faculty-supervised individual graduate student research. Prerequisite: approval of DGS and adviser.

EPS 703a / E&EB 930a, Seminar in Systematics Jacques Gauthier

Topics and class time are chosen by the participants, and have included reading books and/or a series of papers on particular topics (e.g., homology; morphological phylogenetics; evolution of egg colors and exposed nesting in dinosaurs/birds; origin of snake ecology; conflicts between morphology and molecules; role of fossils in phylogenetic inference).

EPS 710a, Ethical Conduct and Scientific Research Mary-Louise Timmermans and Maureen Long

This seminar is required of all graduate students and must be completed within the first year. Postdoctoral associates supported by NSF funding are also required to take this course. Topics include: how to do science; how to treat data correctly (data management); mistakes and negligence; research misconduct; responding to suspected violation of standards; sharing of research results; the peer-review process; collaboration; authorship and the allocation of credit; conflict of interest; cultivating a respectful, inclusive, harassment-free scientific workplace; and science and society. This course is in addition to the online ethics module, The Yale Guide to Professional Ethics, that must be completed by all GSAS students within the first term of study, regardless of source of financial support. o Course cr

EPS 720a, The Role of the Oceans in Climate Solutions: Physical, Environmental, Societal and Legal Constraints Matthew Eisaman

In this seminar, we explore the role that oceans can play in helping to address the climate crisis. We first review seawater carbonate chemistry and the role of oceans in the global carbon cycle. We then dive into the physical, environmental, societal, and legal constraints that may place limits on the degree to which oceans can contribute to climate solutions.

EPS 742a, Polar Processes and Climate Mary-Louise Timmermans

This seminar is for graduate students interested in understanding the climate of the Polar Regions. Atmosphere, ice, and ocean processes and interactions at high latitudes are studied in the context of global climate. Each week, one or two scientific papers will set the theme of tutorials and discussions. Small student groups present the papers weekly.

EPS 744a, Seminar in Mantle and Core Processes Staff

The seminar covers advanced topics concerning physical and chemical processes in the mantle and core of the Earth and planets. Specific topic and hour are arranged in consultation with enrolled graduate students.

EPS 750a, Seminar on Planetary Atmospheric Dynamics Juan Lora

This seminar focuses on the physical processes, governing mechanisms, and general circulation that result in and control the climates of various planetary bodies. The course is structured around reading and discussing a selection of papers related to the dynamics of planetary atmospheres.

EPS 775a, Seminar on Lithosphere and Surface Processes Mark Brandon and Jordan Wostbrock

This semester, the LSP Seminar focuses on using stable isotopes to measure the topographic evolution of the continents. The format includes weekly discussions of assigned published papers and book chapters. The time, location, and format are flexible and are adjusted to accommodate the participants' interests and schedules. The seminar is open to undergraduate students, but permission from the instructors is required to enroll.

EPS 789a, Current Topics in Metamorphic Processes Jay Ague

This seminar is based mostly on readings from the literature and focuses on emerging issues in metamorphic petrology, including deep element cycling, non-lithostatic pressure, and ultrahigh-temperature and ultrahigh-pressure metamorphism.

EPS 790a, Colloquium in Earth and Planetary Sciences Staff

This course focuses on discussion of emerging research across the Earth and planetary sciences. $\frac{1}{2}$ Course cr

East Asian Languages and Literatures

Humanities Quadrangle, Rm. 110, 203.432.2860 http://eall.yale.edu M.A., M.Phil., Ph.D.

Chair Aaron Gerow

Director of Graduate Studies Michael Hunter

Professors Aaron Gerow, Edward Kamens, Tina Lu, Jing Tsu

Associate Professor Lucas Bender, Michael Hunter, Hwansoo Kim

Assistant Professor Kyunghee Eo, Rosa van Hensbergen

Senior Lecturer Pauline Lin

Senior Lectors II Seungja Choi, Angela Lee-Smith, Rongzhen Li, Ninghui Liang, Hiroyo Nishimura, Peisong Xu

Senior Lectors Hsiu-hsien Chan, Min Chen, Fan Liu, Kumiko Nakamura, Jianhua Shen, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Mika Yamaguchi, Yongtao Zhang, William Zhou

Lectors Seunghee Back, Hyun Sung Lim, Saori Nozaki

FIELDS OF STUDY

Fields for doctoral study are Chinese literature and Japanese literature. (See also the Combined Ph.D. Program in Film and Media Studies.) Although the primary emphasis is on these East Asian subjects, the department welcomes applicants who are seeking to integrate their interests in Chinese or Japanese literature with interdisciplinary studies in such fields as history, history of art, linguistics, religious studies, comparative literature, film and media studies, theater studies, literary theory and criticism, and the social sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

During the first three years of study, students are required to take at least fourteen term courses. Usually students complete twelve term courses in the first and second years, and then take two tutorials or two seminars in the third year. Students concentrating in Chinese or Japanese literature are encouraged to take at least one term course in Western literature or literary theory. If approved by the director of graduate studies (DGS), graduate courses taken for a grade of Satisfactory/Unsatisfactory in other departments or programs in which these courses are counted toward that department/ program's doctoral course or certificate requirements will be counted toward the fourteen-course requirement. To maximize flexibility for students pursuing non-traditional pathways, the department will accept petitions to replace specific program requirements with alternate training. For example, a student might propose to substitute a professionalization experience for a required course. Such decisions will be made on a case-by-case basis by the DGS in conjunction with the primary

adviser. Contingent on DGS approval, students might also count up to two courses on languages beyond their primary research language toward the fourteen-course requirement.

By the end of the second year, all students must prove their proficiency in a language other than their primary language of study that is relevant to their course of study and is approved by the DGS. By the end of the third year, students specializing in premodern Japanese literature must pass a reading test in literary Chinese. By the end of the second full academic year, the student must take a written examination in the language of the student's specialization, including both its modern and premodern forms.

At the end of each academic year, until a student is admitted to candidacy, a faculty committee will review the student's progress. For the second-year review, the student must submit a revised seminar research paper, on a topic selected in consultation with the adviser, no later than April 1 of the fourth term. No later than the end of the sixth term the student will take the qualifying oral examination. The exam will cover three fields distinguished by period and/or genre in one or more East Asian national literatures or in other fields closely related to the student's developing specialization. These fields and accompanying reading lists will be selected in consultation with the examiners and the DGS in order to allow the student to demonstrate knowledge and command of a range of topics. After having successfully passed the qualifying oral examination, students will be required to submit a dissertation prospectus to the department for approval by September 1 of the seventh term in order to complete the process of admission to candidacy for the Ph.D.

Teaching experience is an integral part of the graduate program in East Asian Languages and Literatures. As such, the department requires all students to serve as teaching fellows for four terms, typically in the third and fourth years. With the permission of the DGS, students can substitute a professional development opportunity for a teaching fellowship or, in extraordinary circumstances, reduce their academic teaching requirement by one or more terms. Note that this academic requirement is distinct from the graduate school's financial requirement that students serve as teaching fellows for four terms.

COMBINED PH.D. PROGRAM

The Department of East Asian Languages and Literatures also offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. in East Asian Languages and Literatures and Film and Media Studies. For further details, see Film and Media Studies. Applicants to the combined program must indicate on their application that they are applying both to Film and Media Studies and to East Asian Languages and Literatures. All documentation within the application should include this information.

MASTER'S DEGREES

M.Phil. The successful completion of all predissertation requirements, including the qualifying examination and the dissertation prospectus, will make a student eligible for an M.Phil. degree.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree provided they have met the requirements and have not already received

the M.Phil. For the M.A., students must successfully complete twelve term courses and satisfy the language requirement. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

Additional program materials are available on the department website, http:// eall.yale.edu.

COURSES

Courses in Chinese, Japanese, and Korean languages at the elementary, intermediate, and advanced levels are listed in *Yale College Programs of Study*. See also https://courses.yale.edu.

CHNS 570a, Introduction to Literary Chinese I Pauline Lin

Reading and interpretation of texts in various styles of literary Chinese (*wenyan*), with attention to basic problems of syntax and literary style. Prerequisite: CHNS 151 or CHNS 153 or equivalent.

CHNS 571b, Introduction to Literary Chinese II Pauline Lin

Continuation of CHNS 570. Reading and interpretation of texts in various styles of literary Chinese (*wenyan*), with attention to basic problems of syntax and literary style. Prerequisite: CHNS 570 or equivalent.

EALL 513a, Philosophy, Religion, and Literature in Medieval China Staff This course explores the rich intellectual landscape of the Chinese middle ages, introducing students to seminal works of Chinese civilization and to the history of their debate and interpretation in the first millennium. No previous knowledge of China is assumed. This is primarily an undergraduate course; graduate students are provided readings in the original language and meet in an additional session to review translations.

EALL 521A / RLST 568a, Introduction to Chinese Buddhist Literature Eric Greene This class is an introduction to Chinese Buddhist literature. Although written in classical Chinese, Buddhist texts in China were written in a particular idiom that was much influenced by the Indian languages and which can be difficult to understand without special training. This class introduces students who already have some reading ability in literary Chinese to this idiom and the tools and background knowledge needed to read and understand Chinese Buddhist literature. We read a series of selections of some of the most influential Chinese Buddhist texts from various genres including canonical scriptures, apocryphal scriptures, monastic law, doctrinal treatises, and hagiography. Secondary readings introduce the basic ideas of Indian and Chinese Buddhist thought to the extent necessary for understanding our readings. Prerequisite: CHNS 571 or equivalent, or permission of the instructor. Students of Japanese or Korean literature who can read basic *kanbun* or *gugyeol* are also welcome to enroll; no knowledge of modern, spoken Chinese is required.

EALL 548b, Modern Chinese Literature Jing Tsu

An introduction to modern Chinese literature. Topics include Sinophone studies, East Asian diaspora, theories of comparison, technologies of writing and new literacies, realism, translation, globalization, scientism, and culture.

EALL 555a / EAST 552a, Japanese Modernism Paul McQuade

Japanese literature and art from the 1920s through the 1940s. The avant-garde and mass culture; popular genre fiction; the advent of new media technologies and techniques; effects of Japanese imperialism, militarism, and fascism on cultural production; experimental writers and artists and their resistance to, or complicity with, the state.

EALL 565a / EAST 553a, Japanese Literature after 1970 Paul McQuade

This course is an introduction to Japanese literature written in the last fifty years, with a focus on women writers. We read poetry and prose featuring mothers, daughters, and lovers, novels that follow convenience and thrift store workers, and poetry about factory girls. Our reading takes us from the daily grind of contemporary Tokyo to dystopian futures, from 1970s suburbia to surreal dreamscapes. We attend carefully to the ways in which different writers craft their works and, in particular, to their representation of feelings and affects. Whether the dull ache of loneliness, the oppression of boredom, or the heavy weight of fatigue, it is often something about the mood of a work-rather than its narrative-that leaves a distinct impression. We develop the tools to analyze and discuss this sense of distinctness, as well as discover ways to stage connections and comparisons between the works we read. Comparative and creative perspectives are especially welcome, and assignments can accommodate a range of media and presentation formats to suit. No knowledge of Japan or Japanese is required, nor is any prior grounding in literature. For those wishing to work with Japanese-language materials, please contact the instructor directly to organize additional Japanese-language workshops.

EALL 569a, Topics in Modern Korean Literature Kyunghee Eo

In this course, students read key works of Korean literature in English translation from the early twentieth century to the present day. The specific course topic varies by term. Primary sources include long-form novels, short stories, poetry, and nonfiction writing by representative authors, as well as literary scholarship on themes and historical context relevant to the materials. The readings in this course are arranged in roughly chronological order, requiring us to examine Korea's colonial modernization process in the first half of the twentieth century, the authoritarian regimes of South Korea from 1948 to 1987, and South Korea's integration into the neoliberal world order after democratization. Supplementary audio-visual materials such as artwork, video clips and music may be presented to students in class. All class materials are in English translation, and no previous knowledge of Korean language is required.

EALL 571b / FILM 882b, Japanese Cinema after 1960 Aaron Gerow The development of Japanese cinema after the breakdown of the studio system, through the revival of the late 1990s, to the present.

EALL 588a / CPLT 612a / EAST 616a / RSEE 605a / RUSS 605a, Socialist '80s: Aesthetics of Reform in China and the Soviet Union Jinyi Chu

This course offers an interdisciplinary introduction to the study of the complex cultural and political paradigms of late socialism from a transnational perspective by focusing on the literature, cinema, and popular culture of the Soviet Union and China in 1980s. How were intellectual and everyday life in the Soviet Union and China distinct from and similar to that of the West of the same era? How do we parse "the cultural logic of late socialism?" What can today's America learn from it? Examining two major socialist cultures together in a global context, this course queries the ethnographic, ideological, and socio-economic constituents of late socialism. Students analyze cultural materials in the context of Soviet and Chinese history. Along the way, we explore themes of identity, nationalism, globalization, capitalism, and the Cold War. Students with knowledge of Russian and Chinese are encouraged to read in original. All readings are available in English.

EALL 600a / EAST 640a, Sinological Methods Pauline Lin

A research course in Chinese studies, designed for students with background in modern and literary Chinese. Students explore and evaluate the wealth of primary sources and research tools available in China and in the West. For native speakers of Chinese, introduction to the secondary literature in English and instruction in writing professionally in English on topics about China. Topics include Chinese bibliographies; bibliophiles' notes; specialized dictionaries; maps and geographical gazetteers; textual editions, variations, and reliability of texts; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias, compendia, and databases.

EALL 601a, Ancient and Medieval Chinese Poetry Staff

Readings in ancient and middle-period Chinese poetry, from the beginnings of the tradition through the Song dynasty. Prerequisite: one year of classical/literary Chinese or equivalent, or permission of the instructor.

EALL 619b, The Vernacular Short Story in Early Modern China (Huaben) Tina Lu This course introduces students to the genre often called huaben, or the vernacular short story. These stories are written in a version of spoken Chinese, and for texts dating from the 17th century are quite easy to read, while providing an unparalleled window onto everyday life. We will be reading a wide range of these stories, in significant volume, and the class will culminate in the student's writing a final paper.

EALL 709a, The Rise of Chinese Autobiographical Writing Staff

Chinese self-writing has a rich and multifaceted history. Autobiographical texts not only continue to make for fascinating reading, but they have also long been regarded as an important part of the Chinese literary tradition. Our inquiry pursues three goals: (1) To get an understanding of the conventions of self-writing in China, we read and discuss important premodern Chinese autobiographical texts in classical Chinese from a spectrum of genres, including prefaces, letters, and poems. (2) We review traditional and contemporary approaches to the interpretation of these texts, focusing on questions of narrative, the representation of self-hood, and authenticity. (3) To throw the early and medieval Chinese autobiographical tradition into sharper relief, we look beyond ancient China and include selected autobiographical works of other literary traditions (ancient and modern) into our discussions. To complement the literary sphere, we also look into self-representations in other media. Overall, the seminar revolves around what happens when humans put themselves into their writing: Why are we writing about ourselves and what are the rules of this kind of writing? Why are we reading autobiographies and making them part of our canons? Prerequisite: one year of classical/literary Chinese (or kambun/kobun), either at Yale or elsewhere. Modern Chinese is not required, and students are not expected to know the pronunciation of the texts we read in Mandarin (i.e., Korean, Japanese, Cantonese, etc. pronunciation is fine). Students who have never taken literary Chinese but have reason

to believe that they can handle the course readings (e.g. native speakers of Chinese or Japanese) should consult the instructor.

EALL 761a, Topics in Early Chinese Thought Mick Hunter

An examination of certain key problems in the study of early Chinese thought. Topics vary from year to year but in general include intellectual typologies and affiliations, relating received texts and excavated manuscripts, the role of Han editors in shaping pre-Han textual traditions, ruling ideology, and comparisons with other parts of the ancient world. Discussions and papers are in English. Because readings are different each year, this course may be repeated for credit.

EALL 773a / ANTH 531a / CLSS 815a / HIST 502a / HSAR 564a / JDST 653a / NELC 533a / RLST 803a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

EALL 808a, Queer East Asian Studies Kyunghee Eo

In this graduate seminar, we explore cultural representations of non-normative sexualities and gender variance produced in East Asia and its diaspora and survey the scholarly field that is broadly referred to as "queer East Asian studies." The materials in this course include primary sources such as poetry, fiction, narrative and documentary films, as well as critical writings on LGBTQ history, culture, and activism in Japan, Korea, and the Sinophone world.

EALL 823b / CPLT 953b / EAST 623b, Topics in Sinophone and Chinese Studies Jing Tsu

This recurring graduate research seminar and symposium examines different areas, periods, genres, and conceptual frameworks in Chinese and Sinophone studies. The topic this year is 1950s–2020. Prerequisite: reading fluency in modern and semiclassical Chinese. Enrollment is restricted; no auditors.

EALL 872a / FILM 880a, Theories Popular Cult In Japan: TV Aaron Gerow Exploration of postwar theories of popular culture and subculture in Japan, particularly focusing on the intellectual debates over television and new media.

EALL 900a or b, Directed Readings Staff

Offered by permission of instructor and DGS to meet special needs not met by regular courses.

EALL 990a or b, Directed Research Staff

Offered as needed with permission of instructor and DGS for student preparation of dissertation prospectus.

JAPN 570a, Introduction to Literary Japanese Staff

Introduction to the grammar and style of the premodern literary language (*bungotai*) through a variety of texts. Prerequisite: JAPN 151 or equivalent.

JAPN 571b, Readings in Literary Japanese Staff

Close analytical reading of a selection of texts from the Nara through Tokugawa period: prose, poetry, and various genres. Introduction of *kanbun*. Prerequisite: JAPN 570 or equivalent.

East Asian Studies

The MacMillan Center 320 Luce Hall, 203.432.3426 http://ceas.yale.edu M.A.

Professors Daniel Botsman (*History*), Fabian Drixler (*History*), Aaron Gerow (*East Asian Languages and Literatures*; *Film and Media Studies*), Valerie Hansen (*History*), Hwansoo Kim (*Religious Studies*), Tina Lu (*East Asian Languages and Literatures*), Helen Siu (*Anthropology*), Chloë Starr (*Divinity School*), Jing Tsu (*East Asian Languages and Literatures*; *Comparative Literature*), Anne Underhill (*Anthropology*), Arne Westad (*History*; *Global Affairs*), Mimi Hall Yiengpruksawan (*History of Art*)

Associate Professors Eric Greene (*Religious Studies*), William Honeychurch (*Anthropology*), Michael Hunter (*East Asian Languages and Literatures*), Yukiko Koga (*Anthropology*)

Assistant Professors Lucas Bender (*East Asian Languages and Literatures*), Jinyi Chu (*Slavic Languages and Literatures*), Maura Dykstra (*History*), Kyunghee Eo (*East Asian Languages and Literatures*), Bo kyung Blenda Im (*Sacred Music; Divinity*), Daniel Mattingly (*Political Science*), Charles McClean (*Political Science*), Quincy Ngan (*History of Art*), Hannah Shepherd (*History*), Rosa van Hensbergen (*East Asian Languages and Literatures*), Emma Zang (*Sociology*)

Senior Lecturer Pauline Lin (East Asian Languages and Literatures)

Lecturers Ugyan Choedup, Jonathan Feuer, Devin Fitzgerald, Victor Fong, Wonseok Lee, J. Scott Lyons, Gyatso Marnyi, Meghan Howard Masang, Angela McClean, Mukaidaisi Muhetaer, Maddalena Poli, Luciana Sanga, Xiaoxiao Shen

Senior Lectors II Seungja Choi, Angela Lee-Smith, Ninghui Liang, Hiroyo Nishimura, Peisong Xu

Senior Lectors Hsiu-hsien Chan, Min Chen, Rongzhen Li, Fan Liu, Kumiko Nakamura, Jianhua Shen, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Mika Yamaguchi, Yongtao Zhang, William Zhou

Lectors Jingjing Ao, Seunghee Back, Hye Seong Kim, Hyun Sung Lim, Saori Nozaki

FIELDS OF STUDY

The Master of Arts (M.A.) program in East Asian studies is a multidisciplinary program offering a concentrated course of study designed to provide a broad understanding of the people, history, culture, contemporary society, politics, and economy of China, Japan, Korea, or a transnational region within East Asia. This program is designed for students preparing to go on to the doctorate in one of the disciplines of East Asian studies (e.g., anthropology; economics; history; history of art; language and literature, including comparative literature, film studies, and theater studies; political science; sociology; etc.), as well as for those students seeking a terminal M.A. degree before entering the business world, the media, government service, or a professional school.

COURSE OF STUDY FOR THE M.A. DEGREE

The East Asian studies graduate program is designed to be completed in either a oneyear or a two-year track. The two-year track requires the preparation of a master's thesis and is therefore ideal for students who are keen to pursue focused, independent research under the guidance of a faculty member. It also provides students with an opportunity to pursue additional disciplinary and language training. Students who enter the two-year track with a strong command of one East Asian language will be encouraged to consider beginning a second (or third) language.

In general, students focus their course work on the study of China, Japan, Korea, or transnational East Asia. Some students may prefer to focus their course work on one or two disciplines, in addition to language study and courses focused on East Asia. Others may create a highly interdisciplinary program, taking courses in traditional disciplines such as history, literature, political science, art history, or anthropology, as well as in Yale's professional schools.

Applicants to the East Asian studies graduate program must indicate on their application whether they are applying to the one-year or the two-year track.

REQUIREMENTS FOR THE M.A. DEGREE: ONE-YEAR TRACK

Language Proficiency Students must demonstrate proficiency in one's primary East Asian research language equivalent to Yale's third-year level, demonstrated by:

- 1. native fluency;
- 2. completion of the language placement and proficiency exam (https://eall.yale.edu/ academics/language-programs) offered by the Department of East Asian Languages and Literatures; or
- 3. completion of two terms of language courses at the third-year level at Yale.

Eight Courses With the exception of East Asian language classes, all classes must be at the graduate level (either a code 500 or above class, or an undergraduate class approved for graduate credit). If approved by the DGS, one graduate course taken for a grade of Satisfactory/Unsatisfactory in other departments or programs in which these courses are counted toward that department/program's requirements will be counted toward the eight-course requirement.

A maximum of four East Asian language classes can be counted toward degree requirements. Four of the eight courses must be East Asian studies classes. These four classes may include:

- a maximum of one independent study class on an East Asian studies topic
- graduate-level courses that appear on the East Asian studies course list (https:// ceas.yale.edu/academics/courses)
- with DGS approval, one non-East Asian studies class for which a final paper or project is written on an East Asian studies topic. The final paper must be submitted to the DGS at the end of the term. In exceptional cases the DGS may approve, in consultation with the academic mentor, additional non-EA classes (with a final EA paper/project).

The course of study must be approved by the DGS.

Special Requirements

Students must earn two Honors grades ("H") over the course of their two terms at Yale. Honors grades earned in any language course cannot be counted toward satisfying this requirement, except with the permission of the DGS.

REQUIREMENTS FOR THE M.A. DEGREE: TWO-YEAR TRACK

Language Proficiency Students must demonstrate proficiency in one's primary East Asian research language equivalent to Yale's fourth-year level, demonstrated by:

- 1. native fluency;
- 2. completion of the language placement and proficiency exam (https://eall.yale.edu/ academics/language-programs) offered by the Department of East Asian Languages and Literatures; or
- 3. completion of two terms of language courses at the fourth-year level at Yale.

Sixteen Courses With the exception of East Asian language classes, all classes must be at the graduate level (either a code 500 or above class, or an undergraduate class approved for graduate credit). If approved by the director of graduate studies (DGS), up to two graduate courses taken for a grade of Satisfactory/Unsatisfactory in other departments or programs in which these courses are counted toward that department/ program's requirements will be counted toward the sixteen-course requirement.

A maximum of eight East Asian language classes can be counted toward degree requirements. One of the sixteen courses is EAST 900, Master's Thesis. Eight of the sixteen courses must be East Asian studies classes. These eight classes may include:

- · a maximum of two independent study class on an East Asian studies topic
- graduate-level courses that appear on the East Asian studies course list (https:// ceas.yale.edu/academics/courses)
- with DGS approval, two non-East Asian studies classes for which a final paper or project is written on an East Asian studies topic. The final paper must be submitted to the DGS at the end of the semester. In exceptional cases the DGS may approve, in consultation with the academic mentor, additional non-EA classes (with a final EA paper/project).

The course of study must be approved by the DGS.

Special Requirements

Students must earn four Honors grades ("H") over the course of their four terms at Yale. Honors grades earned in any language course cannot be counted toward satisfying this requirement, except with the permission of the DGS. A master's thesis is also required.

Master's Thesis

A master's thesis is required of students enrolled in the two-year degree program. The master's thesis is based on research in a topic approved by the DGS and advised by a faculty member with specialized competence in the chosen topic. M.A. students must register for EAST 900, which may count toward the sixteen required courses. EAST 900 may not be taken for audit. Students may register for an additional
independent study to prepare topics and begin research. The master's thesis must be prepared according to CEAS guidelines and is due in the student's second year on a mid-December date (if completed in the fall term) or an early-May date (if completed in the spring term) as specified by CEAS.

JOINT-DEGREE PROGRAMS

The Council on East Asian Studies (CEAS) collaborates with three of Yale's professional schools – Environment, Law, and Public Health – and has developed joint-degree programs that offer a strong connection between two demanding courses of study while also fulfilling the requirements of each separate school. Only students enrolled in the two-year track of the East Asian studies M.A. degree program are eligible for a joint degree.

Each joint program leads to the simultaneous award of two graduate professional degrees: the M.A. in East Asian studies from the Graduate School of Arts and Sciences, and an M.F., M.E.M., M.E.Sc., M.F.S., J.D., or M.P.H. from the relevant professional school. Students can earn the two degrees simultaneously in less time than if they were pursued sequentially.

With the exception of the joint M.A./J.D. program, which requires four years, completion of all requirements takes three years. Typically candidates spend the first year in one program and the second year in the partner program. During the third and final year of study, students register in one program each term. Joint-degree students are guided in this process by a committee composed of the DGS and a faculty member of the relevant professional school.

Candidates must submit formal applications to both the graduate school and the relevant professional school and be admitted separately to each school, i.e., each school makes its decision independently. It is highly recommended that students apply to and enter a joint-degree program from the outset, although it is possible to apply to the second program once matriculated at Yale.

Program materials are available upon request to the Council on East Asian Studies, Yale University, PO Box 208206, New Haven CT 06520-8206; e-mail, eastasian.studies@yale.edu; website, http://ceas.yale.edu. Applications are available online at http://gsas.yale.edu/admission; email, graduate.admissions@yale.edu.

COURSES

Please consult the course information available online at http://ceas.yale.edu/ academics/courses and https://courses.yale.edu for a complete list of East Asian-related courses offered at Yale University.

EAST 512a / EMST 710a / HSAR 520a, Chinese Art Modernity Quincy Ngan This seminar uses the visual and material cultures of China to examine the notion of "modernity" and the relations among the "medieval," "early modern," and "modern" periods. By comparing these concepts with the historiographical frameworks of "Song-Yuan-Ming transition" and "late imperial China," we will become familiar with the methodological concerns and contradictions that complicate these relativized temporal frameworks. Works by Craig Clunas, Jonathan Hay, and Wu Hung, along with the insights from historians, inform our discussions of Chinese prints, paintings, ceramics, and other decorative objects in the long-term development of global art history. This class is most suitable for graduate students who have background in Asian art history, the history of China, East Asian studies, or early modern studies.

EAST 514a / HSAR 615a, Mapping and Translating Spaces, Cultures, and Languages (1500–1700) Angelo Cattaneo

This course combines the methods of history with those of linguistics and translation studies to promote an innovative interdisciplinary analysis of the processes of cultural (mis)communication and (mis)translation among communities across the Iberian Empires and Royal Patronages between 1500 and 1700. This course has three main objectives: (1) mapping the emergence of multilingual communities in early modernity involving cultures and languages that were previously unknown in Europe; (2) drawing up a comprehensive typological catalogue of overlooked, dispersed metalinguistic and multilingual sources (reports, letters, Christian doctrines, maps, word lists, lexicons, grammars, visual material which described linguistic practices and\or display bilingual or three-lingual evidence) produced mostly in missionary contexts; and (3) within this broad "horizontal" survey, highlighting specific area studies to carry out an indepth "vertical" comparative analysis of cultural-linguistic contacts and translations in America, Sub-Saharan Africa, and Asia, specifically chosen because they were paradigmatic, coeval, and sometimes antithetical cases detailing the different shades of cultural translations in colonial, imperial, and missionary contexts. The integration of two working strategies - the extensive typological mapping of intercultural multilingual sources and the analysis of case studies - allows us to undertake a comparative analysis of the processes related to the learning, imposing or rejection of cultures and languages in the "troubled pasts" of missionary and colonial contexts. The course aims to document the largest possible corpora of translations in early modernity and offers new ideas on the relevance of linguistic and cultural interactions and on our multicultural and multilingual "troubled present." Participants also have the opportunity to analyze a selection of historical multilingual and metalinguistic documents (dictionaries, grammars, doctrines, maps) in the John Carter Brown Library collections, in Providence, RI, to discover how these documents have variously embodied cultural lenses, religious beliefs, and political concerns.

EAST 515b / ANTH 515b, Culture, History, Power, and Representation Helen Siu This seminar critically explores how anthropologists use contemporary social theories to formulate the junctures of meaning, interest, and power. It thus aims to integrate symbolic, economic, and political perspectives on culture and social process. If culture refers to the understandings and meanings by which people live, then it constitutes the conventions of social life that are themselves produced in the flux of social life, invented by human activity. Theories of culture must therefore illuminate this problematic of agency and structure. They must show how social action can both reproduce and transform the structures of meaning, the conventions of social life. Even as such a position becomes orthodox in anthropology, it raises serious questions about the possibilities for ethnographic practice and theoretical analysis. How, for example, are such conventions generated and transformed where there are wide differentials of power and unequal access to resources? What becomes of our notions of humans as active agents of culture when the possibilities for maneuver and the margin of action for many are overwhelmed by the constraints of a few? How do elites - ritual elders, Brahmanic priests, manorial lords, factory-managers - secure compliance to a normative order? How are expressions of submission and resistance woven together in

a fabric of cultural understandings? How does a theory of culture enhance our analyses of the reconstitution of political authority from traditional kingship to modern nationstate, the encapsulation of pre-capitalist modes of production, and the attempts to convert "primordial sentiments" to "civic loyalties"? How do transnational fluidities and diasporic connections make instruments of nation-states contingent? These questions are some of the questions we immediately face when probing the intersections of culture, politics and representation, and they are the issues that lie behind this seminar.

EAST 516b, Advanced Readings in Tokugawa Documents Staff

The holdings of the Yale Univerity Library include numerous collections of invaluable pre-modern Japanese documents, including many, such as the "Kyoto Komonjo" collection, which make it possible to delve deep into the history of Tokugawa period (1600–1868) Japan. In the last two years, moreover, the Council on East Asian Studies has been able to acquire a variety of fascinating new collections of Tokugawa period documents to augment the library's existing holdings. As a result, students at Yale now have the opportunty to use unpublished primary sources to study various aspects of Tokugawa period history in a way that is rarely possible outside of Japan. This course is intended to help graduate students and properly qualified undergraduates build the advanced skills, knowledge, and confidence needed to engage these kinds of materials independently and use them to pursue a variety of historical research topics. Prerequisite: HIST 304J, Japanese Historical Documents, or instructor's permission.

EAST 546a / ANTH 542a, Cultures and Markets: Asia Connected through Time and Space Helen Siu

Historical and contemporary movements of people, goods, and cultural meanings that have defined Asia as a region. Reexamination of state-centered conceptualizations of Asia and of established boundaries in regional studies. The intersections of transregional institutions and local societies and their effects on trading empires, religious traditions, colonial encounters, and cultural fusion. Finance flows that connect East Asia and the Indian Ocean to the Middle East and Africa. The cultures of capital and market in the neoliberal and postsocialist world.

EAST 552a / EALL 555a, Japanese Modernism Staff

Japanese literature and art from the 1920s through the 1940s. The avant-garde and mass culture; popular genre fiction; the advent of new media technologies and techniques; effects of Japanese imperialism, militarism, and fascism on cultural production; experimental writers and artists and their resistance to, or complicity with, the state.

EAST 553a / EALL 565a, Japanese Literature after 1970 Paul McQuade

This course is an introduction to Japanese literature written in the last fifty years, with a focus on women writers. We read poetry and prose featuring mothers, daughters, and lovers, novels that follow convenience and thrift store workers, and poetry about factory girls. Our reading takes us from the daily grind of contemporary Tokyo to dystopian futures, from 1970s suburbia to surreal dreamscapes. We attend carefully to the ways in which different writers craft their works and, in particular, to their representation of feelings and affects. Whether the dull ache of loneliness, the oppression of boredom, or the heavy weight of fatigue, it is often something about the mood of a work – rather than its narrative – that leaves a distinct impression. We develop the tools to analyze and discuss this sense of distinctness, as well as discover ways to stage connections and comparisons between the works we read. Comparative

and creative perspectives are especially welcome, and assignments can accommodate a range of media and presentation formats to suit. No knowledge of Japan or Japanese is required, nor is any prior grounding in literature. For those wishing to work with Japanese-language materials, please contact the instructor directly to organize additional Japanese-language workshops.

EAST 616a / CPLT 612a / EALL 588a / RSEE 605a / RUSS 605a, Socialist '80s: Aesthetics of Reform in China and the Soviet Union Jinyi Chu

This course offers an interdisciplinary introduction to the study of the complex cultural and political paradigms of late socialism from a transnational perspective by focusing on the literature, cinema, and popular culture of the Soviet Union and China in 1980s. How were intellectual and everyday life in the Soviet Union and China distinct from and similar to that of the West of the same era? How do we parse "the cultural logic of late socialism?" What can today's America learn from it? Examining two major socialist cultures together in a global context, this course queries the ethnographic, ideological, and socio-economic constituents of late socialism. Students analyze cultural materials in the context of Soviet and Chinese history. Along the way, we explore themes of identity, nationalism, globalization, capitalism, and the Cold War. Students with knowledge of Russian and Chinese are encouraged to read in original. All readings are available in English.

EAST 623b / CPLT 953b / EALL 823b, Topics in Sinophone and Chinese Studies Jing Tsu

This recurring graduate research seminar and symposium examines different areas, periods, genres, and conceptual frameworks in Chinese and Sinophone studies. The topic this year is 1950s–2020. Prerequisite: reading fluency in modern and semiclassical Chinese. Enrollment is restricted; no auditors.

EAST 640a / EALL 600a, Sinological Methods Pauline Lin

A research course in Chinese studies, designed for students with background in modern and literary Chinese. Students explore and evaluate the wealth of primary sources and research tools available in China and in the West. For native speakers of Chinese, introduction to the secondary literature in English and instruction in writing professionally in English on topics about China. Topics include Chinese bibliographies; bibliophiles' notes; specialized dictionaries; maps and geographical gazetteers; textual editions, variations, and reliability of texts; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias, compendia, and databases.

EAST 889a / EMST 689a / HIST 889a, Research in Japanese History Fabian Drixler and Hannah Shepherd

After a general introduction to the broad array of sources and reference materials available for conducting research related to the history of Japan since ca. 1600, students prepare original research papers on topics of their own choosing in a collaborative workshop environment. Prerequisite: reading knowledge of Japanese.

EAST 900a or b, Master's Thesis Staff

Directed reading and research on a topic approved by the DGS and advised by a faculty member (by arrangement) with expertise or specialized competence in the chosen field. Readings and research are done in preparation for the required master's thesis.

EAST 910a or b, Independent Study Staff

By arrangement with faculty and with approval of the DGS.

Ecology and Evolutionary Biology

Osborn Memorial Laboratories, 203.432.3837 http://eeb.yale.edu M.S., Ph.D.

Chair David Vasseur

Professors Richard Bribiescas (*Anthropology*), Craig Brodersen (*School of the Environment*), Nicholas Christakis (*Sociology*), Liza Comita (*School of the Environment*), Casey Dunn, Erika Edwards, Vanessa Ezenwa, Vivian Irish (*Molecular, Cellular, and Developmental Biology*), Walter Jetz, Thomas Near, David Post, Jeffrey Powell, Richard Prum, Eric Sargis (*Anthropology*), Oswald Schmitz (*School of the Environment*), David Skelly (*School of the Environment*), Jeffrey Townsend (*Public Health*), Paul Turner, David Vasseur

Associate Professors Forrest Crawford (*Public Health*), Nathan Grubaugh (*Epidemiology*), James Noonan (*Genetics*), Carla Staver, Alison Sweeney

Assistant Professors Jennifer Coughlan, Martina Dal Bello, Martha Muñoz, C. Brandon Ogbunu, Eric Slessarev, Serena Tucci (*Anthropology*), Michelle Wong

Senior Lecturer Marta Martínez Wells

Lecturers Adalgisa Caccone, Gordon Geballe, Joshua Moyer, Linda Puth

Research Scientist Mary Beth Decker

FIELDS OF STUDY

The Department of Ecology and Evolutionary Biology (E&EB) offers training programs in organismal biology, ecology, and evolutionary biology.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Each entering student, in consultation with the faculty Entry Committee, develops a specific program of courses, seminars, laboratory research, and independent reading tailored to the student's interests, background, and goals. There are normally no foreign language requirements. The course requirements to advance to candidacy in E&EB are:

- 1. E&EB 500* and E&EB 501,* Advanced Topics in Ecology and Evolutionary Biology;
- 2. E&EB 545, \star a course on the responsible conduct of research;
- 3. weekly E&EB seminars;
- 4. symposia of faculty and graduate student research;
- 5. two research rotations (E&EB 901,* Research Rotation I, and E&EB 902,* Research Rotation II) in the first two years; and
- 6. a minimum of three additional graduate-level courses (numbered 500 and above) with a grade of Honors in at least two of these.

Teaching experience is regarded as an integral part of the graduate training program. All students are required to teach three courses, typically during their first three years of study. Students who require additional support from the graduate school may be required to teach additional terms after they have fulfilled the academic teaching requirement.

By the middle of the fourth term of study, each student organizes a formal preprospectus consultative meeting with the student's advisory committee to discuss the planned dissertation research. Before the beginning of the fifth term, students present and defend their planned dissertation research at a prospectus meeting, at which the department determines the viability and appropriateness of the student's Ph.D. proposal. A successful prospectus meeting and completion of course requirements results in admission to candidacy for the Ph.D. The prospectus is held by the end of the fourth semester. Following admission to candidacy, the student must hold committee meetings at least once a year and remain in good academic standing by showing significant progress on their thesis project. The final requirements for a Ph.D. include completion, presentation, and successful defense of the dissertation, and submission of copies of the dissertation to the graduate school and to the Marx Science and Social Science Library.

In some cases, such as when there is extensive field work, the prospectus meeting can be delayed by one term. A request for a delay must come from the dissertation committee adviser and must be approved by the DGS. In these exceptional cases, admission to candidacy may not be required for registration for the third year of graduate study.

* This course is graded on a Satisfactiory/Unsatisfactory basis.

HONORS REQUIREMENT

Students must meet the graduate school's requirement of Honors in two courses by the end of the fourth term of study. The E&EB department also requires an average grade of at least High Pass in coursework during the first two years of study.

MASTER'S DEGREE

M.S. (en route to the Ph.D.) The course requirements for the M.S. are the same those as for advancing to candidacy in the Ph.D. program except that an M.S. does not require successful completion of a prospectus meeting.

Additional information on the department, faculty, courses, and facilities is available from Kelly Pyers, Registrar, Department of Ecology and Evolutionary Biology, Yale University, PO Box 208106, New Haven CT 06520-8106; email, kelly.pyers@yale.edu; tel., 203.432.3837; http://eeb.yale.edu.

COURSES

E&EB 500a and E&EB 501b, Advanced Topics in Ecology and Evolutionary Biology Staff

Topics to be announced. Graded Satisfactory/Unsatisfactory.

E&EB 515a, Conservation Biology Linda Puth

An introduction to ecological and evolutionary principles underpinning efforts to conserve Earth's biodiversity. Efforts to halt the rapid increase in disappearance of both plants and animals. Discussion of sociological and economic issues.

E&EB 520a, General Ecology David Vasseur and Michelle Wong

A broad consideration of the theory and practice of ecology, including the ecology of individuals, population dynamics and regulation, community structure, ecosystem

function, and ecological interactions on broad spatial and temporal scales. Topics such as climate change, fisheries management, and infectious disease are placed in an ecological context.

E&EB 525b, Evolutionary Biology Paul Turner and Jennifer Coughlan An overview of evolutionary biology as the discipline uniting all of the life sciences. Evolution explains the origin of life and Earth's biodiversity, and how organisms acquire adaptations that improve survival and reproduction. This course uses reading and discussion of scientific papers to emphasize that evolutionary biology is a dynamic science, involving active research to better understand the mysteries of life. We discuss principles of population genetics, paleontology, and systematics; and application of evolutionary thinking in disciplines such as developmental biology, ecology, microbiology, molecular biology, and human medicine.

E&EB 542b, Behavioral Ecology Vanessa Ezenwa

An introduction to the study of animal behavior from an evolutionary and ecological perspective. Topics include decision-making, group living and cooperation, sexual selection and mating behavior, signaling and communication. In addition to lectures, in-class discussions and activities, students engage in the material by design and implement their own research projects. Prerequisite: Biology 104 or permission of instructor

E&EB 545b, Responsible Conduct of Research Casey Dunn

This five-week discussion seminar considers issues related to the responsible conduct of research. Topics addressed include research misconduct, plagiarism, data acquisition and management, mentoring and collaboration, authorship and peer review, the use of animals and humans in scientific research, sexual harassment, diversity, and balancing professional and personal life. Graded Satisfactory/Unsatisfactory. o Course cr

E&EB 546a, Plant Diversity and Evolution Erika Edwards

Introduction to the major plant groups and their evolutionary relationships, with an emphasis on the diversification and global importance of flowering plants.

E&EB 547a, Laboratory for Plant Diversity and Evolution Erika Edwards Hands-on experience with the plant groups examined in the accompanying lectures. Local field trips.

E&EB 572b, Ornithology Richard Prum

Structure, function, behavior, evolution, and diversity of birds. A general overview of avian biology and evolution. Topics include the evolutionary origin of birds, avian phylogeny, anatomy, physiology, neurobiology, behavior, breeding systems, and biogeography.

E&EB 573b, Lab for Ornithology Richard Prum

E&EB 635a, Evolution and Medicine Brandon Ogbunu

Introduction to the ways in which evolutionary science informs medical research and clinical practice. Diseases of civilization and their relation to humans' evolutionary past; the evolution of human defense mechanisms; antibiotic resistance and virulence in pathogens; cancer as an evolutionary process. Students view course lectures online; class time focuses on discussion of lecture topics and research papers. Prerequisites: BIOL 101–BIOL 104.

E&EB 654a, Phylogenetic Biology Casey Dunn

Phylogenetic biology is the study of the evolutionary relationships between organisms, and the use of evolutionary relationships to understand other aspects of organism biology. This course surveys phylogenetic methods, providing a detailed picture of the statistical, mathematical, and computational tools for building phylogenies and using them to study evolution. We also examine the application of these tools to particular problems in the literature and emerging areas of study.

E&EB 750a, Forgotten Grassy Ecosystems Carla Staver

Grassy ecosystems – including savannas and grasslands – have historically been relatively undervalued, often confused and misclassified as forests. This seminar includes weekly readings and discussion about the world's grassy ecosystems in general and focusing on regional examples of overlooked savannas and grasslands. This seminar is intended for Ph.D. students. It is open to master's students and undergraduates by permission of the instructor only, based on a one- or two-paragraph description of interest in the course.

E&EB 762a, Ecology of Landforms Eric Slessarev

This course is a combined graduate research seminar and research practicum that explores the linkage between ecological and geomorphic processes – between biology at Earth's surface and the shape and structure of that surface. This course is centered around two skill-building activities: (1) a series of presentations in which students deliver short mock lectures, lead subsequent discussion, and receive constructive feedback from the class; (2) a series of quantitative workshops (held in alternate weeks) in which the class collaboratively designs and codes a model or model(s) that relate to ecological and geomorphic processes. A primary focus of this course is understanding how biogeochemical cycles play out across hillslopes, watersheds, and fluvial landforms. Depending on student interest we may also address questions relating community ecology, population ecology, or evolutionary processes to landscape structure. Students should expect to hone their presentation skills and quantitative toolset, particularly with respect to spatial analysis and numerical modeling.

E&EB 901a or b, Research Rotation I Staff

E&EB 902a or b, Research Rotation II Staff

E&EB 930a / EPS 703a, Seminar in Systematics Jacques Gauthier

Topics and class time are chosen by the participants, and have included reading books and/or a series of papers on particular topics (e.g., homology; morphological phylogenetics; evolution of egg colors and exposed nesting in dinosaurs/birds; origin of snake ecology; conflicts between morphology and molecules; role of fossils in phylogenetic inference).

Economics

28 Hillhouse Avenue, 203.432.3575 http://economics.yale.edu M.A., M.Phil., Ph.D.

Chair Tony Smith

Director of Graduate Studies

Yuichi Kitamura (30 Hillhouse Ave., 203.432.3699, yuichi.kitamura@yale.edu)

Professors Joseph Altonji, Donald Andrews, Konstantinos Arkolakis, Orazio Attanasio, Dirk Bergemann, Steven Berry, Xiaohong Chen, Ray Fair, Howard Forman (*Public Health*), John Geanakoplos, Pinelopi Goldberg, Philip Haile, Marina Halac, Gerald Jaynes, Amit Khandelwal, Yuichi Kitamura, Alvin Klevorick, Samuel Kortum, Giovanni Maggi, Costas Meghir, Robert Mendelsohn (*School of the Environment*), A. Mushfiq Mobarak (*Management*), Giuseppe Moscarini, Kaivan Munshi, William Nordhaus, Gerard Padró i Miquel, Rohini Pande, Benjamin Polak, Mark Rosenzweig, Larry Samuelson, Katja Seim (*Management*), Tony Smith, Philipp Strack, Aleh Tsyvinski, Edward Vytlacil, Fabrizio Zilibotti

Associate Professors José-Antonio Espín-Sánchez, Mira Frick, Zhen Huo, Mitsuru Igami, Ryota Iijima, Ilse Lindenlaub, Michael Peters, Nicholas Ryan

Assistant Professors Lauren Bergquist, Max Cytrynbaum, Eduardo Davila, Charles Hodgson, John Eric Humphries, Yusuke Narita, Cormac O'Dea, Winnie van Dijk

FIELDS OF STUDY

Fields include microeconomics, macroeconomics, econometrics, labor, public finance, industrial organization, international trade and finance, financial economics, environmental economics, economic development, economic history, political economy, and behavioral economics.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Exceptions to the requirements described below may be obtained only by vote of the Economics faculty and will be granted only in recognition of extenuating circumstances.

Prior to Registration for the Second Year

(1.1) Students must have taken for credit and passed at least six economics graduate courses. With the permission of the director of graduate studies (DGS), courses in related fields can be used to fulfill this requirement. (Courses in the International and Development Economics master's program do not satisfy this requirement.) (1.2) Students who earn a grade of HP- or better in each of the four first-year courses in microeconomics and macroeconomics may proceed directly to the second year. In June and August of each year, the department will give waiver exams in micro and macro, written and graded to the extent possible by a committee of faculty who have taught the first-year courses in the previous year. First-year students who do not earn a grade of HP- or better in each of the first-year micro or macro courses must either take and pass the corresponding exam in June or take the exam in June and then (in the event

of failure) take and pass the exam in August in order to continue in the program. A student who obtains an HP- or better in one term of a sequence, but not the other, must take (and retake, if necessary) only the waiver exam corresponding to the term in which they failed to obtain an HP- or better. Students who have not passed all the required examinations prior to the second year of study may register as master's candidates for the following fall term for the purpose of completing enough courses to be eligible for the Master of Arts degree.

Exceptionally well prepared incoming students may petition the DGS and the faculty in the field to take the waiver exam before their first year, with an eye toward placing out of either one or both terms of either of the first-year micro or macro courses. Incoming students taking the waiver exam will be exempt from the corresponding course only if their performance is an exemplary (rather than marginal) pass.

Prior to Registration for the Third Year

(2.1) Students must have met the graduate school's requirement of Honors in two courses. (2.2) Students must have taken at least fourteen term courses in economics and have received a grade of at least a P- in each of them. With the permission of the DGS, courses in related fields and independent reading courses can be used to fulfill this requirement. Workshops may not be used to satisfy it. (2.3) Students must have received an average of at least HP in the courses they have taken. The admissibility of courses for this requirement is the same as for the fourteen-course requirement, (2.2). Grades within the Economics department include pluses and minuses. The grade average is computed as follows. A failure counts as a zero, a P- as a 1, a P as a 2, a P+ as a 3, an HP- as a 4, and so on up to a 9 for an H+. The arithmetic average of these numbers must be at least 4.5. (2.4) All students must have submitted a draft of their empirical paper, discussed in (3.3) below. (2.5) All students must make their first attempt at each of two qualifying examinations by June 30 of their second year in the program. The examinations test a student's general analytic ability in economics and knowledge of two fields chosen by the student. Fields are typically drawn from microeconomics, macroeconomics, econometrics, labor, public finance, industrial organization, international trade and finance, financial economics, environmental economics, economic development, economic history, political economy, and behavioral economics. Students may request examination in a special field designed in consultation with Economics department faculty. The choice of fields must be approved by the DGS. Students may list two preferred examiners in each field. The DGS's office strives to satisfy these preferences subject to faculty availability and the number of students making similar requests. The nature and content of the field qualifying exams will be determined by the faculty in the field (i.e. these exams might require written work, depending on the field). If a student fails a field qualifying exam in the spring of the second year, the student must either retake the exam in that field or may take an exam in a different field. In either case, the student must pass this second attempt, whether in the same field or not, in the fall of the third year to remain in the program.

Admission to Candidacy

The Economics department adheres strictly to the graduate school requirement that students be admitted to candidacy prior to registration for the fourth year of study. Students are recommended to the graduate school for admission to candidacy by vote of the Department of Economics faculty after having completed requirements (2.1), (2.2), and (2.3) above, the graduate school's prospectus requirement, and the following additional requirements. (3.1) Students must have completed two one-term prospectus workshops, one in each term of the third year. All prospectus workshops have the word "prospectus" in their title. If students can find no prospectus workshop corresponding to their interests, they may substitute other workshops to meet this requirement. In order for two workshops to count toward the prospectus requirement, students must make a presentation in each workshop and present original work in one of them. This stipulation applies even if a workshop is not labeled as a prospectus workshop. If students can find no workshop whatsoever in their area of interest, they may substitute an independent study course guided by a faculty member, provided the independent study leads to a dissertation prospectus that is accepted. (3.2) Students must receive a grade of HP- or better in ECON 551 (Econometrics II) or ECON 552 (Econometrics III). More advanced courses may be substituted for these with permission of the DGS. (3.3) Students must receive a grade of Satisfactory on an empirical paper, which is evaluated by a faculty adviser or an instructor of ECON 556. In the paper, the student should (a) specify an economic model useful for the investigation of an interesting economic problem, (b) select data and econometric methods appropriate to the question, (c) conduct proper statistical analysis, and (d) interpret the results in an intelligent way. The department's posted description of the empirical paper requirement should answer any questions about it. The paper may be written in the course ECON 556 or independently with the help of a faculty adviser, the standards for a satisfactory paper being the same in both cases. The paper is not expected to be of publishable or nearly publishable quality but should demonstrate facility in the application of econometric methods to an economic question. Note: Jointly authored papers will not be accepted. (3.4) Students must complete with a grade of at least HP- a term of economic history, drawn from a list of courses approved by the DGS and the economic history instructors. (3.5) Students must pass two field qualifying examinations given by committees of faculty members. These exams are discussed in (2.5) above.

Additional Requirements

(1) All students must give a dissertation prospectus to their advisory committee by the second Friday in May of their third year. (2) Students must provide, via email, the names of their advisory committee consisting of two members to the DGS's office by February 1 of the third year. The student should indicate which faculty member is the main advisor for the purpose of reviewing their annual DPR (Dissertation Progress Report). (3) In each academic year after the second, all students must regularly attend at least two workshops. At least one of them must be an "informal" prospectus workshop. Each student must present at least once a year in one or other of the workshops that they regularly attend in the third and fourth years. (4) Third-year students who have not yet satisfied the empirical paper requirement must submit an empirical paper by February 1.

The Dissertation

The dissertation should make an original contribution to economics that demonstrates the student's mastery of relevant resources and methods. Although the dissertation

may cover several related topics, it should have a unifying theme. The dissertation may consist of one or more than one essay. The dissertation is guided by a committee of two advisers, at least one of whom must be a member of the Economics department. The second adviser need not be from the Economics department or even from Yale University. Second advisers from outside the Yale Economics department must be approved by the DGS. The two advisers serve as readers. After the student has completed a first draft of the dissertation, the DGS appoints a third reader. The student and the committee may recommend third readers, but the choice remains with the DGS, since the third reader serves as an independent referee.

Collaborative Work in the Dissertation

The Economics department's objective regarding collaboration is to achieve a reasonable compromise between two goals. While the department wishes to encourage collaborative research among students and between students and faculty, a dissertation should demonstrate the student's ability to do independent research. The dissertation committee and the DGS must approve the inclusion of collaborative work in the dissertation, and students must acknowledge and describe any collaboration in the preface to the dissertation.

Expiration of Admission to Candidacy

Advancement to candidacy expires ten years after the date it is granted, if no dissertation has been submitted and approved in the intervening period.

Normal Sequence of Studies

What follows in the next three paragraphs are recommendations, not requirements.

During the fall term of the first year, students usually take ECON 500 (General Economic Theory: Microeconomics), ECON 510 (General Economic Theory: Macroeconomics), ECON 550 (Econometrics I). In the following spring, they usually take ECON 501 (General Economic Theory: Microeconomics), ECON 511 (General Economic Theory: Macroeconomics), ECON 551 (Econometrics II). Students who are well prepared in econometrics may take an advanced econometrics course instead of ECON 550 in the fall of the first year after consulting the DGS and an appropriate econometrics faculty member.

Students typically also take a course in economic history in either the fall or spring term, that would satisfy the economic history requirement, (3.4) above, if a grade of at least HP- were obtained. Taking the history course in the spring may be more appropriate for students concerned about making the transition to graduate school in the fall.

During the second year, students normally take ECON 556 and satisfy the empirical paper requirement. Students also take economics courses in specialized fields, such as economic theory, macroeconomics, econometrics, labor, public finance, industrial organization, international trade and finance, financial economics, environmental economics, economic development, economic history, political economy, and behavioral economics. These courses serve as preparation for the qualifying examinations and allow students to identify potential areas of study for dissertation research. As they

identify an area, students should locate a faculty adviser to advise them about their studies. Students may also take courses related to economics from other departments.

The third year is normally devoted to finding a dissertation topic and to beginning research on it. In this year, students are expected to make the transition from being a taker of classes to a participant in research. Important elements in achieving this transition are thinking critically about material learned, reading widely, choosing research topics that are feasible and of interest to the student, and gaining contact with faculty. Students should expect to take the initiative in making such contact.

COMBINED PH.D. DEGREES

A combined degree results in the award of one Ph.D. with two departments named. It is not two separate degrees, and the student is not expected to fulfill all the requirements of both departments.

Purpose Combined degrees are intended to provide a sufficiently broad training program for a student wishing to complete an interdisciplinary dissertation.

Program Design Combined-degree programs are designed on an ad hoc basis by the student, the DGSs of the two departments, and the appropriate associate dean of the graduate school.

Timing Most combined degrees are proposed by students during the summer after the first year of study. Students are not given extra time or funding to complete combined degrees. In particular, students must advance to candidacy by the end of their third year of study.

Degree of Integration A combined program should synthesize the knowledge and methods of the two departments into a single study. Ideally the dissertation should be equally strong in both fields. For example, a dissertation with the first half focused on economics and the second half focused on political science would not be acceptable.

Administrative Requirements An ad hoc combined degree program is established in the following steps.

- 1. A program is initiated by writing of a pre-prospectus by the student. This document describes how and why the two fields are to be integrated.
- 2. The student recruits a faculty dissertation adviser from each department and obtains their approval of the pre-prospectus, perhaps modified in response to their advice.
- 3. The student recruits two other faculty members to serve on the dissertation committee, one from each department.
- 4. The student discusses the requirements for a combined degree with both departmental DGSs.
- 5. The student prepares a comprehensive study plan that contains a list of courses and examinations agreed on by both DGSs and approved by both departments. The goals of the course selection are to give some breadth of knowledge of both fields and prepare the student to complete the dissertation. A key to success in combined programs is not to require too many courses and to focus on preparation for dissertation research. Requirements include successful completion of ECON 500, ECON 501, ECON 510, and ECON 511 with grades of at least HP-; please see (1.2)

for a complete description of the requirement. Normally the two departments administer qualifying examinations. This procedure may require the production of examinations that both departments evaluate simultaneously. The plan of study should contain the following: (a) a cover sheet for approvals by both dissertation advisers, both DGSs, and the appropriate associate dean of the graduate school, (b) an introduction where the student explains the rational for proposing the ad hoc combined degree, and (c) a term-by-term timeline listing all classes, teaching, and required examinations.

- 6. Both departments must accept the dissertation prospectus.
- 7. The plan of study is a contract, and the student must receive written permission in advance from both DGSs and the appropriate associate dean of the graduate school for any changes to the plan.
- 8. Once everyone agrees and the plan of study is approved, the combined program is recorded in Banner.

Funding and Teaching The department that first admitted the student is the "primary department." The student's funding is from the primary department, as is the teaching expectation. Ideally students should obtain teaching experience from both departments.

MASTER'S DEGREES

M.Phil. The M.Phil. degree is awarded to students in the Ph.D. program upon completion of all the requirements for advancement to candidacy for a doctorate in economics except the prospectus and prospectus workshop requirements.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete at least eight term graduate courses in the Department of Economics. At least six of these courses must be Ph.D. courses in the Department of Economics (not courses from the International and Development Economics master's program). The average grade of all the graduate courses taken that are listed or cross-listed by the Department of Economics must be at least a High Pass, and at least two of these grades must be Honors. Students must complete at least two of the three first-year two-course sequences in microeconomics, macroeconomics, or econometrics. In computing the grade average, the relevant grades are those reported to the registrar and so do not include pluses or minuses. A Fail counts as a zero, a Pass counts as a 1, a High Pass counts as a 2, and an Honors counts as a 3. To say that the average grade must be High Pass means that the arithmetic average of these numbers must be at least 2. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

J.D./M.A. Degree Program Students working toward a J.D. in the Law School may earn an M.A. degree in Economics. The degree requirements that apply to these students are the same as those described above. Students wishing to join this J.D./M.A. joint-degree program must apply for separate admission to the Economics graduate program; applicants should submit scores from the GRE General Test. Students admitted to this program pay three years of tuition to the Law School and one year of tuition to the graduate school. The graduate school does not offer fellowship support to J.D./M.A. candidates. The M.A. in International and Development Economics is described under International and Development Economics.

COURSES

ECON 500A, General Economic Theory: Microeconomics Eduardo Davila Introduction to optimization methods and partial equilibrium. Theories of utility and consumer behavior production and firm behavior. Introduction to uncertainty and the economics of information, and to noncompetitive market structures.

ECON 510A, General Economic Theory: Macroeconomics Fabrizio Zilibotti Analysis of short-run determination of aggregate employment, income, prices, and interest rates in closed and open economies. Stabilization policies.

ECON 520a, Advanced Microeconomic Theory I Mira Frick

A formal introduction to game theory and information economics. Alternative noncooperative solution concepts are studied and applied to problems in oligopoly, bargaining, auctions, strategic social choice, and repeated games.

ECON 522a, Microeconomic Theory Lunch Staff

A forum for advanced students to critically examine recent papers in the literature and present their own work.

ECON 525a, Advanced Macroeconomics I Zhen Huo and Ilse Lindenlaub Heterogeneous agent economics, investment, scrapping and firing, nonquadratic adjustment costs, financial constraints, financial intermediation, psychology of decision making under risk, optimal risk management, financial markets, consumption behavior, monetary policy, term structure of interest rates.

ECON 538a, Microeconomic Theory Workshop Staff

Presentations by research scholars and participating students.

ECON 540a, Student Workshop in Macroeconomics Staff

A course that gives third- and fourth-year students doing research in macroeconomics an opportunity to prepare their prospectuses and to present their dissertation work. Each student is required to make at least two presentations per term. For third-year students and beyond, at least one of the presentations in the first term should be a mock job talk.

ECON 542a, Macroeconomics Workshop Staff

A forum for presentation and discussion of state-of-the-art research in macroeconomics. Presentations by research scholars and participating students of papers in closed economy and open economy macroeconomics and monetary economics.

ECON 545a, Microeconomics Michael Boozer

A survey of the main features of current economic analysis and of the application of the theory to a number of important economic questions, covering microeconomics and demand theory, the theory of the firm, and market structures. For IDE students.

ECON 546a, Growth and Macroeconomics Ana Fieler

This course presents a basic framework to understand macroeconomic behavior and the effects of macroeconomic policies. Topics include consumption and investment, labor market, short-run income determinations, unemployment, inflation, growth, and the effects of monetary and fiscal policies. The emphasis is on the relation between the underlying assumptions of macroeconomic framework and policy implications derived from it.

ECON 550a, Econometrics I Donald Andrews

Probability: concepts and axiomatic development. Data: tools of descriptive statistics and data reduction. Random variables and probability distributions; univariate distributions (continuous and discrete); multivariate distributions; functions of random variables and transformations; the notion of statistical inference; sampling concepts and distributions; asymptotic theory; point and interval estimation; hypothesis testing.

ECON 556a, Topics in Empirical Economics and Public Policy Yusuke Narita, Charles Hodgson, and Max Cytrynbaum

Methods and approaches to empirical economic analysis are reviewed, illustrated, and discussed with reference to specific empirical studies. The emphasis is on learning to use methods and on understanding how specific empirical questions determine the empirical approach to be used. We review a broad range of approaches including program evaluation methods and structural modeling, including estimation approaches, computational issues, and problems with inference. Open only to doctoral students in the Department of Economics. Exceptionally, doctoral students from other departments may take the course for credit if a faculty member, normally from their department, can supervise and grade their term paper.

ECON 558a, Econometrics Michael Boozer

Application of statistical analysis to economic data. Basic probability theory, linear regression, specification and estimation of economic models, time series analysis, and forecasting. The computer is used. For IDE students.

ECON 568a, Econometrics Workshop Staff

A forum for state-of-the-art research in econometrics. Its primary purpose is to disseminate the results and the technical machinery of ongoing research in theoretical and applied fields.

ECON 570a, Prospectus Workshop in Econometrics Staff

A course for third- and fourth-year students doing research in econometrics to prepare their prospectus and present dissertation work.

ECON 588a and ECON 589a, Economic History Workshop Staff

A forum for discussion and criticism of research in progress. Presenters include graduate students, Yale faculty, and visitors. Topics concerned with long-run trends in economic organization are suitable for the seminar. Special emphasis given to the use of statistics and of economic theory in historical research.

ECON 600a, Industrial Organization I Philip Haile and Charles Hodgson Begins by locating the study of industrial organization within the broader research traditions of economics and related social sciences. Alternative theories of decision making, of organizational behavior, and of market evolution are sketched and contrasted with standard neoclassical theories. Detailed examination of the determinants and consequences of industrial market structure.

ECON 606a, Prospectus Workshop in Industrial Organization Staff

For third-year students in microeconomics, intended to guide students in the early stages of theoretical and empirical dissertation research. Emphasis on regular writing assignments and oral presentations.

ECON 608a, Industrial Organization Seminar Staff

For advanced graduate students in applied microeconomics, serving as a forum for presentation and discussion of work in progress of students, Yale faculty members, and invited speakers.

ECON 630a, Labor Economics Costas Meghir

Topics include static and dynamic approaches to demand, human capital and wage determination, wage income inequality, unemployment and minimum wages, matching and job turnover, immigration and international trade, unions, implicit contract theory, and efficiency wage hypothesis.

ECON 638a, Labor and Population Workshop Staff

A forum primarily for graduate students to present their research plans and findings. Discussions encompass empirical microeconomic research relating to both high- and low-income countries.

ECON 640a, Prospectus Workshop in Labor Economics and Public Finance Staff Workshop for students doing research in labor economics and public finance.

ECON 678a / MGMT 762a, Macro Finance Alp Simsek

ECON 679a, Financial Economics Student Lunch Staff

This workshop is for third-year and other advanced students in financial economics. It is intended to guide students in the early stages of dissertation research. The emphasis is on presentation and discussion of materials presented by students that will eventually lead to dissertation topics. Open to third-year and advanced Ph.D. students only.

ECON 680a, Public Finance I Orazio Attanasio

Major topics in public finance including externalities, public goods, benefit/cost analysis, fiscal federalism, social insurance, retirement savings, poverty and inequality, taxation, and others. Applications are provided to crime, education, environment and energy, health and health insurance, housing, and other markets and domains. The course covers a variety of applied methods including sufficient statistics, randomized control trials, hedonic models, regression discontinuity, discrete choice, spatial equilibrium, dynamic growth models, differences-in-differences, integrated assessment models, applied general equilibrium, event studies, firm production functions, learning models, general method of moments, and propensity-score reweighting estimators.

ECON 706a, Prospectus Workshop in International and Spatial Economics Staff This workshop is for third-year and other advanced students in international economic fields. It is intended to guide students in the early stages of dissertation research. The emphasis is on students' presentation and discussion of material that will eventually lead to the prospectus.

ECON 720a, International Trade I Amit Khandelwal and Costas Arkolakis The first part of this course covers the basic theory of international trade, from neoclassical theory where trade is the result of comparative advantage (Ricardo, Heckscher-Ohlin) to the "New Trade Theory" where trade is generated by imperfect competition and increasing returns to scale. Particular emphasis is placed on the implications of the different theories concerning the aggregate gains or losses from trade and the distributional implications of trade liberalization. The second part of the course explores new advances in the field. It covers the Eaton-Kortum (2002) and Melitz (2003) models; extensions of these models with many countries, multiproduct firms, and sectors; methods of quantitative trade analysis to revisit classic questions (gains from trade, distributional effects of trade, trade policy); and new advances in dynamic trade theory.

ECON 724a, International Finance Ana Fieler

A study of how consumers and firms are affected by the globalization of the world economy. Topics include trade costs, the current account, exchange rate pass-through, international macroeconomic co-movement, multinational production, and gains from globalization. Prerequisite: intermediate macroeconomics or equivalent.

ECON 728a / MGMT 521a, Workshop: International Trade Staff Workshop/seminar for presentations and discussion on topics in the field of international trade.

ECON 730a, Economic Development I Mark Rosenzweig and Kaivan Munshi Development theory at both aggregate and sectoral levels; analysis of growth, employment, poverty, and distribution of income in both closed and open developing economy contexts.

ECON 733a, Urban and Environmental Economics Costas Arkolakis and Mushfiq Mobarak

A Ph.D. field course covering latest research topics in urban economics and in environmental and energy economics. Topics include the links between urban planning and city productivity and livability, infrastructure investments in electrification and water management, managing externalities, environmental regulation, and the effects of climate change in cities and in rural areas. Prerequisites: first-year Ph.D. economics courses in microeconomics, macroeconomics, and econometrics (or equivalent), or instructor permission.

ECON 750a, Trade and Development Workshop Staff

A forum for graduate students and faculty with an interest in the economic problems of developing countries. Faculty, students, and a limited number of outside speakers discuss research in progress.

ECON 756a, Prospectus Workshop in Development Staff

Workshop for students doing research in development to present and discuss work.

ECON 899a, Individual Reading and Research Staff

By arrangement with faculty.

Electrical and Computer Engineering

17 Hillhouse Avenue, 203.432.4220 M.S., M.Phil., Ph.D.

Chair

Jung Han

Director of Graduate Studies

Hong Tang (hong.tang@yale.edu)

Professors Hui Cao,* Ronald Coifman,† James Duncan,* Anna Gilbert,† Jung Han, Liangbing Hu, Roman Kuc, Rajit Manohar, A. Stephen Morse, Kumpati Narendra (*Emeritus*), Daniel Prober,* Lawrence Staib,* Hong Tang, Leandros Tassiulas, J. Rimas Vaisnys (*Emeritus*), Fengnian Xia

Associate Professors Amin Karbasi, Jakub Szefer

Assistant Professors Dionysis Kalogerias, Mengxia Liu, Owen Miller,* Priyadarshini Panda, Shreya Saxena*

- * A secondary appointment with primary affiliation in another department or school
- † A joint appointment with another department

FIELDS OF STUDY

Fields include biomedical sensory systems, communications and signal processing, neural networks, control systems, wireless networks, sensor networks, microelectromechanical and nanomechanical systems, nanoelectronic science and technology, optoelectronic materials and devices, semiconductor materials and devices, quantum and nonlinear photonics, quantum materials and engineering, computer engineering, computer architecture, hardware security, neuromorphic computing, and VLSI design.

For degree requirements and courses, see Engineering & Applied Science.

Engineering & Applied Science

17 Hillhouse Avenue, 203.432.4220 http://seas.yale.edu M.S., M.Phil., Ph.D.

Dean Jeffrey Brock

Deputy Dean Vincent Wilczynski

Assistant Dean Sarah M. Miller

Assistant Dean for Faculty Affairs Kristin Flower

Assistant Dean for Faculty Development Julie Dorsey

Assistant Dean for Research Rajit Manohar

Assistant Dean for Innovation and Entrepreneurship W. Mark Saltzman

APPLIED PHYSICS

Chair Vidvuds Ozolins

Director of Graduate Studies Peter Schiffer (BCT 329; 203.432.2647; peter.schiffer@yale.edu)

Professors Charles Ahn, Sean Barrett (*Physics*), Hui Cao, Michel Devoret, Paul Fleury (*Emeritus*), Steven Girvin (*Physics*), Leonid Glazman (*Physics*), Jack Harris (*Physics*), Victor Henrich (*Emeritus*), Sohrab Ismail-Beigi, Marshall Long (*Mechanical Engineering* & Materials Science), Simon Mochrie, Corey O'Hern (*Mechanical Engineering* & Materials Science), Vidvuds Ozolins, Daniel Prober, Nicholas Read, Peter Schiffer, Robert Schoelkopf, Ramamurti Shankar (*Physics*), Mitchell Smooke (*Mechanical Engineering* & Materials Science), A. Douglas Stone, Hong Tang (*Electrical Engineering*), Robert Wheeler (*Emeritus*), Werner Wolf (*Emeritus*)

Associate Professors Michael Choma (Biomedical Engineering), Peter Rakich

Assistant Professors Yu He, Owen Miller, Shruti Puri

BIOMEDICAL ENGINEERING Chair James Duncan

Director of Graduate Studies Richard Carson (richard.carson@yale.edu) **Professors** Helene Benveniste,* Joerg Bewersdorf,* Richard Carson,† Nicholas Christakis,* Todd Constable,* Robin de Graaf,* James Duncan,† Rong Fan, Anjelica Gonzalez, Michelle Hampson,* Henry Hsia,* Jay Humphrey, Fahmeed Hyder,† Farren Isaacs,* Themis Kyriakides,† Francis Lee,* Andre Levchenko, Chi Liu, Graeme Mason,* Evan Morris,* Xenophon Papademetris,* Douglas Rothman,† W. Mark Saltzman, Martin Schwartz,* Fred Sigworth,* Albert Sinusas,* Brian Smith,* Lawrence Staib,† Hemant Tagare,* John Tsang,* Paul Van Tassel,* Jiangbing Zhou,* Steven Zucker†

Associate Professors Fadi Akar,* Stuart Campbell, Julius Chapiro, Tarek Fahmy, Gigi Galiana,* Michael Higley,* Ansel Hillmer,* Chenxiang Lin,* Kathryn Miller-Jensen, Michael Murrell, Dana Peters,* Yibing Qyang*

Assistant Professors Sanjay Aneja,* Daniel Coman,* Purushottam Dixit,* Nicha Dvornek,* Evelyn Lake, Michael Mak, John Onofrey, Cristina Rodriguez, Shreya Saxena, Dustin Scheinost*

* A secondary appointment with primary affiliation in another department or school.

⁺ A joint appointment with another department.

CHEMICAL AND ENVIRONMENTAL ENGINEERING

Chair Jordan Peccia

Director of Graduate Studies

Mingjiang Zhong (mingjiang.zhong@yale.edu)

Professors Eric Altman, Paul Anastas,* Michelle Bell,* Menachem Elimelech, John Fortner, Gary Haller (*Emeritus*), Edward Kaplan, Jaehong Kim, Michael Loewenberg, Jordan Peccia, Lisa Pfefferle, Daniel Rosner (*Emeritus*), W. Mark Saltzman,* Udo Schwarz,* T. Kyle Vanderlick, Paul Van Tassel, Julie Zimmerman⁺

Associate Professor Nicole Deziel,* Drew Gentner, Krystal Pollitt*

Assistant Professors Peijun Guo, Amir Haji-Akbari, Shu Hu, Lea Winter, Yuan Yao,* Mingjiang Zhong

Lecturer Yehia Khalil

* A secondary appointment with primary affiliation in another department or school.

⁺ A joint appointment with another school.

COMPUTER SCIENCE

Chair Zhong Shao

Directors of Graduate Studies

Lin Zhong (lin.zhong@yale.edu) Vladimir Rokhlin

Professors Dana Angluin (*Emerita*), James Aspnes, Dirk Bergemann,* Abhishek Bhattacharjee, Ronald Coifman,* Aaron Dollar,* Julie Dorsey, Joan Feigenbaum, Michael Fischer, Robert Frank,* David Gelernter, Mark Gerstein,* John Lafferty,* Rajit Manohar,* Vladimir Rokhlin,† Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao, Avi Silberschatz, Daniel Spielman, Phillipp Strack,* Leandros Tassiulas,* Nisheeth Vishnoi, Y. Richard Yang, Lin Zhong, Steven Zucker†

Associate Professors Yang Cai, Theodore Kim, Smita Krishnaswamy,* Sahand Negahban,* Charalampos Papamanthou, Ruzica Piskac, Robert Soule, Jakub Szefer*

Assistant Professors Ian Abraham,* Kim Blenman,* Arman Cohan, Yongshan Ding, Benjamin Fisch, Tesca Fitzgerald, Julian Jara-Ettinger,* Anurag Khandelwal, Quanquan Liu, Tom McCoy,* Daniel Rakita, Katerina Sotiraki, David van Dijk,* Marynel Vázquez, Andre Wibisono, Alex Wong, Zhitao Ying, Manolis Zampetakis

Senior Lecturers James Glenn, Stephen Slade

Lecturers Timos Antonopoulos, Timothy Barron, Ozan Erat, Kyle Jensen,* Janet Kayfetz, Jay Lim, Dylan McKay, Cody Murphey, Sohee Park, Scott Petersen, Brad Rosen, Alan Weide, Cecillia Xie

* A secondary appointment with primary affiliation in another department or school.

⁺ A joint appointment with another department.

ELECTRICAL AND COMPUTER ENGINEERING

Chair Jung Han

Director of Graduate Studies

Hong Tang (hong.tang@yale.edu)

Professors Hui Cao,* Ronald Coifman,† James Duncan,* Anna Gilbert,† Jung Han, Liangbing Hu, Roman Kuc, Rajit Manohar, A. Stephen Morse, Kumpati Narendra (*Emeritus*), Daniel Prober,* Lawrence Staib,* Hong Tang, Leandros Tassiulas, J. Rimas Vaisnys (*Emeritus*), Fengnian Xia

Associate Professors Amin Karbasi, Jakub Szefer

Assistant Professors Dionysis Kalogerias, Mengxia Liu, Owen Miller,* Priyadarshini Panda, Shreya Saxena*

* A secondary appointment with primary affiliation in another department or school.

⁺ A joint appointment with another department.

MECHANICAL ENGINEERING AND MATERIALS SCIENCE

Chair Udo Schwarz

Director of Graduate Studies

Jan Schroers (jan.schroers@yale.edu)

Professors Charles Ahn,[†] Ira Bernstein (*Emeritus*), Juan Fernández de la Mora, Aaron Dollar, Alessandro Gomez, Sohrab Ismail-Beigi,^{*} Shun-Ichiro Karato,^{*} Marshall Long (*Emeritus*), Corey O'Hern, Vidvuds Ozolins,^{*} Brian Scassellati,^{*} Jan Schroers, Udo Schwarz, Mitchell Smooke Associate Professors Rebecca Kramer-Bottiglio, Madhusudhan Venkadesan

Assistant Professors Ian Abraham, Yimin Luo, Amir Pahlavan, Diana Qiu, Cong Su, Daniel Wiznia*

Senior Lecturer Beth Anne Bennett

Lecturers Joran Booth, Lawrence Wilen, Joseph Zinter

- * A secondary appointment with primary affiliation in another department or school.
- ⁺ A joint appointment with another department.

Programs of study are offered in the areas of applied mechanics, applied physics, computer science, mechanical engineering and materials science, chemical and environmental engineering, electrical engineering, biomedical engineering, and personalized medicine and applied engineering. All programs are under the School of Engineering & Applied Science.

APPLIED PHYSICS Fields of Study

Fields include areas of theoretical and experimental condensed-matter and materials physics, optical and laser physics, quantum engineering, and nanoscale science. Specific programs include surface and interface science, first principles electronic structure methods, photonic materials and devices, complex oxides, magnetic and superconducting artificially engineered systems, quantum computing and superconducting device research, quantum transport and nanotube physics, quantum optics, and random lasers.

BIOMEDICAL ENGINEERING

Fields of Study

Biological and medical devices, biological signals and sensors, biomaterials, biophotonics, cellular biomechanics, computational biomechanics, computational medicine, computer vision, digital image analysis and processing, drug delivery, energy metabolism, experimental biomechanics, gene delivery, gene therapy, image analysis, Magnetic Resonance Imaging (MRI), Magnetic Resonance Spectroscopy (MRS), modeling in mechanobiology, molecular biomechanics, nanomedicine, network analysis, neuroreceptors, physics of image formation (MRI, optics, ultrasound, nuclear medicine, and X-ray), physiology and human factors engineering, Positron Emission Tomography (PET), regenerative medicine, signaling pathways, Single Photon Emission Computed Tomography (SPECT), systems biology, systems medicine, tissue engineering, tracer kinetic modeling, and vascular biology.

CHEMICAL AND ENVIRONMENTAL ENGINEERING Fields of Study

Fields include nanomaterials, polymers, interfacial phenomena, energy, water and air quality, environmental microbiology, carbon capture, and sustainability.

COMPUTER SCIENCE Fields of Study

Algorithms and computational complexity, artificial intelligence, data networking, databases, graphics, machine learning, programming languages, robotics, scientific computing, security and privacy, and systems.

ELECTRICAL AND COMPUTER ENGINEERING Fields of Study

Fields include biomedical sensory systems, communications and signal processing, neural networks, control systems, wireless networks, sensor networks, microelectromechanical and nanomechanical systems, nanoelectronic science and technology, optoelectronic materials and devices, semiconductor materials and devices, quantum and nonlinear photonics, quantum materials and engineering, computer engineering, computer architecture, hardware security, neuromorphic computing, and VLSI design.

MECHANICAL ENGINEERING AND MATERIALS SCIENCE Fields of Study

Fluids and thermal sciences Electrospray theory and characterization; electrical propulsion applications; aerodynamic instrumentation for separation of clusters and aerosol particles; heterogeneous nucleation in the gas phase; combustion and flames; computational methods for fluid dynamics and reacting flows; interfacial flows and instabilities and transport phenomena in disordered media.

Soft matter/complex fluids Jamming and slow dynamics in gels, glasses, and granular materials; mechanical properties of soft and biological materials; rheology and statistical mechanics of muscle; structure and dynamics of proteins and other macromolecules and wetting of soft solids, elastocapillarity, poroelasticity, microrheology and scattering.

Materials science Studies of structure-property-processing relationships; thin films; nanoscale effects on electronic, optical, and emergent properties of two-dimensional layered materials; picoscale characterization and engineering; correlated electron systems; molecular beam epitaxy; metallic glasses; sustainable metallurgy; data centered research approaches; nanomaterials; characterization of crystallization and other phase transformations; nanoimprinting; atomic-scale investigations of surface interactions and properties; classical and quantum nanomechanics; nanostructured energy applications; combinatorial materials science; data science in materials science; materials genome; scanning probe microscopy; theoretical spectroscopy and computational materials science; and halide perovskites.

Robotics/mechatronics Machine and mechanism design; dynamics and control; robotic grasping and manipulation; legged locomotion; multi-agent search and exploration; optimal control for learning; model-predictive control; reinforcement learning; human-machine interface; rehabilitation robotics; haptics; soft robotics; flexible and stretchable electronics; soft material manufacturing; responsive material

actuators; artificial muscle; soft-bodied control; electromechanical energy conversion; biomechanics of human movement and human-powered vehicles.

Bioengineering Engineering sciences of living systems; biomolecular structure; biomechanics; motor control; animal locomotion; cell and tissue mechanics; biomaterials and therapeutics; human health and orthopaedics; bio-inspired computation and design; biomaterials and cell-material interaction.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in Applied Physics, Biomedical Engineering, Chemical and Environmental Engineering, and Mechanical Engineering and Materials Science may also apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

QUANTUM MATERIALS SCIENCE AND ENGINEERING (QMSE)

Students applying to the Ph.D. program in Applied Physics or Mechanical Engineering and Materials Science may also apply to be part of the QMSE program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The online publication *Qualification Procedure for the Ph.D. Degree* describes in detail all requirements in Biomedical Engineering, Chemical and Environmental Engineering, Electrical Engineering, and Mechanical Engineering & Materials Science. The student is strongly encouraged to read it carefully; key requirements are briefly summarized below. See Computer Science's departmental entry in this bulletin for special requirements for the Ph.D. in Computer Science and the Applied Physics departmental entry for special requirements for the Ph.D. in Applied Physics.

Students plan their course of study in consultation with faculty advisers (the student's advisory committee). A minimum of ten term courses is required, to be completed in the first two years. Well-prepared students may petition for course waivers based on courses taken in a previous graduate degree program. Similarly, students may place out of certain ENAS courses via an examination prepared by the course instructor. Placing out of the course will not reduce the total number of required courses. Core courses, as identified by each department, should be taken in the first year unless otherwise noted by the department. With the permission of the departmental director of graduate studies (DGS), students may substitute more advanced courses that cover the same topics. During the first year, students are required to register for two Special Investigations; any additional terms of Special Investigations will not count toward the degree. At least two elective courses must be outside the area of the dissertation. All students must complete a one-term course, Responsible Conduct of Research, in the first year of study.

Each term, the faculty review the overall performance of the student and report their findings to the DGS who, in consultation with the associate dean, determines whether

the student may continue toward the Ph.D. degree. By the end of the second term, it is expected that a faculty member has agreed to accept the student as a research assistant, and it is required that by the beginning of the third term, the faculty adviser provides the financial support indicated in the admissions offer letter, barring the award of external funding. By December 5 of the third year, an area examination must be passed and a written prospectus submitted before dissertation research is begun. These events result in the student's admission to candidacy. Subsequently, the student will report orally each year to the full advisory committee on progress. When the research is nearing completion, but before the thesis writing has commenced, the full advisory committee will advise the student on the thesis plan. A final oral presentation of the dissertation research is required to be given during term time. There is no foreign language requirement.

Teaching experience is regarded as an integral part of the graduate training program at Yale University, and all Engineering graduate students are required to serve as teaching fellows for two terms, typically during year two. Teaching duties normally involve assisting in laboratories or discussion sections and grading papers and are not expected to require more than ten hours per week. Students are not permitted to teach during their first year of study.

If a student was admitted to the program having earned a score of less than 26 on the Speaking Section of the Internet-based TOEFL, the student will be required to take an English as a Second Language (ESL) course each term at Yale until the graduate school's Oral English Proficiency standard has been met. This must be achieved by the end of the third year for the student to remain in good standing.

CORE COURSE REQUIREMENTS FOR THE PH.D. DEGREE

Applied Physics See the departmental entry for Applied Physics in this bulletin.

Biomedical Engineering ENAS 510, ENAS 550. One of these courses may be taken in the second year. In addition, there is a math requirement that must be met by taking ENAS 500, ENAS 505, or ENAS 549 in the first year. Students enrolled in IGPPEB may also meet the math requirement by taking ENAS 541 or ENAS 561.

Chemical and Environmental Engineering (Chemical track) ENAS 500, and two of the following three courses: ENAS 521, ENAS 602, ENAS 603.

Chemical and Environmental Engineering (Environmental track) ENAS 640, ENAS 641, ENAS 642. In addition, there is a math requirement that must be met by taking one of the following courses in the first year: ENAS 500, ENAS 748, ENV 758, or S&DS 530. Any other mathematics or statistics class can be taken as an elective in addition to one of these core classes.

Computer Science See the departmental entry for Computer Science in this bulletin.

Electrical Engineering Courses will be assigned by the adviser in coordination with the research committee, and are subject to approval by the DGS.

Mechanical Engineering and Materials Science Students must demonstrate competence in one of five areas: Fluid and Thermal Sciences, Soft Matter/ Complex Fluids, Materials Science, Robotics/Mechatronics, or Bioengineering. As a minimum requirement, students must take at least one of the following courses in the first year of study: CPSC 559, CPSC 570, CPSC 572, CPSC 573, CPSC 585, ENAS 521, ENAS 541, ENAS 559, ENAS 606, ENAS 615, ENAS 703, ENAS 704, ENAS 708, ENAS 752, ENAS 755, ENAS 770, ENAS 773, ENAS 778, ENAS 787, ENAS 848, ENAS 850, ENAS 851, ENAS 902 (if not used to satisfy the math requirement), ENAS 994, PHYS 628. There is a math requirement that must be met by taking CPSC 553, ENAS 500, ENAS 902, or PHYS 506, depending on the research area. In addition, students must take two terms of ENAS 700 during the first two years of study; this course does not count toward the ten-course requirement.

HONORS REQUIREMENT

Students must meet the Honors requirement in at least two term courses (excluding Special Investigations) by the end of the second term of full-time study. An extension of one term may be granted at the discretion of the DGS. An average grade of at least High Pass must be maintained through all courses that count toward the Ph.D.

M.D.-PH.D. STUDENTS

M.D.-Ph.D. students affiliate with the Department of Biomedical Engineering via the School of Medicine. M.D.-Ph.D. students officially affiliate with Biomedical Engineering after selecting a thesis adviser and consulting with the DGS.

The academic requirements for M.D.-Ph.D. students entering Biomedical Engineering are modified from the normal requirements for Ph.D. students. Other than the modifications listed here, M.D.-Ph.D. students in Biomedical Engineering are subject to all of the same requirements as the other graduate students in the department.

Courses Seven graduate-level courses taken for a grade must be completed during the first two years of the Ph.D. program. (One Yale graduate-level course taken for a grade during medical school may be counted toward this requirement at the discretion of the DGS.) There are three required courses: ENAS 510 and two terms of BENG 990. All students are expected to present their Special Investigation work at a department symposium held on the last day of the reading period. In addition, there is a math requirement, which may be met by taking any one of the following courses: ENAS 500, ENAS 505, or ENAS 549. Among the three electives, one must be in engineering or a closely related field. Students must obtain a grade of Honors in any two of these courses, excluding BENG 990, and maintain an average of at least High Pass.

Teaching Students are required to serve as a teaching fellow for two terms but are not permitted to teach during their first year of graduate study.

Prospectus and qualifying exam M.D.-Ph.D. students must complete and submit their thesis prospectus by the end of the fifth term as an affiliated graduate student. Students who affiliate at the customary point of year three must submit the approved prospectus before the end of the fall term of the fifth year (at the beginning of year three as an affiliated Ph.D. student). After submitting the prospectus, students present their results to date and their proposed research to their thesis committee in an area examination. Students are given two opportunities to pass this exam.

Candidacy M.D.-Ph.D. students will be admitted to candidacy once they have completed their course requirements, passed their qualifying exam, and had their dissertation prospectus approved by their advisory committee.

Further requirements M.D.-Ph.D. students who are admitted to candidacy are required to have an annual Thesis Committee meeting. In the first year after admission to candidacy, students are expected to present their research work at a departmental seminar. Attendance at weekly Biomedical Engineering Seminars is mandatory. A final oral presentation of the dissertation research is required before students may submit to the Dissertation Office.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. (en route to the Ph.D.) To qualify for the M.S., the student must pass eight term courses; no more than two may be Special Investigations. An average grade of at least High Pass is required, with at least one grade of Honors.

Terminal Master's Degree Program Students may also be admitted directly to a terminal master's degree program. The requirements are the same as for the M.S. en route to the Ph.D., although there are no core course requirements for students in this program. This program is normally completed in one year, but a part-time program may be spread over as many as four years. Some courses are available in the evening, to suit the needs of students from local industry.

The Master's of Science in Personalized Medicine and Applied Engineering Directed and taught jointly by faculty in the School of Engineering & Applied Sciences and the School of Medicine, this program prepares biomedical, mechanical, and electrical engineers, as well as computer science majors and medical students, with the tools to develop innovative 3D solutions for personalized medicine. The program trains graduate students to develop and apply 3D technology to address surgical and medical conditions, with the goal of personalizing healthcare treatments to improve patient clinical outcomes. Additional societal benefits include lower healthcare costs and improved patient quality of life. Prospective students should apply through the Graduate School of Arts and Sciences (https://gsas.yale.edu/admissions/degreeprogram-application-process).

The program is one full year: summer through spring. Students are required to participate in an eight-week, summer clinical immersion session prior to registration in fall term sequence courses. Although course credit is not awarded for the clinical program, completion of the requirement will be noted on the transcript.

Students have flexibility in selecting the focus of their special investigation projects as well as an optional biomedical engineering industry collaboration project ("internal internship") tailored to their specific academic backgrounds and interests. For example, students with a strong engineering background may want to focus on medical school-focused classes, while medical students may want to focus on engineering-related courses. Students must take a total of eight courses, of which six courses are required of all students in the program: PMAE 526, PMAE 527, PMAE 528, PMAE 529, and two terms of PMAE 532 or PMAE 990. In rare exceptions, students may be allowed to take both with approval from the program director and DGS. With the approval of the program's DGS, the final two courses may be chosen from Yale-wide graduate-level technical electives, which must be approved by the program's DGS. An average grade of at least High Pass is required, with at least one grade of Honors.

Joint Master's Degree Program (School of Engineering & Applied Science and School of the Environment) The joint master's degree program offered by the School of the Environment (YSE) and the School of Engineering & Applied Science (SEAS) provides environmental engineers and environmental managers with the opportunity to develop knowledge and tools to address the complex relationship between technology and the environment. This joint-degree program will train graduate students to design and manage engineered and natural systems that address critical societal challenges, while considering the complex technical, economic, and sociopolitical systems relationships. Each joint program leads to the simultaneous award of two graduate professional degrees: either the Master of Environmental Management (M.E.M.) or the Master of Environmental Science (M.E.Sc.) from YSE, and a Master of Science (M.S.) from SEAS. Students can earn the two degrees concurrently in 2.5 years, less time than if they were pursued sequentially. Candidates spend the first year at YSE, the second year at SEAS, and their final term at YSE. Joint-degree students are guided in this process by advisers in both YSE and SEAS. Candidates must submit formal applications to both YSE and SEAS and be admitted separately to each School, i.e., each School makes its decision independently. It is highly recommended that students apply to and enter a joint-degree program from the outset, although it is possible to apply to the second program once matriculated at Yale. Prospective students to the joint-degree program apply to the YSE master's degree through YSE (https://apply.environment.yale.edu/ apply) and to the SEAS master's degree in Chemical and Environmental Engineering through the Graduate School of Arts and Sciences (https://gsas.yale.edu/admissions/ degree-program-application-process).

The following six courses are required of all joint-degree YSE/SEAS master's students completing their M.S. in Environmental Engineering: ENAS 641, ENAS 642, ENAS 660, ENV 773, ENV 838, and either ENV 712 or ENV 724. Two additional Yale-wide technical electives approved by the DGS (or faculty in an equivalent role in Environmental Engineering) are required. These courses may be cross-listed with or administered by YSE with prior approval from the DGS. For the joint-degree requirements for completion of the M.E.M. or M.E.Sc. in YSE, see the bulletin of the Yale School of the Environment at https://bulletin.yale.edu.

Program information is available via email to engineering@yale.edu or at our website, http://seas.yale.edu.

COURSES

The list of courses may be slightly modified by the time term begins. Please visit https://courses.yale.edu for the most updated course listing.

CENG 990a or b, Special Investigations Staff

Faculty-supervised individual projects with emphasis on research, laboratory, or theory. Students must define the scope of the proposed project with the faculty member who has agreed to act as supervisor, and submit a brief abstract to the director of graduate studies for approval.

ENAS 500a, Mathematical Methods I Martin Pfaller

A beginning, graduate-level introduction to ordinary and partial differential equations, vector analysis, linear algebra, and complex functions. Laplace transform, series expansion, Fourier transform, and matrix methods are given particular attention.

Applications to problems frequently encountered in engineering practice are stressed throughout.

ENAS 502b / S&DS 551b, Stochastic Processes Ilias Zadik

Introduction to the study of random processes, including Markov chains, Markov random fields, martingales, random walks, Brownian motion, and diffusions. Techniques in probability such as coupling and large deviations. Applications chosen from image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, genetics, and evolution.

ENAS 508b, Responsible Conduct of Research Staff

Required of first-year students. Presentation and discussion of topics and best practices relevant to responsible conduct of research including academic fraud and misconduct, conflict of interest and conflict of commitment, data acquisition and human subjects, use and care of animals, publication practices and responsible authorship, mentor/ trainee responsibilities and peer review, and collaborative science. o Course cr

ENAS 509a, Electronic Materials Mengxia Liu

Survey and review of fundamental material issues pertinent to modern microelectronic and optoelectronic technology. Topics include band theory, electronic transport, surface kinetics, diffusion, defects in crystals, thin film elasticity, crystal growth, and heteroepitaxy.

ENAS 510a, Physical and Chemical Basis of Bioimaging and Biosensing Douglas Rothman and Ansel Hillmer

Basic principles and technologies for imaging and sensing the chemical, electrical, and structural properties of living tissues and biological macromolecules. Topics include magnetic resonance spectroscopy, MRI, positron emission tomography, and molecular imaging with MRI and fluorescent probes.

ENAS 517b / MB&B 517b / MCDB 517b / PHYS 517b, Methods and Logic in

Interdisciplinary Research Corey O'Hern and Emma Carley This full PEB class is intended to introduce students to integrated approaches to research. Each week, the first of two sessions is student-led, while the second session is led by faculty with complementary expertise and discusses papers that use different approaches to the same topic (for example, physical and biological or experiment and theory).

ENAS 518a / CBIO 635 / MB&B 635a, Quantitative Methods in Biophysics Nikhil Malvankar, Julien Berro, and Yong Xiong

An introduction to quantitative methods relevant to analysis and interpretation of biological data. Topics include statistical testing, data presentation, and error analysis; introduction to artificial intelligence-based data analysis tools, Alpha Fold Tutorial, introduction to mathematical modeling of biological dynamics; and Fourier analysis in signal/image processing and macromolecular structural studies. Instruction in basic programming skills and data analysis using MATLAB; study of real data from MB&B research groups. Prerequisites: MATH 120 and MB&B 600 or equivalents, or permission of the instructors.

ENAS 519b, Responsible Conduct of Research Vincent Wilczynski Required of first-year students in Chemical & Environmental Engineering, Electrical Engineering, and Mechanical Engineering & Materials Science. Presentation and discussion of topics and best practices relevant to responsible conduct of research including academic fraud and misconduct, conflict of interest and conflict of commitment, data acquisition and human subjects, use and care of animals, publication practices and responsible authorship, mentor/trainee responsibilities and peer review, and collaborative science. o Course cr

ENAS 521b, Classical and Statistical Thermodynamics Peijun Guo A unified approach to bulk-phase equilibrium thermodynamics, bulk-phase irreversible thermodynamics, and interfacial thermodynamics in the framework of classical thermodynamics, and an introduction to statistical thermodynamics. Both the activity coefficient and the equations of state are used in the description of bulk phases. Emphasis on classical thermodynamics of multicomponents, including concepts of stability and criticality, curvature effect, and gravity effect. The choice of Gibbs free energy function covers applications to a broad range of problems in chemical, environmental, biomedical, and petroleum engineering. The introduction includes theory of Gibbs canonical ensembles and the partition functions, fluctuations; Boltzmann statistics; Fermi-Dirac and Bose-Einstein statistics. Application to ideal monatomic and diatomic gases is covered.

ENAS 522a, Engineering and Biophysical Approaches to Cancer Michael Mak This course examines the current understanding of cancer as a complex disease and the advanced engineering and biophysical methods developed to study and treat this disease. All treatment methods are covered. Basic quantitative and computational backgrounds are required. Prerequisites: BENG 249 or equivalent and MATH 120 or equivalent.

ENAS 523a, Data and Clinical Decision-Making John Onofrey and Michael Choma Data and computation are reshaping medicine and clinical decision-making. Examples include acute states of physiological failure such as shock and sepsis as well as failure modes associated with aging (e.g., delirium/acute brain failure, falls). This seminar provides (1) a modern, clinically facing view of physiological failure and (2) a survey of how data and computation are reshaping clinical concepts and practice, including decision-making. Key topics and concepts include medical data types (e.g., imaging, lab values, oximetry); nonlinearity and complexity in physiological resilience and failure; clinically relevant AI/ML methods; data-driven definitions of medical disease; predictive modeling as a distinct field in AI/ML; and clinical decision-making using modern data and computational tools. The course is led by two instructors with complementary backgrounds that include AI/ML, statistics/data science, medical physiology, clinical medicine, and digital health. Guest lecturers from both clinical practice and industry provide additional context. Course work includes scientific literature review, written reports, oral presentations, and a final project. Students interested in AI/ML in medicine in both academic and industry settings with an engineering/medical background would benefit from this course. The course provide the requisite background for physiology and assumes a basic understanding of AI/ML but has no strict prerequisites.

ENAS 534a, Biomaterials Anjelica Gonzalez

Introduction to materials, classes of materials from atomic structure to physical properties. Major classes of materials: metals, ceramics and glasses, and polymers, addressing their specific characteristics, properties, and biological applications. Throughout the presentation of the synthesis, characterization, and properties of the classes of materials, a connection is made to the selection of materials for use in specific biological applications by matching the material's properties to those necessary for success in the application. Case studies address the successes and failures of particular materials from each of the classes in biological applications.

ENAS 535b / PATH 630b, Biomaterial-Tissue Interactions Themis Kyriakides Study of the interactions between tissues and biomaterials, with an emphasis on the importance of molecular- and cellular-level events in dictating the performance and longevity of clinically relevant devices. Attention to specific areas such as biomaterials for tissue engineering and the importance of stem/progenitor cells, as well as biomaterial-mediated gene and drug delivery.

ENAS 539a, Small Objects Timothy Newton

This course is offered to graduate and undergraduate students who wish to pursue their own special talents, follow their passions, and expand possibilities and creative impulses to create a small object of their own design. The course is cross-listed with architecture, neuroscience, and engineering & applied science and intentionally brings together students with different backgrounds and experiences. The course explores the ideation, design processes, and fabrication of a functioning prototype. Potential areas of exploration include, but are not limited to: jewelry, furniture, experimental scientific instruments, electronic devices, architectural objects, lighting, cutlery, packaging, and musical instruments. Proposal submissions are due by August 18. See course syllabus for course and proposal details. Selection for the course is through application only.

ENAS 541a / CB&B 523a / MB&B 523a / PHYS 523a, Biological Physics Yimin Luo This course has three aims: (1) to introduce students to the physics of biological systems, (2) to introduce students to the basics of scientific computing, and (3) to familiarize students with characterization methods and analysis tools. We focus on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, entropic forces, membranes, and cell motion using computational tools and methods. We provide intensive tutorials for Matlab including basic syntax, arrays, functions, plotting, and importing and exporting data.

ENAS 542b, Topics in Computational and Systems Biology Purushottam Dixit This course covers topics related to modeling biological networks across time and length scales. Specifically, the course covers models of intracellular signaling networks, transcriptional regulation networks, cellular metabolic networks, and ecological networks in microbial consortia. For each type of network, we cover the biological basics, standard mathematical treatments including deterministic and stochastic modeling, methods to infer model parameters from data, and new machine-learning based inference approaches. The required mathematical methods are briefly covered. The course assignments involve coding in MATLAB.

ENAS 544a, Fundamentals of Medical Imaging Chi Liu, Dana Peters, and Gigi Galiana

Review of basic engineering and physical principles of common medical imaging modalities including X-ray, CT, PET, SPECT, MRI, and echo modalities (ultrasound and optical coherence tomography). Additional focus on clinical applications and cutting-edge technology development.

ENAS 549b, Biomedical Data Analysis Richard Carson

The course focuses on the analysis of biological and medical data associated with applications of biomedical engineering. It provides basics of probability and statistics,

and analytical approaches for determination of quantitative biological parameters from noisy, experimental data. Programming in MATLAB to achieve these goals is a major portion of the course. Applications include Michaelis-Menten enzyme kinetics, Hodgkin-Huxley, neuroreceptor assays, receptor occupancy, MR spectroscopy, PET neuroimaging, brain image segmentation and reconstruction, and molecular diffusion.

ENAS 550a / C&MP 550a / MCDB 550a / PHAR 550a / PTB 550a, Physiological

Systems W. Mark Saltzman and Stuart Campbell The course develops a foundation in human physiology by examining the homeostasis of vital parameters within the body, and the biophysical properties of cells, tissues, and organs. Basic concepts in cell and membrane physiology are synthesized through exploring the function of skeletal, smooth, and cardiac muscle. The physical basis of blood flow, mechanisms of vascular exchange, cardiac performance, and regulation of overall circulatory function are discussed. Respiratory physiology explores the mechanics of ventilation, gas diffusion, and acid-base balance. Renal physiology examines the formation and composition of urine and the regulation of electrolyte, fluid, and acid-base balance. Organs of the digestive system are discussed from the perspective of substrate metabolism and energy balance. Hormonal regulation is applied to metabolic control and to calcium, water, and electrolyte balance. The biology of nerve cells is addressed with emphasis on synaptic transmission and simple neuronal circuits within the central nervous system. The special senses are considered in the framework of sensory transduction. Weekly discussion sections provide a forum for in-depth exploration of topics. Graduate students evaluate research findings through literature review and weekly meetings with the instructor.

ENAS 551b, Biotransport and Kinetics Kathryn Miller-Jensen

Creation and critical analysis of models of biological transport and reaction processes. Topics include mass and heat transport, biochemical interactions and reactions, and thermodynamics. Examples from diverse applications, including drug delivery, biomedical imaging, and tissue engineering.

ENAS 553a, Immunoengineering Tarek Fahmy

An advanced class that introduces immunology principles and methods to engineering students. The course focuses on biophysical principles and biomaterial applications in understanding and engineering immunity. The course is divided into three parts. The first part introduces the immune system: organs, cells, and molecules. The second part introduces biophysical characterization and quantitative modeling in understanding immune system interactions. The third part focuses on intervention, modulation, and techniques for studying the immune system with emphasis on applications of biomaterials for intervention and diagnostics.

ENAS 555b, Vascular Mechanics Staff

This course is designed to enable students to apply methods of continuum biomechanics to study diverse vascular conditions and treatments, including aging, atherosclerosis, aneurysms, effects of hypertension, design of tissue-engineered constructs, and vein grafts from an engineering perspective. Emphasis is placed on ensuring that the mechanics is driven by advances in the vascular mechanobiology.

ENAS 556b, Molecular and Cellular Biomechanics Michael Murrell The basic mechanical principles at the molecular and cellular level that underlie the major physical behaviors of the cell, from cell division to cell migration. Basic cellular physiology, methodology for studying cell mechanical behaviors, models for understanding the cellular response under mechanical stimulation, and the mechanical impact on cell differentiation and proliferation.

ENAS 558a, Introduction to Biomechanics Michael Murrell

An introduction to the biomechanics used in biosolid mechanics, biofluid mechanics, biothermomechanics, and biochemomechanics. Diverse aspects of biomedical engineering, from basic mechanobiology to characterization of materials behaviors and the design of medical devices and surgical interventions.

ENAS 561b / AMTH 765b / CB&B 562b / INP 562b / MB&B 562b / MCDB 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

ENAS 565a, Practical Applications of Bioimaging and Biosensing Daniel Coman, Ansel Hillmer, and Evelyn Lake

Detecting, measuring, and quantifying the structural and functional properties of tissue is of critical importance in both biomedical research and medicine. This course focuses on the practicalities of generating quantitative results from raw bioimaging and biosensing data to complement other courses focus on the theoretical foundations which enable the collection of these data. Participants in the course work with real, cutting-edge data collected here at Yale. They become familiar with an array of current software tools, denoising and processing techniques, and quantitative analysis methods that are used in the pursuit of extracting meaningful information from imaging data. The subject matter of this course ranges from bioenergetics, metabolic pathways, molecular processes, brain receptor kinetics, protein expression and interactions to wide spread functional networks, long-range connectivity, and organ-level brain organization. The course provides a unique hands-on experience with processing and analyzing in vitro and in vivo bioimaging and biosensing data that is relevant to current research topics. The specific imaging modes which are covered include in vivo magnetic resonance spectroscopy (MRS) and spectroscopic imaging (MRSI), functional, structural, and molecular imaging (MRI), wide-field fluorescent optical imaging, and positron emission tomography (PET). The course provides the necessary background in biochemistry, bioenergetics, and biophysics for students to motivate the image manipulations which they learn to perform. Prerequisites: Math through first order differential equations, PHYS 180/181, CHEM 161, BIOL 101/102, BENG 249 or other experience with scientific software like MATLAB, BENG 350 and BENG 410 (both of which can be taken at the same time as this course) o Course cr

ENAS 566b, Engineering of Drug Delivery W. Mark Saltzman

Drug delivery is a field of biomedical engineering that aims to develop approaches and technologies for getting pharmaceutical agents into particular cells and tissues in the body for a biological effect, while minimizing unwanted toxic or side effects. The course describes two interrelated fields of study: (1) mathematical descriptions of the biological barriers to drug delivery (diffusion, permeation through membranes, lifetime of circulation); and (2) engineering design to improve drug delivery. Prerequisite: ENAS 551a.

ENAS 567b, Systems Biology of Cell Signaling Andre Levchenko This course designed for graduate and advanced undergraduate students is focused on systems biology approaches to the fundamental processes underlying the sensory capability of individual cells and cell-cell communication in health and disease. The course is designed to provide deep treatment of both the biological underpinnings and mathematical modeling of the complex events involved in signal transduction. As such, it can be attractive to students of biology, bioengineering, biophysics, computational biology, and applied math. The class is part of the planned larger track in systems biology, being one of its final, more specialized courses. In spite of this, each lecture has friendly introduction to the specific topic of interest, aiming to provide sufficient refreshment of the necessary knowledge. The topics have been selected to represent both cutting-edge directions in systems analysis of signaling processes and exciting settings to explore, making learning complex notions more enjoyable. Prerequisites: basic knowledge of biochemistry and cell biology, as well as programming experience and basic notions from probability theory and differential equations.

ENAS 568b, Topics in Immunoengineering Tarek Fahmy

This course addresses the intersection of immunobiology with engineering and biophysics. It invokes engineering tools, such as biomaterials, solid-state devices, nanotechnology, biophysical chemistry, and chemical engineering, toward developing newer and effective solutions to cancer immunotherapy, autoimmune therapy, vaccine design, transplantation, allergy, asthma, and infections. The central theme is that dysfunctional immunity is responsible for a wide range of disease states and that engineering tools and methods can forge a link between the basic science and clinically translatable solutions that will potentially be "modern cures" to disease. This course is a follow-up to ENAS 553 and focuses more on the clinical translated to the clinic and eventually to the market. Prerequisites: ENAS 553, differential equations, and advanced calculus.

ENAS 575a / CPSC 575a / INP 575a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students.

ENAS 585b / INP 585b, Fundamentals of Neuroimaging Fahmeed Hyder and Douglas Rothman

The neuroenergetic and neurochemical basis of several dominant neuroimaging methods, including fMRI. Topics range from technical aspects of different methods to interpretation of the neuroimaging results. Controversies and/or challenges for application of fMRI and related methods in medicine are identified.
ENAS 591a / QMSE 501a, Introduction to Quantum Materials Science and Engineering Sohrab Ismail-Beigi and Corey O'Hern

This course introduces basic concepts and methodologies relevant for understanding and performing research on quantum materials. The course is designed for Ph.D. students in engineering, physics, chemistry, mathematics, or computer science who are interested in the promise of quantum materials and who wish to understand what quantum materials are, how they can be used, and how one investigates them scientifically and engineers their properties. The emphasis is on core concepts and learning by solving research relevant problems on model systems via computer simulations and theoretical analyses. Note that this course is required for the QMSE certificate. Prerequisites: one semester of quantum mechanics at the undergraduate level and one semester of undergraduate level vector calculus and differential equations.

ENAS 600a or b, Computer-Aided Engineering Staff

Aspects of computer-aided design and manufacture (CAD/CAM). The computer's role in the mechanical design and manufacturing process; commercial tools for two- and three-dimensional drafting and assembly modeling; finite-element analysis software for modeling mechanical, thermal, and fluid systems.

ENAS 602a, Chemical Reaction Engineering Eric Altman

Applications of physical-chemical and chemical-engineering principles to the design of chemical process reactors. Ideal reactors treated in detail in the first half of the course, practical homogeneous and catalytic reactors in the second.

ENAS 603b, Energy, Mass, and Momentum Processes Michael Loewenberg Application of continuum mechanics approach to the understanding and prediction of fluid flow systems that may be chemically reactive, turbulent, or multiphase.

ENAS 606a, Polymer Chemistry and Physics Mingjiang Zhong

A graduate-level introduction to the physics and physical chemistry of macromolecules. This course covers the static and dynamic properties of polymers in solution, melt and surface adsorbed states and their relevance in industrial polymer processing, nanotechnology, materials science, and biophysics. Starting from basic considerations of polymerization mechanisms, control of chain architecture, and a survey of polymer morphology, the course also extensively addresses experimental methods for the study of structure and dynamics via various scattering (light, x-ray, neutron) and spectroscopic methods (rheology, photon correlation spectroscopy) as integral components of polymer physics.

ENAS 609a, Principles and Design of Energy Devices Shu Hu

This is a comprehensive course with content at the intersection of nanoscale science, engineering, and technology, including application areas and nanofabrication technique. Topics include nanoscaled photovoltaic cells, hydrogen storage, fuel cells, and nanoelectronics; layer-by-layer assembly; organic-inorganic mesostructures; colloidal crystals, organic monolayers, proteins, DNA and abalone shells; synthesis of carbon nanotubes, nanowire, and nanocrystals; microelectromechanical systems (MEMs) devices; photolithography, electron beam lithography, and scanning probe lithography; lithium-based batteries; and nanomanufacturing (roll to roll, nanoimprint lithography, inkjet printing).

ENAS 615a, Synthesis of Nanomaterials Lisa Pfefferle

This course focuses on the synthesis and engineering of nanomaterials. We also introduce different types of nanomaterials, unique properties at the nanoscale, measurement, and important applications of nanomaterials (including biomedical, electronic, and energy applications). Synthesis methods covered include gas phase and high vacuum techniques (CVD, MOCVD) as well as wet chemistry techniques such as reduction of metal salts, sonochemistry, and sol gel methods. Taking sample applications, we discuss the properties necessary for each, and how to control these properties through synthesis control, such as by using templating methods.

ENAS 641a or b, Biological Processes in Environmental Engineering Jordan Peccia Fundamental aspects of microbiology and biochemistry, including stoichiometry, kinetics, and energetics of biochemical reactions, microbial growth, and microbial ecology, as they pertain to biological processes for the transformation of environmental contaminants; principles for analysis and design of aerobic and anaerobic processes, including suspended- and attached-growth systems, for treatment of conventional and hazardous pollutants in municipal and industrial wastewaters and in groundwater.

ENAS 642b, Environmental Physicochemical Processes Jaehong Kim Fundamental and applied concepts of physical and chemical ("physicochemical") processes relevant to water quality control. Topics include chemical reaction engineering, overview of water and wastewater treatment plants, colloid chemistry for solid-liquid separation processes, physical and chemical aspects of coagulation, coagulation in natural waters, filtration in engineered and natural systems, adsorption, membrane processes, disinfection and oxidation, disinfection by-products.

ENAS 648b, Environmental Transport Processes Menachem Elimelech Analysis of transport phenomena governing the fate of chemical and biological contaminants in environmental systems. Emphasis on quantifying contaminant transport rates and distributions in natural and engineered environments. Topics include distribution of chemicals between phases; diffusive and convective transport; interfacial mass transfer; contaminant transport in groundwater, lakes, and rivers; analysis of transport phenomena involving particulate and microbial contaminants.

ENAS 660b, Green Engineering and Sustainability Julie Zimmerman This hands-on course highlights the key approaches to advancing sustainability through engineering design. The class begins with discussions on sustainability, metrics, general design processes, and challenges to sustainability. The current approach to design, manufacturing, and disposal is discussed in the context of examples and case studies from various sectors. This provides a basis for what and how to consider when designing products, processes, and systems to contribute to furthering sustainability. The fundamental engineering design topics to be addressed include toxicity and benign alternatives, pollution prevention and source reduction, separations and disassembly, material and energy efficiencies and flows, systems analysis, biomimicry, and life cycle design, management, and analysis. Students tackle current engineering and product design challenges in a series of class exercises and a final design project.

ENAS 670b, Membrane Science and Technology Menachem Elimelech This course provides a comprehensive introduction to membrane science and technology, covering principles, theories, applications, and advancements in membrane-based separation processes. Topics include overview of membrane technologies, membrane materials, solvent and solute transport mechanisms and theories, and applications in chemical separations, water treatment, desalination, and energy. Students also explore emerging trends in membrane research and applications.

ENAS 700a or b, Research Seminars in Mechanical Engineering & Materials Science Jan Schroers

The purpose of this course is to introduce graduate students to state-of-the-art research in all areas of Mechanical Engineering & Materials Science (MEMS), as well as related disciplines, so that students understand the range of current research questions that are being addressed. An important goal is to encourage students to explore research topics beyond their particular field of study and develop the ability to contextualize their work in terms of larger research questions in MEMS. We therefore require that MEMS Ph.D. students enrolled in this course attend at least eight research seminars during the term: six must be part of the official MEMS seminar series, and two can be from any other relevant Yale graduate department/program seminar series. This course is graded Sat/ Unsat with sign-in sheets used to monitor attendance. Required of first- and secondyear MEMS Ph.D. students. o Course cr

ENAS 703a, Introduction to Nanomaterials and Nanotechnology Cong Su Survey of nanomaterial synthesis methods and current nanotechnologies. Approaches to synthesizing nanomaterials; characterization techniques; device applications that involve nanoscale effects.

ENAS 704b, Theoretical Fluid Dynamics Juan de la Mora

Derivation of the equations of fluid motion from basic principles. Potential theory, viscous flow, flow with vorticity. Topics in hydrodynamics, gas dynamics, stability, and turbulence.

ENAS 711b, BioMEMS & Biomedical Microdevices Rong Fan

Principles and applications of micro- and nanotechnologies for biomedicine. Approaches to fabricating micro- and nanostructures. Fluid mechanics, electrokinetics, and molecular transport in microfluidic systems. Integrated biosensors and microTAS for laboratory medicine and point-of-care uses. High-content technologies including DNA, protein microarrays, and cell-based assays for differential diagnosis and disease stratification. Emerging nanobiotechnology for systems medicine. Prerequisites: CHEM 112a, 114a, or 118a, and ENAS 194a or b.

ENAS 713a, Acoustics Eric Dieckman

Wave propagation in strings, membranes, plates, ducts, and volumes; plane, cylindrical, and spherical waves; reflection, transmission, and absorption characteristics; sources of sound. Introduction to special topics such as architectural, underwater, psychological, nonlinear, and musical acoustics, noise, and ultrasonics.

ENAS 718b, Advanced Electronic Devices Mengxia Liu

The science and technology of semiconductor electron devices. Topics include compound semiconductor material properties and growth techniques; heterojunction, quantum well, and superlattice devices; quantum transport; graphene and other 2-D material systems.

ENAS 725a / APHY 725a, Advanced Synchrotron Techniques and Electron Spectroscopy of Materials Charles Ahn

This course provides descriptions of advanced concepts in synchrotron X-ray and electron-based methodologies for studies of a wide range of materials at atomic and nano-scales. Topics include X-ray and electron interactions with matter, X-ray scattering and diffraction, X-ray spectroscopy and inelastic methods, time-resolved applications, X-ray imaging and microscopy, photo-electron spectroscopy, electron microscopy and spectroscopy, among others. Emphasis is on applying the fundamental knowledge of these advanced methodologies to real-world materials studies in a variety of scientific disciplines.

ENAS 747b, Applied Numerical Methods for Algebraic Systems, Eigensystems, and Function Approximation Beth Anne Bennett

The derivation, analysis, and implementation of various numerical methods. Topics include root-finding methods, numerical solution of systems of linear and nonlinear equations, eigenvalue/eigenvector approximation, polynomial-based interpolation, and numerical integration. Additional topics such as computational cost, error analysis, and convergence are studied in several contexts throughout the course.

ENAS 758b, Multiscale Models of Biomechanical Systems Stuart Campbell Current methods for simulating biomechanical function across biological scales, from molecules to organ systems of the human body. Theory and numerical methods; case studies exploring recent advances in multiscale biomechanical modeling. Includes computer laboratory sessions that introduce relevant software packages.

ENAS 770b, Introduction to Soft Robotics Rebecca Kramer-Bottiglio This course covers topics including robot kinematics, elastic materials models, conductive composites, responsive material actuators, simple controllers, and physicsbased soft robot simulation. The course also includes a project. Projects must involve theoretical modeling, design implementation, and/or experimental testing of a scientific hypothesis, and must have a mechanics and/or materials component. Prerequisites: prior course work in solid mechanics and familiarity with MATLAB.

ENAS 772**b**, Introduction to Embedded Robotic Systems Ahalya Prabhakar This project-based course gives students an introduction to concepts useful for a robotics engineer working with practical embedded systems as well as experience with a variety of sensors and software tools needed for working with robots. Students are provided an overview of the different components of robotic systems, including planning, estimation, and control. Topics such as kinematics, dynamics (for robotics), frame transforms, twists, and wrenches will be introduced in the course. In addition, students learn how to use the Robot Operating System (ROS 2) to connect concepts and components relevant to robotic systems. Furthermore, they learn how to write software and simulations to interface sensors and actuators, and to integrate different components in a system, including planning, estimation, and control. By the end of the course, students complete a project using a real robot.

ENAS 776a, Fluid Mechanics of Natural Phenomena Amir Pahlavan This course draws inspiration from nature and focuses on utilizing the fundamental concepts of fluid mechanics and soft matter physics to explain these phenomena. We study a broad range of problems related to (1) nutrient transport in plants, slime molds, and fungi and the adaptation of their networks in dynamic environments, (2) collective behavior and chemotaxis of swimming microorganisms, and (3) pattern formation in nature, e.g. icicles, mud cracks, salt polygons, dendritic crystals, and Turing patterns. We also discuss how our understanding of these problems could be used to develop sustainable solutions for the society, e.g. designing synthetic trees to convert CO₂ to oxygen, developing micro/nano robots for biomedical applications, and utilizing pattern formation and self-assembly to make new materials.

ENAS 778a, Advanced Robotic Mechanisms Aaron Dollar

ENAS 787b, Forces on the Nanoscale Udo Schwarz

Modern materials science often exploits the fact that atoms located at surfaces or in thin layers behave differently from bulk atoms to achieve new or greatly altered material properties. The course provides an in-depth discussion of intermolecular and surface forces, which determine the mechanical and chemical properties of surfaces. In the first part, we discuss the fundamental principles and concepts of forces between atoms and molecules. Part two generalizes these concepts to surface forces. Part three then gives a variety of examples. The course is of interest to students studying thin-film growth, surface coatings, mechanical and chemical properties of surfaces, soft matter including biomembranes, and colloidal suspensions.

ENAS 800a, Smart City Engineering with IoT Andrei Khurshudov

A smart city is one that employs technology to gather data from various sources such as sensors, people, devices, vehicles, and buildings. This data is then used for optimal decision-making and control. Cities around the world are adopting "smart" technology, thereby transforming urban life. Utilizing the Internet of Things (IoT), cities like Barcelona, London, and Singapore aim to improve living standards, boost the economy, and enhance sustainability. They achieve this through innovations like intelligent streetlights, smart electric grids, and advanced traffic systems. The Internet of Things, a global network consisting of connected sensors, machines, devices, communication networks, and decision-making algorithms is facilitating a new wave of the industrial revolution. This course is designed for both graduate and undergraduate students and offers a comprehensive overview of the key technologies shaping contemporary and future smart cities. It delves into the foundational elements of IoT devices and applications, covering topics such as: data analytics using ML and AI (which will be used to address practical problems); smart sensors and interconnected devices; IoT data: formats, transmission, and storage; Cloud and Edge computing, and the associated trade-offs; connectivity and wireless communication technologies; device failure prevention and reliability modeling; and other relevant subjects.

ENAS 805b, Biotechnology and the Developing World Staff

This interactive course explores how advances in biotechnology enhance the quality of life in the developing world. Implementing relevant technologies in developing countries is not without important challenges; technical, practical, social, and ethical aspects of the growth of biotechnology are explored. Readings from *Biomedical Engineering for Global Health* as well as recent primary literature; case studies, in-class exercises, and current events presentations. Guest lecturers include biotechnology researchers, public policy ethicists, preventive research physicians, public-private partnership specialists, and engineers currently implementing health-related technologies in developing countries.

ENAS 806b, Photovoltaic Energy Fengnian Xia

Electricity from photovoltaic solar cells is receiving increasing attention due to growing world demand for clean power sources. This course primarily emphasizes device physics of photovoltaics; statistics of charge carriers in and out of equilibrium; design of solar cells; and optical, electrical, and structural properties of semiconductors relevant to photovoltaics. Two laboratory sessions and a final project aid students in understanding both the applications and limitations of photovoltaic technology. The main objectives of this course are to equip students with the necessary background and analytical skills to understand and assess established and emerging photovoltaic technologies; to familiarize students with the diverse range of photovoltaic materials; and to connect materials properties to aspects of cell design, processing, and performance.

ENAS 825a, Physics of Magnetic Resonance Spectroscopy in Vivo Graeme Mason The physics of chemical measurements performed with nuclear magnetic resonance spectroscopy, with special emphasis on applications to measurement studies in living tissue. Concepts that are common to magnetic resonance imaging are introduced. Topics include safety, equipment design, techniques of spectroscopic data analysis, and metabolic modeling of dynamic spectroscopic measurements.

ENAS 850a / APHY 548a / PHYS 548a, Solid State Physics I Vidvuds Ozolins A two-term sequence (with APHY 549) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

ENAS 851b / APHY 549b / PHYS 549b, Solid State Physics II Yu He A two-term sequence (with APHY 548) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

ENAS 868a, Emerging Materials and Technologies toward Sustainability Liangbing Hu

The goal of this course is to demonstrate the role of new materials and emerging technologies in solving one of the most critical socio-economic issues of our time – sustainability. The course focuses on electrochemical, electrical, optical, thermal, and mechanically functional materials and their use in energy devices. Topics to be covered include electrochemical energy conversion and storage (fuel cells and batteries), catalysts and membrane separations (fossil fuel and biomass energy conversion), electrified heating (Joule, plasma, microwave), solar thermal and fuel, thermoelectrics, energy efficient lighting, and building energy savings (light, thermal).

ENAS 876a, Silicon Compilation Rajit Manohar

A course for seniors and first-year graduate students on compiling computations into digital circuits using asynchronous design techniques. Emphasis is on the synthesis of circuits that are robust to uncertainties in gate and wire delays by the process of program transformations. Topics include circuits as concurrent programs, delay-insensitive design techniques, synthesis of circuits from programs, timing analysis and performance optimization, pipelining, and case studies of complex asynchronous designs.

ENAS 900b, Decisions and Computations across Networks A Stephen Morse Within the field of network science there has long been interest in distributed computation and distributed decision-making problems of many types. Among these are consensus and flocking problems, the multi-robot rendezvous problem, distributed averaging, distributed solutions to linear algebraic equations, social networking problems, localization of sensors in a multisensor network, and the distributed management of robotic formations. The aim of this course is to explain what these problems are and to discuss their solutions. Related concepts from spectral graph theory, rigid graph theory, non-homogeneous Markov chain theory, stability theory, and linear system theory are covered. Prerequisite: although most of the mathematics needed are covered in the lectures, students taking this course should have a working understanding of basic linear algebra.

ENAS 902a, Linear Systems A Stephen Morse

Background linear algebra; finite-dimensional, linear-continuous, and discrete dynamical systems; state equations, pulse and impulse response matrices, weighting patterns, transfer matrices. Stability, Lyapunov's equation, controllability, observability, system reduction, minimal realizations, equivalent systems, McMillan degree, Markov matrices. Recommended for all students interested in feedback control, signal and image processing, robotics, econometrics, and social and biological networks.

ENAS 905a, Applied Digital Signal Process Roman Kuc

ENAS 924b, Computer Hardware Security Jakub Szefer

This course provides an in-depth examination of computers and their hardwarebased security issues. The operation of the hardware, from transistors to processor microarchitectures, has intimate impact on the security of the whole system. Often, software or algorithms executing on a computer have no control over, or detailed access to, the underlying hardware. Yet, the operation of the hardware and different types of side-effects, such as changing timing, changing power consumption, EM emanations, or different types of crosstalk effects lead to information leakage. To understand the hardware-based security issues, and how to prevent them, the course focuses on classical microprocessors, accelerators such as Field Programmable Gate Arrays, as well as emerging technologies such as Quantum Computers. For the different types of computers, the course teaches students about the various hardware security issues, and students are able to experiment and perform hands-on exercises to demonstrate different types of information leaks. Students also learn about latest research through reading and presenting research papers in class.

ENAS 940a, Neural Networks and Learning Systems Priya Panda Neural networks (NNs) have become all-pervasive, giving us self-driving cars, Siri voice assistant, Alexa, and many more. While deep NNs deliver state-of-the-art accuracy on many artificial intelligence tasks, it comes at the cost of high computational complexity. Accordingly, designing efficient hardware architectures for deep neural networks is an important step toward enabling the wide deployment of NNs, particularly in low-power computing platforms, such as mobiles, embedded Internet of Things (IoT), and drones. This course aims to provide a thorough overview of deep learning techniques, while highlighting the key trends and advances toward efficient processing of deep learning in hardware systems, considering algorithm-hardware codesign techniques. Prerequisite: prior exposure to probability/linear algebra/matrix operations at basic undergraduate level is expected. Prior knowledge of programming language like Python NumPy is useful. Familiarity with digital system design with basic understanding of logic, memory, and related design components is expected.

ENAS 952a, Internet Engineering Leandros Tassiulas

ENAS 963b, Network Algorithms and Stochastic Optimization Leandros Tassiulas This course focuses on resource allocation models as well as associated algorithms and design and optimization methodologies that capture the intricacies of complex networking systems in communications computing as well as transportation, manufacturing, and energy systems. Max-weight scheduling, back-pressure routing, wireless opportunistic scheduling, time-varying topology network control, and energy-efficient management are sample topics to be considered, in addition to Lyapunov stability and optimization, stochastic ordering, and notions of fairness in network resource consumption.

ENAS 968a, Cloud Computing with FPGAs Jakub Szefer

This course is an intermediate- to advanced-level course focusing on digital design and use of Field Programmable Gate Arrays (FPGAs). The course centers around the new cloud computing paradigm of using FPGAs that are hosted remotely by cloud providers and accessed remotely by users. The theoretical aspects of the course focus on digital system modeling and design using the Verilog Hardware Description Language (Verilog HDL). In the course, students learn about logic synthesis, behavioral modeling, module hierarchies, combinatorial and sequential primitives, and implementing and testing the designs in simulation and real FPGAs. Students learn about topics ranging from high-level ideas about cloud computing to low-level details of interfacing servers to FPGAs, PCIe protocol, AXI protocol, and other common communication protocols between hardware modules or between AXI protocols, and how to write software that runs on the cloud servers and leverages the FPGAs and the host computer, including Serial, SPI, and I2C. Students also learn about and use FPGA tools from Xilinx, but course also touches on tools available from Intel (formerly Altera) as well as open-source tools. The practical aspects of the course include semester-long projects leveraging commercial or in-lab remote FPGAs, based on the project selected by students. Students should be familiar with digital design basics and have some experience with Hardware Description Languages such as Verilog or VHDL.

ENAS 991a / MB&B 591a / MCDB 591a / PHYS 991a, Integrated Workshop Yimin Luo

This required course for students in the PEB graduate program involves a series of modules, co-taught by faculty, in which students from different academic backgrounds and research skills collaborate on projects at the interface of physics, engineering, and biology. The modules cover a broad range of PEB research areas and skills. The course starts with an introduction to MATLAB, which is used throughout the course for analysis, simulations, and modeling.

ENAS 994b, Mechatronics Laboratory Ian Abraham

Hands-on synthesis of control systems, electrical engineering, and mechanical engineering. Review of Laplace transforms, transfer functions, software tools for solving ODEs. Review of electronic components and introduction to electronic instrumentation. Introduction to sensors, mechanical power transmission elements, programming microcontrollers, and PID control.

English Language and Literature

Linsly-Chittenden Hall, 203.432.2233 http://english.yale.edu M.A., M.Phil., Ph.D.

Chair Jessica Brantley

Director of Graduate Studies Jonathan Kramnick (106a LC, 203.432.2226)

Professors Jessica Brantley, David Bromwich, Ardis Butterfield, Jill Campbell, Joe Cleary, Erica Edwards, Jacqueline Goldsby, Langdon Hammer, Margaret Homans, Cajetan Iheka, Jonathan Kramnick, Pericles Lewis, Stefanie Markovits, Feisal Mohamed, Stephanie Newell, Catherine Nicholson, John Durham Peters, Marc Robinson, Caleb Smith, Katie Trumpener, Shane Vogel, Michael Warner, Ruth Bernard Yeazell

Associate Professors Ben Glaser, Juno Richards, Emily Thornbury, R. John Williams, Sunny Xiang

Assistant Professors Anastasia Eccles, Marcel Elias, Jonathan Howard, Elleza Kelley, Naomi Levine, Joseph Miranda, Ernest Mitchell, Priyasha Mukhopadhyay, Joseph North, Nicole Sheriko, Lloyd Sy

FIELDS OF STUDY

Fields include English language and literature from Old English to the present, American literature, and Anglophone world literature.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

In order to fulfill the basic requirements for the program, a student must:

- 1. Complete twelve courses six courses with at least one grade of Honors and a maximum of one grade of Pass by July 15 following the first year; at least twelve courses with grades of Honors in at least four of these courses and not more than one Pass by July 15 following the second year. One of these twelve courses must be The Teaching of English (ENGL 9090). Courses selected must include one course in at least three out of four designated historical periods: medieval, early-modern, eighteenth- and/or nineteenth-century, twentieth- and/or twenty-first-century. Students are also encouraged to take at least one seminar that adds geographic, linguistic, cultural, and/or methodological breadth to their course of study. Two of these courses may be taken in other departments with the approval of the DGS.
- 2. Satisfy the language requirement by the end of the second year. Two languages appropriate to the student's field of specialization, each to be demonstrated by (a) *passing a translation exam* administered by a Yale language department, at the conclusion of a GSAS Summer Language for Reading course, or (for languages not tested elsewhere at Yale) by the English department; (b) *passing an advanced literature course at Yale* (graduate or upper-level undergraduate, with director of graduate studies [DGS] approval); or (c) *passing both* ENGL 500 *and* ENGL 501.

- 3. Pass the oral examination before or as early as possible in the fifth term of residence. The exam consists of questions on four topics, developed by the student in consultation with examiners and subject to approval by the DGS.
- 4. Submit a dissertation prospectus, normally by January 15 of the third year.
- 5. Teach a minimum of two terms, since the English department considers teaching an integral part of graduate education. In practice, most students teach between four and six terms.
- 6. Submit a dissertation.

Upon completion of all predissertation requirements, including the prospectus, students are admitted to candidacy for the Ph.D. Admission to candidacy must take place by the end of the third year of study.

COMBINED PH.D. PROGRAMS English and African American Studies

The Department of English Language and Literature also offers, in conjunction with the Department of African American Studies, a combined Ph.D. degree in English Language and Literature and African American Studies. For further details, see African American Studies.

English and Early Modern Studies

The Department of English Language and Literature also offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in English Language and Literature and Early Modern Studies. For further details, see Early Modern Studies.

English and Film and Media Studies

The Department of English Language and Literature also offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. degree in English Language and Literature and Film and Media Studies. For further details, see Film and Media Studies.

English and History of Art

The Department of English Language and Literature also offers, in conjunction with the Department of the History of Art, a combined Ph.D. degree in English Language and Literature and History of Art. The requirements are designed to emphasize the interdisciplinarity of the combined degree program.

Coursework In years one and two, a student in the combined program will complete sixteen courses: ten seminars in English, including The Teaching of English (ENGL 9090) and one course in at least three out of four designated historical periods (medieval, early modern, eighteenth– and/or nineteenth-century, twentieth– and/or twenty-first century), and six in history of art, including HSAR 500 and one course outside the student's core area. Up to two cross-listed seminars may count toward the number in both units, reducing the total number of courses to fourteen.

Languages Two languages pertinent to the student's field of study, to be determined and by agreement with the advisers and directors of graduate studies. Normally the language requirement will be satisfied by passing a translation exam administered by one of Yale's language departments. One examination must be passed during the first year of study, the other by the end of the third year.

Qualifying Paper History of Art requires a qualifying paper in the spring term of the second year. The paper must demonstrate original research, a logical conceptual structure, stylistic lucidity, and the ability to successfully complete a Ph.D. dissertation. The qualifying paper will be evaluated by two professors from History of Art and one professor from English.

Qualifying Examination *Written exam:* addressing a question or questions having to do with a broad state-of-the-field or historiographic topic. Three hours, closed book, written by hand or on a non-networked computer. *Oral exam:* given one week after the written exam, covering four fields, including two in English (question periods of twenty minutes each, covering thirty texts each, representing three distinct fields of literary history) and three in history of art (twenty-five minutes each, fields to be agreed on in advance with advisers and DGS). Exam lists will be developed by the student in consultation with faculty examiners.

Teaching Two years of teaching – one course per term in years three and four – are required: two in English and two in History of Art.

Prospectus The dissertation prospectus must be approved by both English and History of Art. The colloquium will take place in the spring term of the third year of study. The committee will include at least one faculty member from each department. As is implied by its title, the colloquium is not an examination, but a meeting during which the student can present ideas to a faculty committee and receive advice from its members. The colloquium should be jointly chaired by the directors of graduate studies of both departments.

First Chapter Reading Students will participate in a first chapter reading (also known as a first chapter conference) normally within a year of advancing to candidacy (spring term of year four). The dissertation committee, including faculty members from both departments, will discuss the progress of the student's work in a seminar-style format.

Dissertation Defense The hour-long defense is a serious intellectual conversation between the student and the committee. Present at the defense will be the student's advisers, committee, and the directors of graduate studies in both English and History of Art; others may be invited to comment after the committee's questioning is completed.

English and Women's, Gender, and Sexuality Studies

The Department of English Language and Literature also offers, in conjunction with the Program in Women's, Gender, and Sexuality Studies, a combined Ph.D. in English Language and Literature and Women's, Gender, and Sexuality Studies. For further details, see Women's, Gender, and Sexuality Studies.

MASTER'S DEGREES

M.Phil. Students may declare their intention in the first or second term of the third year to complete an M.Phil. degree instead of the Ph.D. Students must first submit a research proposal and may request a teaching waiver for the term in which they complete the research project, typically in the second term of the third year or the first

term of the fourth year. Permission to pursue the M.Phil. *en route* to the Ph.D., without additional research leave, may be granted by special permission of the DGS and the GSAS Dean's Office.

M.A. (en route to the Ph.D.) Students enrolled in the Ph.D. program may receive the M.A. upon completion of seven courses with at least one grade of Honors and a maximum of one grade of Pass, and the passing of one foreign language.

Terminal Master's Degree Program Students enrolled in the master's degree program must complete either seven term courses or six term courses and a special project within the English department. (One or two of these courses may be taken in other departments with approval of the DGS.) There must be at least one grade of Honors, and there may not be more than one grade of Pass. Students must also demonstrate proficiency in one foreign language (as described under Special Requirements for the Ph.D. Degree, above).

COURSES

ENGL 500a / LING 500a / MDVL 665a, Old English I Emily Thornbury The essentials of the language, some prose readings, and close study of several celebrated Old English poems.

ENGL 537a, The Gawain Poet Jessica Brantley

The course offers a contextual study of four of the greatest (and most enigmatic) Middle English poems – *Pearl, Patience, Cleanness,* and *Sir Gawain and the Green Knight.* At its center is British Library MS Cotton Nero A.x, the single medieval book that contains them all. In addition to reading the poems closely in their manuscript context, we examine associated artworks, from the twelve illustrations in the Cotton MS that constitute a medieval reading of the poems, to *St. Erkenwald,* a poem preserved elsewhere that some argue was written by the same author. Finally, we think about the modern reception of the poems through a serious engagement with scholarly debate surrounding them, and also through comparative work with translations.

ENGL 551a / EMST 541a, Spenser's Readers Catherine Nicholson

This course has two complementary, though sometimes divergent, objects of interest: the first is the poetry of Edmund Spenser, particularly his immense allegorical epic-romance, *The Faerie Queene*; the second is that poem's varied and often vexed reception history, from the late sixteenth century through the present. *The Faerie Queene* is a poem about interpretation – its pleasures and its discontents – and we often find ourselves reading over the shoulders of readers in the poem. But it is also possible to read the poem through the eyes of other historical readers, adopting their (often alien) expectations, ambitions, and preoccupations as a way of discovering new things in the text and of reflecting on the biases and assumptions of our own critical practices. In this sense, this is a course about readerly methods and the history of reading as well as a course about Spenser, and participants whose primary interests lie outside the English Renaissance are warmly welcomed.

ENGL 7222 / EMST 572a, Transatlantic Literature, 1688–1818 Jill Campbell Study of multiple genres in the literatures of Great Britain, North America, and the Caribbean from the late seventeenth to the early nineteenth century, with twenty-first-century creative and critical works providing a range of contemporary responses. Special focus on the role of literature in advancing and contesting concepts of race and

gender as features of identity and systems of power, with attention to the circulation of goods, people, ideas, and literary works among regions. Readings from the long eighteenth century to include works by Aphra Behn, Phillis Wheatley, Samson Occam, Olaudah Equiano, Omar Ibn Said, Leonora Sansay, and Maria Edgeworth. Twentyfirst-century creative works by Biyi Bandele, Yaa Gyasi, Mary Kathryn Nagle, Honorée Fanonne Jeffers, Rhiannon Giddens and Michael Abel; with critical selections from Édouard Glissant, Sylvia Wynter, Dionne Brand, Christina Sharpe, and Habiba Ibrahim.

ENGL 858a / AMST 858a, Edgar Allan Poe and His Critics Caleb Smith A seminar on Poe's work and how people think about it. We read Poe's gothic tales, detective stories, Romantic poetry, book reviews, essays, satires, and hoaxes. We also take up some of his interlocutors, such as Charles Baudelaire, Walter Benjamin, Jorge Luis Borges, Colin Dayan, Jacques Lacan, Mat Johnson, Toni Morrison, Emily Ogden, and Walt Whitman. Histories of slavery and empire, science and secularism, crime and punishment, magazine culture and the literary marketplace. Theories of consciousness, aesthetics, affect, power, guilt.

ENGL 889a / AFST 889a / CPLT 889a, Postcolonial Ecologies Cajetan Iheka This seminar examines the intersections of postcolonialism and ecocriticism as well as the tensions between these conceptual nodes, with readings drawn from across the global South. Topics of discussion include colonialism, development, resource extraction, globalization, ecological degradation, nonhuman agency, and indigenous cosmologies. The course is concerned with the narrative strategies affording the illumination of environmental ideas. We begin by engaging with the questions of postcolonial and world literature and return to these throughout the semester as we read primary texts, drawn from Africa, the Caribbean, and Asia. We consider African ecologies in their complexity from colonial through post-colonial times. In the unit on the Caribbean, we take up the transformations of the landscape from slavery, through colonialism, and the contemporary era. Turning to Asian spaces, the seminar explores changes brought about by modernity and globalization as well as the effects on both humans and nonhumans. Readings include the writings of Zakes Mda, Aminatta Forna, Helon Habila, Derek Walcott, Jamaica Kincaid, Ishimure Michiko, and Amitav Ghosh. The course prepares students to respond to key issues in postcolonial ecocriticism and the environmental humanities, analyze the work of the major thinkers in the fields, and examine literary texts and other cultural productions from a postcolonial perspective. Course participants have the option of selecting from a variety of final projects. Students can craft an original essay that analyzes primary text from a postcolonial and/or ecocritical perspective. Such work should aim at producing new insight on a theoretical concept and/or the cultural text. They can also produce an undergraduate syllabus for a course at the intersection of postcolonialism and environmentalism or write a review essay discussing three recent monographs focused on postcolonial ecocriticism.

ENGL 902a, Elizabeth Bishop Langdon Hammer

An experiment in intensive author-centered reading, this course studies the life, writing, and visual art of Elizabeth Bishop using tools from biography, gender studies, queer theory, object relations psychoanalysis, and phenomenology. We read against chronology and the focus on single poems in conventional close reading. Topics for discussion include the pressures on and possibilities for a woman poet's career in the mid-twentieth-century United States; the relations between poetry and painting, verse and prose, and private and public writing; the idea of minor literature, and the figure of the minor; Bishop in Brazil and as a hemispheric poet; houses; epistolarity; secularity and religion; the role of objects and the senses in subject formation; the ordinary, perverse, and fantastic; tourism, cosmopolitanism, and the local; the poetics of description. We use archives in the Yale Collection of American Literature at Beinecke Library and in Special Collections, Vassar College Library. In addition to Bishop, readings include, among others, Christopher Bollas, Judith Butler, Lee Edelman, Melanie Klein, Maurice Merleau-Ponty, Marion Milner, and D.W. Winnicott.

ENGL 906a / AMST 696a / ER&M 696a / HSHM 782a / RLST 630a / WGSS 696a,

Michel Foucault I: The Works, The Interlocutors, The Critics Greta LaFleur This graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on The History of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Instructor permission required.

ENGL 915a / CPLT 754a, Western and Postcolonial Marxist Cultural Theory Joe Cleary

An introduction to classic twentieth-century Western and postcolonial Marxist theorists and texts focusing on historical and intellectual exchange between these critical formations. Reading theoretical works in conjunction with some selected literary texts, the course tracks how key Marxian concepts such as capital and class consciousness, modes of production, praxis and class struggles, reification, commodification, totality, and alienation have been developed across these traditions and considers how these concepts have been used to rethink literary and other cultural forms and their ongoing transformation in a changing world system. Writers discussed may include G.W.F. Hegel, Karl Marx, Friedrich Engels, Georg Lukács, Mikhail Bakhtin, Theodor Adorno, Max Horkheimer, Walter Benjamin, Jean-Paul Sartre, Simone de Beauvoir, Toril Moi, C.L.R. James, W.E.B. Du Bois, Frantz Fanon, Paul Gilroy, Antonio Gramsci, Raymond Williams, Fredric Jameson, Perry Anderson, Giovanni Arrighi, Cornel West, and others. The object of the seminar is to provide students with a solid intellectual foundation in these still-developing hermeneutic traditions.

ENGL 928a / CPLT 933a / FILM 751a, British Cinema Katie Trumpener Key films and topics in British cinema. Special attention to the provincial origins of British cinema; overlaps between filmic, literary, and visual modernism; attempts to build on the British literary and dramatic tradition; cinema's role in the war effort and in redefining national identity; postwar auteur and experimental filmmaking; "heritage" films and alternative approaches to tradition. Accompanying readings in British film theorists, film sociology (including Mass Observation), and cultural studies accounts of film spectatorship and memories. Films by Mitchell and Kenyon, Maurice Elvey, Anthony Asquith, Len Lye, John Grierson, Alfred Hitchcock, Alberto Cavalcanti, Humphrey Jennings, Michael Powell, Carol Reed, David Lean, Karel Reisz, Lindsay Anderson, Richard Lester, Peter Watkins, Stanley Kubrick, Laura Mulvey, Ken Loach, Mike Leigh, Terence Davies, Terry Gilliam, Peter Greenaway, Michael Winterbottom, Patrick Keiller, Steve McQueen.

ENGL 935a / AFAM 522a / AMST 721a, The Beautiful Struggle: Blackness, the Archive, and the Speculative Daphne Brooks

This seminar takes its inspiration from concepts and questions centering theories that engage experimental methodological approaches to navigating the opacities of the archive: presumptively "lost" narratives of black life, obscure(d) histories, compromised voices and testimonials, contested (auto)biographies, anonymous testimonies, textual aporias, fabulist documents, confounding marginalia. The scholarly and aesthetic modes by which a range of critics and poets, novelists, dramatists, and historians have grappled with such material have given birth to new analytic lexicons -from Saidiya Hartman's "critical fabulation" to José Estaban Muñoz's "ephemera as evidence" to Tavia Nyong'o's "Afrofabulation." Such strategies affirm the centrality of speculative thought and invention as vital and urgent forms of epistemic intervention in the hegemony of the archive and open new lines of inquiry in black studies. Our class explores a variety of texts that showcase these new queries and innovations, and we also actively center our efforts from within the Beinecke Rare Book and Manuscript Library, where a number of sessions are held and where we focus on Beinecke holdings that resonate with units of the course. Various sessions also feature distinguished guest interlocutors via Zoom, who are on hand to discuss the specifics of their research methods and improvisational experimentations in both archival exploration and approaches to their prose and poetic projects.

ENGL 938a / AFAM 510a, Black Geographic Thought Elleza Kelley This seminar focuses on classic and recent scholarship that constitute the interdisciplinary subfield of "black geographies." Bearing in mind that black studies is not merely the study of black people but, as Alexander Weheliye puts it, "a substantial critique of Western modernity and a sizable archive of social, political, and cultural alternatives," this seminar explores the critiques and alternatives that black studies brings to bear on the feeling, knowledge, representation, and politics of space and place. While we study scholarship across discipline (by geographers, architectural theorists, historians, etc.), we pay particular attention to how cultural production, like literature and visual art, articulates black geographic and spatial thought and how it might engage with, challenge, and enrich the fields of critical and literary geographies. Along the way, our study of literature is transformed by careful attention to the geographic, architectural, and ecological. We read the work of scholars like Katherine McKittrick, Clyde Woods, and AbdouMaliq Simone alongside creative works by poets, novelists, artists, filmmakers, architects, and more, from Toni Morrison and Dionne Brand to Torkwase Dyson and Mati Diop.

ENGL 979b / FREN 668b / HSAR 668b, Ekphrasis and Art Criticism Carol Armstrong

Ekphrasis in its ancient Greek sense refers to the vivid description of an object, animal, person, place, scene, or event undertaken as an exercise in oral rhetoric. In that original context, the practice of ekphrasis was meant to "paint" a picture in the mind of the listener, and thus pointed to both the imagistic capacities of verbal language, and the integral link between the image and the imagination. In the twentieth century, ekphrasis acquired a narrower meaning: poetry addressed to or modeled on works of visual art. While informed by both of those understandings, this seminar considers ekphrasis both more broadly, in terms of genre, and more narrowly, in relation to a partial history of art criticism as a modern form of writing in the anglophone and European worlds, with a focus on the eighteenth through the twentieth century. It treats the different writerly modes now understood to be embraced by the term ekphrasis: not only poetry, but also the prose poem and the novel, as well as the Salon and art review. It also touches on such issues as the Renaissance inversion of the phrase ut pictura poesis; the competition between the arts of word and image; the presence or absence of illustrations; the modern relations between genres and mediums and the question of mediation; and the address of the different arts to the subjectivity of the reader/spectator. In addition to weekly presentations, a short preliminary paper, and a final research paper, students organize and contribute to a workshop on ekphrasis based on their own ekphrastic exercises, undertaken in the Yale Art Gallery. (Some class time is devoted to those exercises.) This seminar is the second of two (the first is HSAR 667); our hope is that students from both seminars will collaborate on this final event.

ENGL 992a, Advanced Pedagogy Heather Klemann

Training for graduate students teaching introductory expository writing. Students plan a course of their own design on a topic of their own choosing, and they then put theories of writing instruction into practice by teaching a writing seminar. Prerequisite: open only to graduate students teaching ENGL 114.

ENGL 993a, Prospectus Workshop Naomi Levine

A workshop in which students develop, draft, revise, and present their dissertation prospectuses, open to all third-year Ph.D. students in English.

ENGL 995a / ENGL 9095, Directed Reading Staff

Designed to help fill gaps in students' programs when there are corresponding gaps in the department's offerings. By arrangement with faculty and with the approval of the DGS.

ENGL 5197b / AMST 697b / ER&M 697b / HSHM 783b, Michel Foucault II: The Works, the Interlocutors, The Critics Greta LaFleur

Continuing graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on The History of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Previously ENGL 907.

ENGL 5805b / CPLT 605b, Edward Said as Public Intellectual Robyn Creswell This seminar focuses on Edward Said's reflections on the role and responsibilities of the intellectual, paying particular attention to his writings on Palestine, the politics and culture of the Arab world, and the discourse of expertise. We also examine the reception of Said's ideas and example among Arab thinkers. Texts include *Orientalism, The Question of Palestine, After the Last Sky, Representations of the Intellectual*, and numerous essays. Previously ENGL 905.

ENGL 5865b / CPLT 665b / WGSS 665b, African Feminism and African Women Writers Helen Yitah

This course looks at how major African women writers such as Ama Ata Aidoo, Mariama Ba, Bessie Head, Nawal El Saadawi, Grace Ogot, and Chimamanda Adichie have represented African feminist concerns and aesthetics in their works. We explore some of their interrogation of sexism and patriarchal social structures, the thematization of gender relations, a rethinking of marginality, and the presentation of alternative frames of reference for (re)defining female subjectivities and identities by reading selected works through the lens of African feminist thought, including Molara Ogundipe-Leslie's stiwanism, Catherine Acholonu's motherism, Obioma Nnaemeka's nego-feminism, and Mary Kolawole's and Chikwenye Ogunyemi's versions of womanism.

ENGL 6137b / AFAM 850b / AFST 937b, African Urban Cultures: Mediations of the City Stephanie Newell

This course approaches the study of African cities and urbanization through the medium of diverse texts, including fiction, nonfiction, popular culture, film, and the arts, as well as scholarly work on African cities. Through these cultural "texts," attention is given to everyday conceptualizations of the body and the environment, as well as to theoretical engagements with the African city. We study urban relationships as depicted in literature and popular media in relation to Africa's long history of intercultural encounters, including materials dating back to the 1880s and the 1930s. Previously ENGL 937.

ENGL 6152b / FILM 652b, Media Theory John Peters

This course provides an intensive introduction to foundational texts in media theory old and new. (It supplements rather than replicate FILM 601, Foundations in Film and Media.) This course focuses either on influential articles of the past five decades or notable books of the last decade or so (or both). In either case, the aim is to gain a familiarity with key ideas, figures, traditions, questions, and methods in media theory. Previously ENGL 923.

ENGL 6157b / AFAM 86ob / MHHR 708b, Ecologies of Black Print Jacqueline Goldsby

A survey of history of the book scholarship germane to African American literature and the ecosystems that have sustained black print cultures over time. Secondary works consider eighteenth- to twenty-first-century black print culture practices, print object production, modes of circulation, consumption, and reception. Students write critical review essays, design research projects, and write fellowship proposals based on archival work at the Beinecke Library, Schomburg Center, and other regional sites (e.g., the Sterling A. Brown papers at Williams College). Previously ENGL 957.

ENGL 6501b / MDVL 666b, Old English II Emily Thornbury

Readings in a variety of pre-Conquest vernacular genres, varying regularly, with supplementary reading in current scholarship. Current topic: Old English devotional literature, especially poetry; our readings explore early medieval strategies for cultivating emotion and understanding. Formerly ENGL 502.

ENGL 6545b / CPLT 582b / FREN 802b / MDVL 502b, Chaucer and Translation Ardis Butterfield

An exploration of the works of Geoffrey Chaucer (ca. 1340–1400), brilliant writer and translator. Using modern postcolonial as well as medieval theories of translation, memory, and bilingualism, we investigate how texts in French, Latin, and Italian are transformed, cited, and reinvented in his writings. Some key questions include: What happens to language under the pressure of crosslingual reading practices? What happens to the notion of translation in a multilingual culture? How are ideas of literary history affected by understanding Chaucer's English in relation to the other more prestigious language worlds in which his poetry was enmeshed? Texts include material in French, Middle English, Latin, and Italian. Proficiency in any one or more of these languages is welcome, but every effort is made to use texts available in modern English translation, so as to include as wide a participation as possible in the course. Formerly ENGL 545. **ENGL 6768b / CPLT 597b, The Birth of Aesthetics** Jonathan Kramnick This is a course on the emergence of aesthetic theory in Enlightenment and Romantic era Europe. We'll examine how a new language of art and nature focused on the *experience* of the beholder and track evolving categories of the sublime, beautiful, and picturesque in key texts of philosophy and literature. We'll connect ideas of aesthetic judgment and autonomy to central institutions and ideologies of the modern era, including the public sphere, secularism, the private subject, racial capitalism, and the market. Readings begin with empirical philosophies of perception and early accounts of the aesthetic in Locke, Addison, Hutcheson, Pope, Hume, and Burke and continue through the watershed moment of Wordsworth, Coleridge, Kant, and Schiller. The seminar ends with a consideration of aesthetic theory in the long contemporary period of Adorno, Scarry, Rancière, and Ngai. Previously ENGL 768.

ENGL 6873b / FILM 973b, Modernity and the Time of Literature John Williams This course examines transformations in temporality that occurred in the sciences and arts during the twentieth century. From the arrival of Einsteinian relativity to more contemporary proofs on quantum nonlocality, the question of time in the twentieth century threatened to overturn some of our oldest assumptions about cause and effect, duration, history, presentness, and futurity. These new temporalities were as scientifically and philosophically vexing as they were rife with spiritual and aesthetic possibility - a dynamic reflected in the literary and artistic forms that were central to these transformations. Our reading reflects this deeply cross-cultural and interdisciplinary trajectory, including histories of science and technology (Peter Galison, N. Katherine Hayles, David Kaiser), philosophies of time (Heidegger, Bruno Latour, Bernard Stiegler, McLuhan, Luhmann), critical theories of temporal form (Derrida, Adorno, Jameson, Pamela Lee, Kojin Karatani), a wide array of literary texts (William Burroughs, Thomas Pynchon, Ursula K. Le Guin, Tom McCarthy, and others), as well as important cinematic innovations (Jodorowsky, Godard, Kubrick). What is the "time" of literature? of film? How does art transform or reinforce theories of temporal flow? How do new technologies of composition and circulation alter the temporal effects of a given work? What was the "End of History"? Previously ENGL 973.

Environment

Kroon Hall, 203.432.5100 http://environment.yale.edu M.S., M.Phil., Ph.D.

Dean Ingrid Burke (Kroon, 203.432.5109)

Director of Doctoral Studies

Peter Raymond (Kroon 205, 203.432.0817, peter.raymond@yale.edu)

Professors Mark Ashton, Michelle Bell, Gaboury Benoit, Mark Bradford, Craig Brodersen, Marian Chertow, Liza Comita, Michael Dove, Daniel Esty, Justin Farrell, Eli Fenichel, Kenneth Gillingham, Timothy Gregoire, Matthew Kotchen, William Lauenroth, Xuhui Lee, Robert Mendelsohn, Peter Raymond, James Saiers, Oswald Schmitz, Karen Seto, David Skelly, Dorceta Taylor, Gerald Torres, John Wargo, Julie Zimmerman

Associate Professors Paulo Brando, Nyeema Harris, Narasimha Rao

Assistant Professors Sparkle Malone, Arianna Salazar Miranda, Luke Sanford, Yuan Yao

FIELDS OF STUDY

Fields include agroforestry; biodiversity conservation; biostatistics and biometry; community ecology; ecosystems ecology; ecosystems management; energy and the environment; environmental and resource policy; environmental anthropology and sociology; environmental biophysics and meteorology; environmental chemistry; environmental ethics; environmental governance; environmental health risk assessment; environmental history; environmental justice; environmental law and politics; environmental management and social ecology in developing countries; forest ecology; green chemistry and engineering; hydrology; industrial ecology; industrial environmental management; plant physiology and anatomy; pollution management; population ecology; resource economics; silviculture; social ecology; stand development, tropical ecology, and conservation; sustainable development; urban ecology; urban geography; urban land cover change; urban planning; and water resource management.

Students admitted in 2020 or earlier have the option of receiving a degree in either forestry and environmental studies or environment. Students admitted in 2021 and subsequent years will receive a degree in environment.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to take ENV 900, Doctoral Student Seminar and Responsible Conduct of Research, in the first year of their program. Courses of study are individually designated through consultation between degree candidates and their advisers and dissertation committees. The amount of coursework required will depend on the previous training of the student, but the normal requirement for a student with no previous graduate training is three or four courses per term for four terms. The program of each student will be evaluated at the end of the first year of residence. At least two term grades of Honors are required in the first two years of study; however, it is anticipated that grades of Honors or High Pass will be achieved in two-thirds of all courses taken. A written and oral qualifying examination is required upon completion of the course requirements. Students are expected to take the examination by the end of their second year, although this can be extended to the third year in cases with appropriate extenuating circumstances. At the time of the qualifying examination, the student must present a prospectus of the research work proposed for the dissertation. Successful completion of the qualifying examination and submission of the prospectus will result in admission to candidacy. Upon completion of the dissertation, the candidate must make unbound copies of the dissertation available to the faculty and appear for an oral examination at a time and place designated by the director of doctoral studies. Copies of the approved dissertation must be submitted to the graduate school. Depending upon the nature of the dissertation topic, completion of the Ph.D. degree normally requires four years.

Teaching and research experiences are regarded as integral parts of the doctoral training program in Environment. All students are required to serve as teaching fellows (ten hours per week) for four terms. The nature of the teaching assignment is determined in cooperation with the student's major adviser and the director of doctoral studies. With the permission of the director of doctoral studies, the total teaching requirement may be reduced for students who are awarded fellowships supported by outside funding. Regardless of outside funding, all doctoral students must serve as teaching fellows for a minimum of two terms.

COMBINED PH.D. PROGRAM

The graduate school offers a combined doctoral degree between the Yale School of the Environment (YSE) and the Department of Anthropology. The purpose of the degree is threefold: it combines (1) the disciplinary identity and strengths of the Anthropology department with the interdisciplinary character and possibilities of YSE, especially in terms of bridging the social and natural sciences; (2) the strengths in ecological and environmental studies of YSE with the social science strengths of the Anthropology department; and (3) the Anthropology department's strengths in theory with the emphasis within YSE on linking theory with policy and practice. The combined degree offers its graduates great flexibility when entering the marketplace. They can represent themselves as anthropologists and/or environmental scientists, as theoreticians and/or practitioners. Combined-degree recipients have the credentials to apply for policy-oriented positions with international institutions, as well as academic positions. The academic program of each student in the combined-degree program is tailored specifically to that student's particular history, interests, and needs, but all combined-degree students are expected to follow the program's general guidelines.

Prospective combined-degree students must initially apply either to Anthropology or to the doctoral program in Environment (not both) and check the combined-degree box on the application form. Students should communicate with faculty in both programs during the year prior to application, and they should apply to the program where their credentials and faculty contacts offer the greatest chance of admission. The program is extremely competitive, accepting one or two students per year out of dozens who apply. (Note: Most successful applicants to the combined program through YSE hold a prior master's degree.) Once a student is accepted in either Environment or Anthropology, the application file is sent to the second department for consideration. A positive decision at this point amounts to acceptance into the combined-degree program. (A negative decision, which is rare in any case, does not affect the student's prior admission into the first program.) Students admitted into the combined-degree program will be allocated to the department to which they initially applied as their primary administrative home, but they will enter Yale as members of the combined-degree program. A student who does not apply to the combined-degree program at the time of their initial application may still apply after matriculating at Yale, but this should be done as soon as possible in their first term on campus. Detailed guidelines for the combined-degree program can be found on the YSE website at http://environment.yale.edu/doctoral/degrees/ combined-anthropology. The program coordinators are Michael Dove (YSE) and Kalyanakrishnan Sivaramakrishnan (Anthropology).

MASTER'S DEGREES

M.Phil. (en route to the Ph.D.) Students may petition for this degree after they have passed the qualifying exam and advanced to candidacy. Applications for this master's degree are not accepted.

M.S. (en route to the Ph.D.) This degree is normally granted only to students who are withdrawing from the Ph.D. program. Applications for this master's degree are not accepted. Requirements that must be met for award of the M.S. are (1) successful completion of two years of course work in residence with two grades of Honors; (2) a written prospectus; (3) fulfillment of one term of the teaching requirement. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

For information on the terminal master's degrees offered by the Yale School of the Environment (the Master of Forestry, Master of Forest Science, Master of Environmental Management, and Master of Environmental Science degrees), visit the School's website, http://environment.yale.edu, or contact Admissions Director, Yale School of the Environment, 195 Prospect Street, New Haven CT 06511.

REQUIRED COURSE

All Ph.D. students are required to take the following course in the fall term of their first year. For a complete list of ENV courses, see the School of the Environment bulletin, available online at https://bulletin.yale.edu; and Yale Course Search at https:// courses.yale.edu.

ENV 900a, Doctoral Student Seminar and Responsible Conduct of Research

This course provides the foundation for doctoral study at the School of the Environment. Students learn what it means to do scholarly research as well as become adept with philosophy of science and research methodology and proposal writing, as a basis for exploring diverse approaches to formulating and addressing research questions. Students work with their advisers to put these concepts and principles into practice to develop the basis for their dissertation research (including building bibliography, identifying and crafting research questions, formulating research hypotheses, and drafting a research proposal). Students further learn about funding opportunities and procedures for submitting grants. The course also covers professional ethics and responsible conduct of research, including ethical approaches to inquiry and measurement, data acquisition and management, authorship and publication, peer review, conflicts of interest, mentoring, collaborative research, and animal and human subjects research. Finally, the course explores ethical ways to advocate for the application of scholarly knowledge in the interest of environmental problem solving. Weekly assigned readings support concepts and issues addressed in class. Students present their embryonic research ideas in class and use feedback from the group to further develop their ideas. 3 Course cr

European and Russian Studies

The MacMillan Center 242 Luce Hall, 203.432.3107 http://europeanstudies.macmillan.yale.edu M.A.

Acting Chair Fatima Naqvi (German; Film and Media Studies)

Director of Graduate Studies

Claire Roosien (Slavic Languages and Literatures)

Professors Bruce Ackerman (*Law*), Julia Adams (*Sociology*), Lauren Benton (*History*; Law), Dirk Bergemann (Economics; Computer Science), Paola Bertucci (History), R. Howard Bloch (French), Edyta Bojanowska (Slavic Languages and Literatures), David Bromwich (English), Paul Bushkovitch (History), Francesco Casetti (Humanities; Film and Media Studies), Carolyn Dean (History; French), Carlos Eire (History; Religious Studies), Fatima El-Tayeb (Ethnicity, Race and Migration; Women's, Gender, and Sexuality Studies), Emily Erikson (Sociology), Paul Franks (Philosophy; Judaic Studies; Religious Studies), Paul Freedman (History), Bryan Garsten (Political Science; Humanities), John Geanakoplos (Economics), Bruce Gordon (Divinity; History), Philip Gorski (Sociology), Alice Kaplan (French), Paul Kennedy (History), John MacKay (Slavic Languages and Literatures; Film and Media Studies), Ivan Marcus (History; Religious Studies), Millicent Marcus (Italian Studies), Isabela Mares (Political Science), Stefanie Markovits (English), Alan Mikhail (History), Fiesal Mohamed (English), Samuel Moyn (Law; History), Fatima Naqvi (German; Film and Media Studies), William Nordhaus (Economics; School of the Environment), Paul North (German), Mark Peterson (History), Douglas Rogers (Anthropology), Pierre Saint-Amand (French), Maurice Samuels (French), Timothy Snyder (History), Peter Swenson (Political Science), Katie Trumpener (Comparative Literature; English), Jesús Velasco (Spanish and Portuguese), Miroslav Volf (Divinity), Kirk Wetters (German), James Whitman (Law), Fabrizio Zilibotti (Economics)

Associate Professors Jennifer Allen (History), Marijeta Bozovic (Slavic Languages and Literatures; Film and Media Studies; Women's, Gender, and Sexuality Studies), Molly Brunson (Slavic Languages and Literatures), Marcela Echeverri (History), José-Antonio Espín-Sánchez (Economics), Hussein Fancy (History), Isaac Nakhimovsky (History; Humanities), Ayesha Ramachandran (Comparative Literature), William Rankin (History), Marci Shore (History)

Assistant Professors Sergei Antonov (History), Jinyi Chu (Slavic Languages and Literatures), Marcel Elias (English), Samuel Hodgkin (Comparative Literature), Egor Lazarev (Political Science), Cormac O'Dea (Economics), Giulia Oskian (Political Science), Carolyn Roberts (African American Studies; History), Claire Roosien (Slavic Languages and Literatures), Nari Shelekpayev (Slavic Languages and Literatures)

Lecturers Marnix Amand (*Economics*), Mordechai Levy-Eichel (*Political Science*), George Syrimis (*Hellenic Studies*; *Religious Studies*)

Senior Lectors Irina Dolgova (*Slavic Languages and Literatures*), Marion Gehlker (*German*), Krystyna Illakowicz (*Slavic Languages and Literatures*), Maria Kaliambou

(Hellenic Studies), Constantine Muravnik (Slavic Languages and Literatures), Julia Titus (Slavic Languages and Literatures)

The European Studies Council at the MacMillan Center promotes innovative research on Europe's past and present in the context of regional and global interactions. The council collaborates with schools and departments throughout Yale to support faculty, students, and visiting scholars by sharing their interdisciplinary expertise on European affairs with the broader public. The council aims to foster a wider understanding of Europe as both a place and an idea, reflecting the evolving nature of the region and its network of connections throughout the world. The geographical scope of the council's activities extends from Ireland to Italy, and from Portugal to the lands of the former Soviet Union. The council's definition of Europe transcends conventional divisions between Western, Central, and Eastern Europe, and includes the Balkans and Russia. The U.S. Department of Education has repeatedly designated the council a National Resource Center and a FLAS Center under its HEA Title VI program. Further information on the council and the Graduate Certificate of Concentration in European Studies is provided under Non-Degree-Granting Programs, Councils, and Research Institutes in this bulletin.

The council administers an M.A. program in European and Russian Studies (E&RS). This M.A. program is unusual in its embrace of all of Europe, east as well as west. The program allows students to choose a regional focus while also ensuring familiarity with those parts of Europe and Eurasia (Russia, Ukraine, Belarus, the Caucasus, and central Asia) outside of that focus. As an interdisciplinary program, the E&RS M.A. allows for concentration in a variety of humanities (languages, literatures, history, art, music) and social science (political science, economics, sociology, anthropology) disciplines, as well as law. The program is suited both to students who wish to pursue further academic studies and to students interested in pursuing careers in policy, journalism, teaching, human rights, development, and NGOs.

FIELDS OF STUDY

European and Eurasian languages and literatures; economics; history; human rights; journalism; law; music; policy; political science; sociology; and other social sciences.

SPECIAL REQUIREMENTS FOR THE M.A. DEGREE

All students must complete sixteen graduate-level term courses (or their equivalent) related to European and Russian studies. When applying to the program, students will specify either Russia, Eastern Europe, and Eurasia, or Western and Central Europe, as an area of primary concentration. For students focusing on Russia, East Europe, and Eurasia two of the sixteen required courses (excluding language courses) must concern the nations of Western and Central Europe. For those focusing on Western and Central Europe, two courses must concern Russia, Eastern Europe, and Eurasia. Students are further required to take at least one course in at least three of the four broadly-defined fields of study relevant to the program: history (including history of art, history of science, and history of music), literature, social sciences, and law. Additionally, in their first year, students must enroll in one course focusing on methodology in a chosen discipline (e.g., history, comparative literature, sociology, anthropology, political science).

Only one of the sixteen graduate-level term courses may be taken for audit. Courses graded Satisfactory/Unsatisfactory cannot be counted toward the sixteen-course requirement of the program. All students must meet the minimum Graduate School grade requirement of an overall grade average of High Pass, including a grade of Honors in at least one one-credit graduate course (for students enrolled in one-year programs), or in at least two one-credit graduate courses (for students enrolled in two-year programs).

As a requirement for graduation, all students must demonstrate at least L4 proficiency in two modern European or Eurasian languages other than English. These two languages must include at least one directly related to their area of concentration – i.e. students focusing on Russia, Eastern Europe, and Eurasia will need to demonstrate knowledge of Russian, an East European, or Eurasian language; those focusing on Western and Central Europe will need to demonstrate knowledge of one of the appropriate regional languages.

A maximum of four of the sixteen courses required for completion of the degree may consist of language courses, even though these courses have undergraduate course numbers and undergraduate grading modes. In order to count towards the degree, these language classes must be taken for a grade, not for audit. Further undergraduatelevel language classes, beyond these four, can be taken for credit or audited, but will not count towards the sixteen courses required for graduation. Graduate-level seminars taught in language departments are unaffected by this four-course maximum; these are counted as regular graduate courses.

Students already possessing language skills must arrange to receive certification of proficiency by the relevant language department. Most often this involves completing a placement or proficiency examination; in some cases, the director of graduate studies may certify native language skills. Because each language department administers these exams in its own way, students must make arrangements individually with the appropriate departments. Students with Russian competence must receive the grade of 1+ or higher on the ACTFL/ETS Rating Scale as administered by the Slavic Languages and Literatures department at Yale, including reading, oral, and grammar portions. Students who have met the European or Eurasian language provided the courses are approved by the DGS.

As part of the program's commitment to outreach, each MA student is required to lead at least one seminar or give one lecture on his/her topic of interest to local secondary school students. This can be arranged through Yale's Office of New Haven Affairs public school partnerships, or depending on the topic, through the Fortunoff Video Archive for Holocaust Testimonies curriculum development program.

In all cases, students will comply with the Policies and Regulations of the Yale Graduate School of Arts and Sciences, especially regarding degree requirements and academic standing.

Through agreements negotiated by the MacMillan Center, the European Studies Council offers joint master's degrees with the Law School, the School of the Environment, and the School of Public Health. Application for admission must be made to both the Graduate School and the desired professional school, with notation made on each application that the applicant would like to be considered for the jointdegree program. Refer to http://macmillan.yale.edu/academic-programs/joint-degreeprograms and contact the European and Russian Studies registrar for up-to-date information.

THE MASTER'S THESIS

A master's thesis is required. The topic must be approved by the DGS and the thesis advised by a faculty member with expertise in the chosen topic. M.A. students must register for E&RS 950, which may not be taken for audit and is counted toward the sixteen required courses. For the purposes of preparatory research, students may register for one additional independent study with their potential adviser in a semester prior to taking E&RS 950. The master's thesis must be submitted in accordance with departmental guidelines; it is due in two copies in the student's second year on a date in April as specified by the council.

Program materials are available upon request to the European Studies Council, Yale University, PO Box 208206, New Haven CT 06520-8206.

COURSES

E&RS 619a / RSEE 610a / SLAV 610a, Eurasian Ecomedia Claire Roosien This course explores the relationship between Eurasian environments and popular media (film, photography, television, literature, and other media). Conversations about environmental humanities and ecomedia have thus far centered capital as the operative category; this course asks what we might gain from considering state socialism and postsocialism in conversation with that broader scholarship. The goal is to tell the environmental and cultural history of Eurasia as part of the connected history of the Anthropocene. Questions for discussion include: how do Eurasian publics engage with the mass media and how does that engagement shape environmental subjectivities in the region? How can we think about media histories in dialogue with material histories? How do narratives of the environment and ecological catastrophe correlate with broader Eurasian political discourses (socialist construction, collapse, post-Soviet nation-building)? Discussions comprise close analysis of cultural artifacts alongside relevant theory and scholarship about environmental and cultural histories of the region. Case studies focus on Central Asia, with transregional engagement with Siberia, the Caucasus, and Eastern Europe, focusing on the twentieth and twentyfirst centuries. Major assignments include a translation/curatorial project and a final, polished conference-style presentation. Knowledge of Russian or another Eurasian language is required.

E&RS 629a / CPLT 689a / RSEE 613a / RUSS 613a / SLAV 613a, Art and Resistance in Belarus, Russia, and Ukraine Andrei Kureichyk

This interdisciplinary seminar is devoted to the study of protest art as part of the struggle of society against authoritarianism and totalitarianism. It focuses on the example of the Soviet and post-Soviet transformation of Belarus, Russia, and Ukraine. The period under discussion begins after the death of Stalin in 1953 and ends with the art of protest against the modern post-Soviet dictatorships of Alexander Lukashenka in Belarus and Vladimir Putin in Russia, the protest art of the Ukrainian Maidan, and the anti-war movement of artists against the Russian-Ukrainian war. The course begins by looking at the influence of the "Khrushchev Thaw" on literature and cinema,

which opened the way for protest art to a wide Soviet audience. We explore different approaches to protest art in conditions of political unfreedom: "nonconformism," "dissidence," "mimicry," "rebellion." The course investigates the existential conflict of artistic freedom and the political machine of authoritarianism. These themes are explored at different levels through specific examples from the works and biographies of artists. Students immerse themselves in works of different genres: films, songs, performances, plays, and literary works.

E&RS 641a, Modern Baltic Independence: Ideas and Histories in Context Staff This graduate course explores what is perhaps the most crucial political process in modern Baltic history: Estonia's, Latvia's, and Lithuania's achievement of national independence during the end stage and aftermath of the First World War. With the help of both relevant secondary literature and selected primary sources, the course engages with this topic from a variety of angles, including the formation of modern Baltic national movements and their ideological development in the nineteenth and the early twentieth centuries, the concrete events that shaped the Baltic states' road towards internationally recognized statehood during the First World War and its immediate aftermath, and the ways in which the Baltics explained to themselves and others what independence would mean for their national future and the future of the Baltic Sea Region more broadly. Each week is dedicated either to a broader topic, approached comparatively in a regional setting, or a more narrowly focused case study that helps to elucidate a particular facet of historical development.

E&RS 940a or b, Independent Study Staff By arrangement with faculty.

E&RS 950a or b, Master's Thesis Staff By arrangement with faculty.

Film and Media Studies

Humanities Quadrangle, 1st floor, 203.436.4668 http://filmstudies.yale.edu M.Phil., Ph.D.

Chair Fatima Naqvi

Director of Graduate Studies John MacKay

Professors Marijeta Bozovic (*Slavic Languages and Literatures*; *Women's, Gender, and Sexuality Studies*), Francesco Casetti (*Humanities*), Marta Figlerowicz (*Comparative Literature*; *English Language and Literature*), Aaron Gerow (*East Asian Languages and Literatures*), Brian Kane (*Music*), John MacKay (*Slavic Languages and Literatures*), Millicent Marcus (*Italian Studies*), Charles Musser (*American Studies*), Fatima Naqvi (*Germanic Languages and Literatures*), John Durham Peters (*English Language and Literature*), Katie Trumpener (*Comparative Literature*; *English Language and Literature*), Laura Wexler (*American Studies*; *Women's, Gender, and Sexuality Studies*), R. John Williams (*English Language and Literature*)

Assistant Professor Neta Alexander

Visiting Professor Leighton Pierce

Professor in the Practice Thomas Allen Harris (African American Studies)

Senior Lecturer Camille Thomasson

Lecturers Jonathan Andrews (*Art*), Shakti Bhagchandani, Oksana Chefranova, Claire Demoulin, Wanda Strauven

FIELDS OF STUDY

Film and media studies is an interdisciplinary field. Students have the option to apply for admission to one of two tracks within the program: either solely to the Ph.D. in Film and Media Studies or to a combined program track involving one of the following disciplines: African American studies, American studies, comparative literature, East Asian languages and literatures, English, French, German, history of art, Italian studies, and Slavic languages and literatures. In addition to acquiring a firm grounding in the methods and core material of film and media studies (and, for the combined degree track students, another discipline), all students are expected to coordinate a plan of study involving comprehensive knowledge of one or more areas of specialization.

Through course work, examinations, and the dissertation, candidates in a combined degree program link a film and media specialty with the participating discipline. Directors of graduate studies from both programs monitor the candidate's plans and progress.

To be considered for admission to the combined degree track, applicants must indicate both Film and Media Studies and one of the participating departments/programs listed

above. Students seeking admission to Film and Media Studies alone should indicate only Film and Media Studies on their application.

For students already admitted into another department or program, retroactive admissions into the combined Ph.D. with Film and Media Studies is possible during the first year of coursework. Such retroactive admission must be done in consulation with the directors of graduate studies of Film and Media Studies and of the department into which the student was admitted.

In addition to the Ph.D. program, Film and Media Studies offers students in the graduate school's other doctoral programs the chance to obtain the Graduate Certificate in Film and Media Studies. See Film and Media Studies, under Non-Degree Granting Programs, Councils, and Research Institutes, in this bulletin.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Every student selected for the combined program track is subject to the supervision of the Film and Media Studies program and the relevant participating department. A written protocol between each department and Film and Media Studies outlines the requirements and schedule to be borne in mind as a plan of study is worked out in consultation with the director of graduate studies (DGS) of Film and Media Studies and the DGS of the participating department. In all cases, students are required to take FILM 601 as well as at least five additional film and media studies seminars. The final course paper for one of those five additional courses must be on a topic focused on the history or historiography of film/media. Course requirements vary for participating departments. By the third year, students advance to candidacy by completing qualifying examinations and a dissertation prospectus.

Students in the stand-alone Film and Media Studies track are held to the same Department of Film and Media Studies requirements and deadlines as students in the combined degree track: twelve graduate-level courses, including the required courses listed above and four additional Film and Media Studies seminars.

In addition, students in both tracks are expected to complete the following requirements:

Qualifying Examinations Qualifying examinations follow the regulations of the participating department with at least one member of the Film and Media Studies Executive Committee participating. Students pursuing the stand-alone Ph.D. in Film and Media Studies should consult the DGS for details about the format of the examinations and formation of the examining committee.

Dissertation Prospectus The dissertation prospectus is presented to a faculty committee or the entire faculty of the participating department for combined degree students. The prospectus is also submitted to the prospectus committee of Film and Media Studies for approval.

Defense of Method A defense of method occurs when the dissertation is nearing completion, one or two terms before submission. The purpose of this defense is to provide guidance and feedback at a critical stage, in order to assist the dissertation's final form. At least three faculty readers meet with the student; the DGS of Film and Media Studies is (and, for students in the combined degree program, the DGS of the participating department is also) invited to participate. For combined degree students,

at least one examiner of the dissertation must be a member of the Film and Media Studies Executive Committee and one must be from the participating department; for students in the stand-alone track, two-thirds of the dissertation committee members should be a member of the Film and Media Studies Executive Committee.

The faculty in Film and Media Studies considers participation in the Teaching Fellows Program to be essential to the professional preparation of graduate students. Students normally teach in years three and four. Every student may expect to assist in two Film and Media Studies courses, one of which will very likely be Introduction to Film Studies (FILM 150) or Introduction to Media (FILM 160). Students in the stand-alone track are expected to teach in the two courses above as well as two other courses in either film and media studies or an allied program, with the permission of the DGS.

MASTER'S DEGREE

M.Phil. See Degree Requirements under Policies and Regulations.

COURSES

The required core seminars, FILM 601 and FILM 603, are offered in alternating years.

FILM 605a and FILM 606b, Film and Media Studies Certificate Workshop Staff The workshop is built on students' needs and orientations. It is aimed at helping the individual trajectories of students and at deepening the topics they have met while attending seminars, conferences, and lectures. Students are required to present a final qualifying paper demonstrating their capacity to do interdisciplinary work. The workshop covers two terms and counts as one regular course credit. Open only to students pursuing the Graduate Certificate in Film and Media Studies. Prerequisite: FILM 601. ¹/₂ Course cr per term

FILM 614a, Early Film Theory and Modernity Francesco Casetti For a long time, early film theories have been overlooked and underestimated. Their recent rediscovery has, however, highlighted their crucial role in framing film as a "modern" invention. The main point of interest in early film theories is based on their capacity of highlight and focus some of the characteristic of modern life: speed, economy, contingency, excitation, etc. By prioritizing the filmic experience, they focalized attention on the spectator. But the idea of a "modern" art, as well as the research for a "modern" language, were also an important issue. On the background of this interest in modernity, early film theories were not uniform. Ideological differences and national identities played a major role in defining the perspective of theoretical research. In this respect, it is useful to compare the debate in the US and in Europe and to acknowledge the very different traditions which they represented. The seminar accordingly takes into account theories in France (Delluc, Epstein), Germany (Arnhein, Kracauer), Middle-Europe (Bálazs, Lukács, Tille), Italy (Papini, Thovez), Soviet Union (Eisenstein, Vertov, Pudovkin), and the US (Lindsay, Freeburg, Münsterberg). Every week there is a screening with films representative of the time.

FILM 63ob / RUSS 714b, Russian and Soviet Film John MacKay

Overview of Russian, Soviet, and post-Soviet cinema, from prerevolutionary Russia to the present. Theoretical writings and canonical films of important figures such as Sergei Eisenstein, Dziga Vertov, Andrei Tarkovsky, Kira Muratova, Aleksei German, and Alexander Sokurov. A variety of film genres and modes are investigated, as well as non-Russophone Soviet film.

FILM 632a / CPLT 566a / GMAN 532a, Paper: Material and Medium Austen Hinkley Paper is one of the most ubiquitous and indispensable media of the modern era. Although we are (still) surrounded by it, paper tends to recede into the background, working best when we do not notice it at all. This course sets out to challenge our understanding of paper as a neutral or passive bearer of inscriptions by foregrounding its material quality. Our focus will rest in equal parts on the media history of paper and on paper works of art – among them many literary texts – that reflect or take advantage of their medium. Studying materials and histories from the early modern period to the present, we will uncover paper's status as a commodity bound up in a complex web of economic processes, as an instrument of political power, as a gendered and racialized object, and as a material that can be cut, shuffled, and even eaten. Ultimately, we will investigate the ways in which paper is still central to our lives, even in the age of tablets and PDFs. Readings will include Emily Dickinson's envelope poems, Robert Walser's "Microscripts," and M. NourbeSe Philip's "Zong!" The class will make several visits to the Beinecke Library for hands-on work with paper materials.

FILM 652b / ENGL 6152b, Media Theory John Peters

This course provides an intensive introduction to foundational texts in media theory old and new. (It supplements rather than replicate FILM 601, Foundations in Film and Media.) This course focuses either on influential articles of the past five decades or notable books of the last decade or so (or both). In either case, the aim is to gain a familiarity with key ideas, figures, traditions, questions, and methods in media theory. Previously ENGL 923.

FILM 653a / AMST 653a, Studies in Documentary Film Charles Musser This course examines key works, crucial texts, and fundamental concepts in the critical study of nonfiction cinema, exploring the participant-observer dialectic, the performative, and changing ideas of truth in documentary forms.

FILM 655a / CPLT 557a / GMAN 555a, Habit and Habitation: On Walter Benjamin's Media Aesthetics and Philosophy of Technology Staff

In recent years, Walter Benjamin has become one of the most quoted media theorists. His philosophy of technology is not as widely known as the concept of aura he developed in his essay *The Work of Art in the Age of Its Technological Reproducibility*. The contemporary relevance of his philosophy of technology lies in the fact that Benjamin establishes a connection between technology and different forms of habitation and between the latter and the concept of habit (Gewohnheit), which is etymologically related to the concept of habitation (Wohnen). This enables a comparison of Benjamin's approach with the philosophies of technology developed by Heidegger, Deleuze/Guattari, and Simondon, all of whom associate technology with the shaping of environments and the problem of poesis. In our seminar, we reconstruct Benjamin's media anthropology of technology through a close reading of his diaries and essays and compare it to philosophies of technology very much being discussed today.

FILM 690a / CPLT 913a / SPAN 691, Radical Cinemas of Latin America Moira Fradinger

An introductory overview of Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required.

FILM 735a and FILM 736a / AMST 832a and AMST 833a, Documentary Film Workshop Charles Musser

This workshop in audiovisual scholarship explores ways to present research through the moving image. Students work within a Public Humanities framework to make a documentary that draws on their disciplinary fields of study. Designed to fulfill requirements for the M.A. with a concentration in Public Humanities.

FILM 751a / CPLT 933a / ENGL 928a, British Cinema Katie Trumpener Key films and topics in British cinema. Special attention to the provincial origins of British cinema; overlaps between filmic, literary, and visual modernism; attempts to build on the British literary and dramatic tradition; cinema's role in the war effort and in redefining national identity; postwar auteur and experimental filmmaking; "heritage" films and alternative approaches to tradition. Accompanying readings in British film theorists, film sociology (including Mass Observation), and cultural studies accounts of film spectatorship and memories. Films by Mitchell and Kenyon, Maurice Elvey, Anthony Asquith, Len Lye, John Grierson, Alfred Hitchcock, Alberto Cavalcanti, Humphrey Jennings, Michael Powell, Carol Reed, David Lean, Karel Reisz, Lindsay Anderson, Richard Lester, Peter Watkins, Stanley Kubrick, Laura Mulvey, Ken Loach, Mike Leigh, Terence Davies, Terry Gilliam, Peter Greenaway, Michael Winterbottom, Patrick Keiller, Steve McQueen.

FILM 770b / CPLT 614b / GMAN 594b, East German Literature and Film Katie Trumpener

The German Democratic Republic (1949–89) was a political and aesthetic experiment that failed, buffeted by external pressures and eroded by internal contradictions. For forty years, in fact, its most ambitious literary texts and films (some suppressed, others widely popular) explored such contradictions, often in a vigilant, Brechtian spirit of irony and dialectics. This course examines key texts both as aesthetic experiments and as critiques of the country's emerging cultural institutions and state censorship, recurrent political debates, and pressing social issues. Texts by Brecht, Uwe Johnson, Heiner Müller, Christa Wolf, Johannes Bobrowski, Franz Fühmann, Wolf Biermann, Thomas Brasch, Christoph Hein; films by Slatan Dudow, Kurt Maetzig, Konrad Wolf, Heiner Carow, Frank Beyer, Jürgen Böttcher, Volker Koepp. Knowledge of German desirable but not crucial; all texts available in English.

FILM 772a / GMAN 544a, Landscape, Film, Architecture Fatima Naqvi Movement through post-1945 landscapes and cityscapes as a key to understanding them. The use of cameras and other visual-verbal means as a way to expand historical, aesthetic, and sociological inquiries into how these places are inhabited and experienced. Exploration of both real and imaginary spaces in works by filmmakers (Wenders, Herzog, Ottinger, Geyrhalter, Seidl, Ade, Grisebach), architects and sculptors (e.g. Rudofsky, Neutra, Abraham, Hollein, Pichler, Smithson, Wurm, Kienast), photographers (Sander, B. and H. Becher, Gursky, Höfer), and writers (Bachmann, Handke, Bernhard, Jelinek). Additional readings by Certeau, Freytag, J.B. Jackson, L. Burckhardt.

FILM 833a, Semiotics Francesco Casetti

Digging into semiotics tradition, the seminar provides analytical tools for "close readings" of a vast array of objects and operations, from verbal texts to all sorts of images, from cultural practices to all sorts of manipulation. Semiotics' foundational goal consisted in retracing how meaning emerges in these objects and operations, how it circulates within and between different cultural environments, and how it affects and is affected by the cultural contexts in which these objects and operations are embedded. To revamp semiotics' main tasks, after an introduction about the idea of "making meaning," the seminar engages students in a weekly discussion about situations, procedures, objects, and attributes that are "meaningful," in the double sense that they have meaning and they arrange reality in a meaningful way. Objects of analysis are intentionally disparate; the constant application of a set of analytical tools provides the coherence of the seminar. Students are expected to regularly attend the seminar, actively participate in discussions, propose new objects of analysis, present a case study (fifteen-twenty minutes), and write a final paper (max. 5,000 words). Enrollment limited to fifteen. Students from Film and Media Studies and the School of Architecture have priority: they are asked to express their choice by August 25. Students from other departments are asked to send the instructor up to ten lines with the reasons why they want to attend the seminar by August 26. The seminar is aimed at bolstering a dialogue that crosses cultures and disciplines.

FILM 880a / EALL 872a, Theories Popular Cult In Japan: TV Aaron Gerow Exploration of postwar theories of popular culture and subculture in Japan, particularly focusing on the intellectual debates over television and new media.

FILM 882b / EALL 571b, Japanese Cinema after 1960 Aaron Gerow The development of Japanese cinema after the breakdown of the studio system, through the revival of the late 1990s, to the present.

FILM 900a or b, Directed Reading Staff

FILM 901a or b, Individual Research Staff

FILM 902a, Teaching Fellows Mentoring John MacKay

Faculty members instruct their Teaching Fellows on the pedagogical methods for teaching specific subject matter.

FILM 973b / ENGL 6873b, Modernity and the Time of Literature John Williams This course examines transformations in temporality that occurred in the sciences and arts during the twentieth century. From the arrival of Einsteinian relativity to more contemporary proofs on quantum nonlocality, the question of time in the twentieth century threatened to overturn some of our oldest assumptions about cause and effect, duration, history, presentness, and futurity. These new temporalities were as scientifically and philosophically vexing as they were rife with spiritual and aesthetic possibility – a dynamic reflected in the literary and artistic forms that were central to these transformations. Our reading reflects this deeply cross-cultural and interdisciplinary trajectory, including histories of science and technology (Peter Galison, N. Katherine Hayles, David Kaiser), philosophies of time (Heidegger, Bruno Latour, Bernard Stiegler, McLuhan, Luhmann), critical theories of temporal form (Derrida, Adorno, Jameson, Pamela Lee, Kojin Karatani), a wide array of literary texts (William Burroughs, Thomas Pynchon, Ursula K. Le Guin, Tom McCarthy, and others), as well as important cinematic innovations (Jodorowsky, Godard, Kubrick). What is the "time" of literature? of film? How does art transform or reinforce theories of temporal flow? How do new technologies of composition and circulation alter the temporal effects of a given work? What was the "End of History"? Previously ENGL 973.

FILM 995a or b, Directed Reading Staff

French

Humanities Quadrangle, 3rd floor, 203.432.4900 http://french.yale.edu M.A., M.Phil., Ph.D.

Chair Maurice Samuels

Director of Graduate Studies Jill Jarvis

Professors R. Howard Bloch, Dominique Brancher, Ardis Butterfield (*English*), Marlene Daut, Carolyn Dean (*History*), Alice Kaplan, Pierre Saint-Amand, Maurice Samuels

Associate Professors Morgane Cadieu, Thomas Connolly

Assistant Professor Jill Jarvis

Affiliated Faculty Carol Armstrong (History of Art)

FIELDS OF STUDY

Fields include French literature, criticism, theory, and culture from the early Middle Ages to the present, and the French-language literatures of Africa, the Caribbean, and the Maghreb.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

- Candidates must demonstrate proficiency in two languages (in addition to English and French). Proficiency is defined as the successful completion of one year of study at the college level or reading proficiency at the graduate level. Students must fulfill one language requirement no later than the beginning of their third term of study. The second language requirement must be satisfied before the prospectus can be approved.
- During the first two years of study, students normally take fourteen term courses. These must include Old French (FREN 610) and at least two graduate-level term courses outside the department. They may include one term of an approved language course taken as a means of fulfilling one of the language requirements, and as many as four graduate-level term courses outside the department. Methods and Techniques in the Italian and French Classroom (FREN 670) is also required for students in their second year. At the end of the first year of study, a grade of Honors must be obtained in at least two graduate term courses taught by core faculty within the French department. By the end of the second year, a grade of Honors must be obtained in at least four graduate term courses taught by core faculty within the French department. The total required number of Honors in French department courses taught by core faculty appointed in French, as opposed to affiliated faculty.)
- A qualifying oral examination takes place during the sixth term. The examination is designed to demonstrate students' mastery of the French language, their knowledge
and command of selected topics in literature, and their capacity to present and discuss texts and issues.

• After having successfully passed the qualifying oral examination, students are required to submit a dissertation prospectus for approval, normally no later than the end of the term following the oral examination.

In order to be admitted to candidacy for the Ph.D., students must complete all predissertation requirements, including the prospectus. Students must be admitted to candidacy by the end of the seventh term.

Teaching is considered an integral part of the preparation for the Ph.D. degree, and all students are required to teach for at least one year. Opportunities to teach undergraduate courses normally become available to candidates in their third year, after consideration of the needs of the department and of the students' capacity both to teach and to fulfill their final requirements. Prior to teaching, students take a languageteaching methodology course.

COMBINED PH.D. PROGRAMS

The French department also offers three combined Ph.D.s: one in French and African American Studies (in conjunction with the Department of African American Studies), one in French and Early Modern Studies (in conjunction with the Early Modern Studies Program), and one in French and Film and Media Studies (in conjunction with the Film and Media Studies Program). Students in all of these combined degree programs are subject to all the requirements for a Ph.D. in French, with exceptions noted below. In addition, they must fulfill certain requirements particular to the combined program.

French and African American Studies

This program is most appropriate for students who intend to concentrate in and write a dissertation on the literature of the francophone Caribbean. Students take sixteen term courses, including Theorizing Racial Formations (AFAM 505), which is a required course for all first-year graduate students in the combined program, and three other graduate-level African American Studies courses: (1) a history course, (2) a social science course, and (3) a course in African American literature or culture. Ten of the remaining twelve courses are devoted to the full spectrum of periods and fields in French and francophone literature and culture; the two remaining courses can be in any field. Students in the combined degree program should fulfill the French department's language requirements by gaining proficiency in either a Creole language of the Caribbean or Spanish, as well as by demonstrating competence in a second foreign language that is directly relevant to the study of the Caribbean. The students' oral examinations normally include two topics of African American content. The dissertation prospectus must be approved by the director of graduate studies (DGS) both in the French department and in African American Studies, and final approval of the dissertation must come from both departments. For further details see African American Studies.

French and Early Modern Studies

The Department of French offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in French and Early Modern Studies. For further details see Early Modern Studies.

French and Film and Media Studies

For students in the combined Ph.D. program in French and Film and Media Studies, the oral examination will normally include one topic on film theory and one on French film. Both the dissertation prospectus and the final dissertation must be approved by the French department and the program in Film and Media Studies. In addition, Film and Media Studies requires a dissertation defense. For further details see Film and Media Studies.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete one of the language requirements and eight courses, of which at least six are in French. Two grades of Honors in French are required, and the remaining grades must average High Pass.

Program materials are available on the department's website at http://french.yale.edu/ academics/graduate-program.

COURSES

FREN 668b / ENGL 979b / HSAR 668b, Ekphrasis and Art Criticism Carol Armstrong

Ekphrasis in its ancient Greek sense refers to the vivid description of an object, animal, person, place, scene, or event undertaken as an exercise in oral rhetoric. In that original context, the practice of ekphrasis was meant to "paint" a picture in the mind of the listener, and thus pointed to both the imagistic capacities of verbal language, and the integral link between the image and the imagination. In the twentieth century, ekphrasis acquired a narrower meaning: poetry addressed to or modeled on works of visual art. While informed by both of those understandings, this seminar considers ekphrasis both more broadly, in terms of genre, and more narrowly, in relation to a partial history of art criticism as a modern form of writing in the anglophone and European worlds, with a focus on the eighteenth through the twentieth century. It treats the different writerly modes now understood to be embraced by the term ekphrasis: not only poetry, but also the prose poem and the novel, as well as the Salon and art review. It also touches on such issues as the Renaissance inversion of the phrase *ut pictura poesis*; the competition between the arts of word and image; the presence or absence of illustrations; the modern relations between genres and mediums and the question of mediation; and the address of the different arts to the subjectivity of the reader/spectator. In addition to weekly presentations, a short preliminary paper, and a final research paper, students organize and contribute to a workshop on ekphrasis based on their own ekphrastic exercises, undertaken in the Yale Art Gallery. (Some class time is devoted to those exercises.) This seminar is the second of two (the first is HSAR 667); our hope is that students from both seminars will collaborate on this final event.

FREN 785b / HIST 823b, Haiti in the Americas Anne Eller and Marlene Daut This course broadens the temporal parameters of Atlantic history to consider the formation and impact of colonial Saint-Domingue, the import of revolutionary Haiti, and the trajectory of state making on the island through imperial projects of the twentieth century. The course engages with scholarship from the circum-Caribbean, the United States, France, and the greater Atlantic African diaspora.

FREN 802b / CPLT 582b / ENGL 6545b / MDVL 502b, Chaucer and Translation Ardis Butterfield

An exploration of the works of Geoffrey Chaucer (ca. 1340–1400), brilliant writer and translator. Using modern postcolonial as well as medieval theories of translation, memory, and bilingualism, we investigate how texts in French, Latin, and Italian are transformed, cited, and reinvented in his writings. Some key questions include: What happens to language under the pressure of crosslingual reading practices? What happens to the notion of translation in a multilingual culture? How are ideas of literary history affected by understanding Chaucer's English in relation to the other more prestigious language worlds in which his poetry was enmeshed? Texts include material in French, Middle English, Latin, and Italian. Proficiency in any one or more of these languages is welcome, but every effort is made to use texts available in modern English translation, so as to include as wide a participation as possible in the course. Formerly ENGL 545.

FREN 844a, Inventories and Inventions: Cabinets de Curiosité and the Writing of Singularity Dominique Brancher

A seminar on "cabinets de curiosités" and the stories told about the objects they contain, whether real or invented. We pay close attention to catalogues, as modes of exhibition in their own right, as products of a collection, as well as vectors for the dissemination of a given collection of objects. We see how the catalogue is a textual crossroads, able to absorb, integrate, and sometimes correct developments in scholarly or travel writing. The catalogue is often also the pretext to parodic or fictional forms. For example, some might claim to present imaginary collections. Others present themselves as real catalogs while exhibiting the signs of fabrication. Catalogues include "Le Cabinet de M. de Scudéry" (1646), "Musaeum clausum" or "Bibliotheca abscondita" by Thomas Browne (1684), and the fictitious catalogue included in Francis Bacon's "La Nouvelle Atlantide" (1627). This course includes readings in relevant critical and theoretical literature, as well as visits to museums and libraries in New Haven. Readings and discussions in French. For each session, critical readings (complementary texts, articles, excerpts) are proposed on the server in PDF or HTML format.

FREN 861a / EMST 661a, Margins of the Enlightenment Pierre Saint-Amand This course proposes a critical examination of the French Enlightenment, with a focus on issues of progress, universalism, empire, and race. We confront these notions with approaches that have emerged in the postcolonial field of studies as well as gender and sexuality studies. Canonical authors are reinterpreted in that light along with lesserknown works. We are assisted by contemporary historians and critics of the Enlightenment, principally Michel Foucault, Lynn Hunt, and Robert Darnton. Readings by Mme. de Graffigny, Mme. de Stael, Mme. de Duras, Voltaire, Diderot, and Rousseau, Raynal and Cugoano. Conducted in French.

FREN 900b / HIST 667b / WGSS 667b, History of Gender and Sexuality in Modern Europe Carolyn Dean

An introduction to the various lines of inquiry informing the history of sexuality. The course asks how historians and others constitute sexuality as an object of inquiry and addresses different arguments about the evolution of sexuality in Europe, including the relationship between sexuality and the state and sexuality and gender.

FREN 930a / CPLT 734a, Fiction and the Archives Alice Kaplan

What can be learned about 20th-century French literature from literary archives? This course investigates fiction by Proust, Céline, Guilloux, Sartre, Sarraute, Wittig, studying finished books in the light of manuscripts, letters, and historical sources. An exploration in particular of the idea of the "genesis" of a literary work. A number of classes will take place in the Beinecke Rare Book and Manuscript Library. Conducted in English.

FREN 969a / AFST 969a / CPLT 985a, Islands, Oceans, Deserts Jill Jarvis This seminar brings together literary and theoretical works that chart planetary relations and connections beyond the paradigm of francophonie. Comparative focus on the poetics and politics of spaces shaped by intersecting routes of colonization and forced migrations: islands (Sri Lanka, Mauritius, Martinique), oceans (Indian, Mediterranean, Atlantic), and deserts (Sahara, Sonoran). Prerequisite: reading knowledge of French; knowledge of Arabic and Spanish invited. Conducted in English.

FREN 970b, Directed Reading Pierre Saint-Amand By arrangement with faculty.

FREN 971b, Independent Research Pierre Saint-Amand

Genetics

Sterling Hall of Medicine I313, 203.785.5846 http://medicine.yale.edu/genetics M.S., M.Phil., Ph.D.

Chair Valerie Reinke

Directors of Graduate Studies James Noonan Zhaoxia Sun

Professors Allen Bale, Susan Baserga (*Molecular Biophysics and Biochemistry*), Kristen Brennand (*Psychiatry*), Martina Brueckner (*Pediatrics/Cardiology*), Keith Choate (*Dermatology*), Lynn Cooley, Daniel DiMaio, Casey Dunn (*Ecology and Evolutionary Biology*), Joel Gelernter (*Psychiatry*; *Neuroscience*), Antonio Giraldez, Peter Glazer (*Therapeutic Radiology*), Valentina Greco, Daniel Greif (*Internal Medicine/Cardiovascular Medicine*), Jeffrey Gruen (*Pediatrics*), Murat Gunel (*Neurosurgery*), Ira Hall, Marc Hammarlund, Arthur Horwich, Yong-Hui Jiang, Mustafa Khokha (*Pediatrics*), Kenneth Kidd (*Emeritus*), Peining Li, Haifan Lin (*Cell Biology*), Maurice Mahoney (*Emeritus*), Shrikant Mane, Arya Mani (*Internal Medicine/Cardiovascular Medicine*), Margaret McGovern (*School of Medicine*), Michael Nitabach (*Cellular and Molecular Physiology*), James Noonan, Valerie Reinke, Margretta Seashore (*Emerita*), Nenad Sestan (*Neuroscience*), Stefan Somlo (*Internal Medicine/Nephrology*), Sherman Weissman, Hongyu Zhao (*Public Health*; *Biostatistics*)

Associate Professors Sidi Chen, Nadya Dimitrova (*Molecular, Cellular, and Developmental Biology*), Smita Krishnaswamy, Bluma Lesch, Janghoo Lim, Jun Lu, Mandar Muzumdar, Stefania Nicoli (*Internal Medicine/Cardiovascular Medicine*), Sabrina Nunez, In-Hyun Park, Curt Scharfe, Michele Spencer-Manzon, Zhaoxia Sun, Siyuan Wang, Andrew Xiao, Hui Zhang

Assistant Professors Grace Chen (Immunobiology), Maurizio Chioccioli (Comparative Medicine), Nada Derar, Teodoro Jerves Serrano, Nicole Lake, Monkol Lek, Deqiong Ma, Diyendo Massilani, Steven Reilly, Jason Sheltzer (Surgery/Oncology), Zachary Smith, Trevor Sorrells, Berna Sozen, Kaelyn Sumigray, Jia Di Wen, Frederick Wilson (Internal Medicine/Oncology), Chen Zhao

FIELDS OF STUDY

Cancer genetics: oncogenesis and tumor suppression, tumor progression, and metastasis. Cellular and developmental genetics: the genetic basis of germline development, skin development, internal organ development, stem cell development, genetic control and the role of the cilium, cytoskeleton, cell fate determination, cell cycle progression, cell migration, cell signaling, growth control and cell death during development, homeostasis and aging. Genomics: genome mapping, genome modification, high-throughput technology, evolutionary genetics, and functional genomics. Human genetics: genetic basis of human disease, chromosome rearrangements, population and quantitative genetics. Molecular genetics: chromosome structure and function, genetic recombination, mosaic genetics, viral genetics, DNA damage repair, ribosome biogenesis, protein folding, neurodegenerative diseases, non-coding RNA function, and the regulation of gene expression. Model Organism Genetics: forward genetic screens and targeted genetic manipulations in *Drosophila*, *C. elegans*, zebrafish, frogs, mouse, organoids, and stem-cell-based embryo models.

To enter the Ph.D. program, students apply to the Molecular Cell Biology, Genetics, and Development (MCGD) track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

REQUIREMENTS FOR THE PH.D. DEGREE

The Ph.D. program in genetics is designed to provide the student with a broad background in general genetics and the opportunity to conduct original research in a specific area of genetics. The student is expected to acquire a broad understanding of genetics, spanning knowledge of at least three basic areas of genetics, which include molecular, cellular, organismal genetics and genomics. Normally this requirement is accomplished through the satisfactory completion of formal courses, many of which cover more than one of these areas. Advanced graduate study becomes increasingly focused on the successful completion of original research and the preparation of a written dissertation under the direct supervision of a faculty adviser along with the guidance of a thesis committee.

Laboratory Rotations and Choosing a Thesis Adviser Students must complete rotations in at least three laboratories in their first year in the MCGD program before selecting a thesis adviser. The student's dissertation adviser must hold a primary or secondary appointment in Genetics in order for the student to join the department.

Courses Students typically take two to three courses each term and three research rotations (GENE 911, GENE 912, GENE 913) during the first year and are required to pass at least five graduate level courses that are taken for a grade. The required Graduate Student Seminar course (GENE 675/GENE 676, two terms, graded Satisfactory/Unsatisfactory) is taken in the second year. In addition to all other requirements, students must successfully complete GENE 900 and GENE 901, Research Skills and Ethics I and II, prior to the end of their first year of study. In their fourth year of study, all students must successfully complete MCDB 504, RCR Refresher for Senior BBS Students. Students must meet the Graduate School's Honors requirement by the end of the fourth term of full-time study. Students must also maintain a High Pass average as required by the graduate school.

Qualifying Exam The qualifying exam (informally, QE or Quals) is an essential step in graduate-student training. The overarching goal is to provide a launching pad for the student to embark on a successful thesis project. The qualifying exam typically spans eight weeks and must be completed by December 15 in the student's second year. The exam consists of three parts:

 A five-week reading period during which the student discusses a selection of primary research articles with each of three Qualifying Committee faculty readers. The adviser will not be a member of the Qualifying Committee and will not participate in the oral defense.

- 2. A two-week writing period during which the student writes an original research proposal modeled on the NIH F₃₁ NRSA application and focused on the student's planned thesis work.
- 3. A one-week presentation period during which the student prepares an oral defense of the research proposal. The exam culminates in a two-hour oral defense of the research proposal, during which the committee provides feedback on the student's oral and written presentations and evaluates the readiness of the student to proceed with their proposed research.

Dissertation Prospectus and Admission to Candidacy By January 15 of their third year, each student must prepare a written summary of the proposed nature and scope of the thesis research, together with a provisional title for the dissertation, following the format described in the *Genetics Department Handbook*. This document should be written in clear, plain English with minimal jargon, abbreviations, or colloquialisms. The student's adviser must review the prospectus and indicate their approval in writing via an email to the DGS. The student then sends the prospectus and the adviser's approval to their DGS, who may require additional changes, for review. Once the DGS has approved the prospectus, the student sends the prospectus and approval emails to the Genetics registrar for their file and so it may be noted on their transcript. Students will not be admitted to candidacy nor will they be allowed to register for their fourth year of study without an approved prospectus.

In order to be admitted to candidacy, the student must fulfill (1) all course requirements, (2) the Honors requirement, (3) the qualifying examination, (4) the dissertation prospectus, and (5) the holding a satisfactory Thesis Committee meeting, at the conclusion of which, the committee will give their assent for the student to be admitted to candidacy. Upon completion of these requirements, final approval for admission to candidacy is granted during a subsequent faculty meeting – usually in late spring of the third year of study.

Thesis Committee The Thesis Committee normally comprises three to four faculty members, including the student's adviser, and is assembled by the student in consultation with the thesis adviser. At least two members (including the adviser) must have primary or secondary appointments in the Department of Genetics. If a committee member outside of Yale is included, the committee should consist of: the advisor, two Yale faculty members, and the outside committee member, making four members in total. Names of committee members should be submitted to the DGS for approval, with the Genetics registrar copied, within the first month of the spring semester of the student's second year. Students in years two and three at are required to meet with their committee every six months.

Teaching and Departmental Presentations An important aspect of graduate training in genetics is the acquisition of communication and teaching skills. Students participate in departmental presentation seminars and two terms (or the equivalent) of teaching. Teaching activities are drawn from a diverse menu of lecture, laboratory, and seminar courses given at the undergraduate, graduate, and medical school levels. Students are not expected to teach until they pass their qualifying exam. Students are also expected to present in the departmental Research in Progress seminar.

M.D.-PH.D. STUDENTS

M.D.-Ph.D. students affiliate with the Department of Genetics graduate program via a different route than other incoming graduate students in the department, resulting in some modification of the academic requirements for the Ph.D. portion of the M.D.-Ph.D. degree. Typically, one or more research rotations are done during the first two years of medical school (in many cases, the first rotation is done during the summer between years one and two). No set number of research rotations is required. M.D.-Ph.D. students officially affiliate with the Department of Genetics after selecting a thesis adviser and consulting with the director of graduate studies (DGS). M.D.-Ph.D. students interested in Genetics are required to consult with the DGS prior to formal affiliation to determine an appropriate set of courses tailored to the student's background and interests.

The courses, rotations, and teaching requirements for M.D.-Ph.D. students entering the Genetics graduate program (see below) are modified from the normal requirements for Ph.D. students. Besides the modifications in these three requirements, M.D.-Ph.D. students in the Department of Genetics are subject to all of the same requirements as the other graduate students in the department.

Laboratory Rotations and Choosing a Thesis Advisor One or more rotations are necessary to identify a thesis adviser. No set number of research rotations is required. The student's dissertation adviser must hold a primary or secondary appointment in Genetics in order for the student to join the department.

Courses Four graduate-level courses taken for a grade are required. (Yale graduate-level courses taken for a grade during medical school may be counted toward this requirement at the discretion of the DGS.) Coursework is aimed at providing a firm basis in genetics and in cellular molecular mechanisms, with graduate-level proficiency in genetics, cell biology, and biochemistry.

Required courses: In addition to the four graduate-level courses, all M.D.-Ph.D. students must take: Graduate Student Seminar (GENE 675 and GENE 676, two terms, graded Satisfactory/Unsatisfactory); Responsible Conduct of Research (B&BS 501, graded Satisfactory/Unsatisfactory); and, in their fifth year of study, RCR Refresher for Senior BBS Students (MCDB 504).

Electives: Other courses may be taken in a wide variety of fields relevant to the biological and biomedical sciences.

Qualifying Exam M.D.-Ph.D. students take their qualifying exam in the second year in the Ph.D. program. The structure of the qualifying exam is identical to that for other Ph.D. students in genetics as described above.

Dissertation Prospectus and Admission to Candidacy M.D.-Ph.D. students submit their prospectus in their second year in the Ph.D. program once their qualifying exam has been completed, but no later than April 30 following their exam. Each student must prepare a written summary of the proposed nature and scope of the thesis research, together with a provisional title for the dissertation, following the format described in the *Genetics Department Handbook*. This document should be written in clear, plain English with minimal jargon, abbreviations, or colloquialisms. The student's adviser must review the prospectus and indicate their approval in writing via an email to

the DGS. The student then sends the prospectus and the adviser's approval to their DGS, who may require additional changes, for review. Once the DGS has approved the prospectus, the student sends the prospectus and approval emails to the Genetics registrar for their file and so it may be noted on their transcript. Students will not be admitted to candidacy nor will they be allowed to register for their fourth year of study without an approved prospectus.

In order to be admitted to candidacy, the student must fulfill (1) all course requirements, (2) the Honors requirement, (3) the qualifying examination, (4) the dissertation prospectus, and (5) the holding of a satisfactory Thesis Committee meeting, at the conclusion of which meeting the committee will give their assent for the student to be admitted to candidacy. Upon completion of these requirements, final approval for admission to candidacy is granted during a subsequent faculty meeting.

Thesis Committee The composition of the Thesis Committee for M.D.-Ph.D. is the same as for Ph.D. students as described above. M.D-Ph.D. students are required to have one Thesis Committee meeting per year, beginning the term after passing their qualifying exam, and two meetings per year beginning in the fourth year in the Ph.D. program.

Teaching and Departmental Presentations One term of teaching is required. Previous teaching while enrolled at the Yale School of Medicine may count toward this requirement at the discretion of the DGS. Students are also expected to present in the departmental Research in Progress seminar.

MASTER'S DEGREES

M.Phil. Students are not admitted for this degree. The M.Phil. is awarded only to students who are continuing for the Ph.D. Students must have completed all of their course requirements, their qualifying exam, and have been admitted to candidacy as described above to be awarded this degree. Students will be automatically petitioned by the university for a M.Phil. after successful completion of the requirements at the end of the third year. No additional action is required on the part of the student.

M.S. Students are not admitted for this degree. They may receive this recognition if they leave Yale without completing the qualifying exam but have satisfied the course requirements as described above, as well as the Graduate School's Honors requirement. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

Prospective applicants are encouraged to visit the BBS website (https:// medicine.yale.edu/bbs), MCGD Track.

COURSES

GENE 625a / MB&B 625a / MCDB 625a, Basic Concepts of Genetic Analysis Jun Lu The universal principles of genetic analysis in eukaryotes are discussed in lectures. Students also read a small selection of primary papers illustrating the very best of genetic analysis and dissect them in detail in the discussion sections. While other Yale graduate molecular genetics courses emphasize molecular biology, this course focuses on the concepts and logic underlying modern genetic analysis. **GENE 645a / CB&B 647a, Statistical Methods in Human Genetics** Hongyu Zhao Probability modeling and statistical methodology for the analysis of human genetics data are presented. Topics include population genetics, single locus and polygenic inheritance, linkage analysis, quantitative trait analysis, association analysis, haplotype analysis, population structure, whole genome genotyping platforms, copy number variation, pathway analysis, and genetic risk prediction models. Offered every other year. Prerequisites: genetics; BIS 505; S&DS 541 or equivalent; or permission of the instructor.

GENE 655a / CBIO 655a, Stem Cells: Biology and Application In-Hyun Park This course is designed for first-year or second-year students to learn the fundamentals of stem cell biology and to gain familiarity with current research in the field. The course is presented in a lecture and discussion format based on primary literature. Topics include stem cell concepts, methodologies for stem cell research, embryonic stem cells, adult stem cells, cloning and stem cell reprogramming, and clinical applications of stem cell research. Prerequisites: undergraduate-level cell biology, molecular biology, and genetics.

GENE 675a and GENE 676b, Graduate Student Seminar: Critical Analysis and

Presentation of Scientific Literature Siyuan Wang and Trevor Sorrells Students gain experience in preparing and delivering seminars and in discussing presentations by other students. A variety of topics in molecular, cellular, developmental, and population genetics are covered. Required of all second-year students in Genetics. Graded Satisfactory/Unsatisfactory.

GENE 734b / MB&B 734b / MBIO 734b, Molecular Biology of Animal Viruses

Walther Mothes and Maudry Laurent-Rolle Lecture course with emphasis on mechanisms of viral replication, oncogenic

transformation, and virus-host cell interactions.

GENE 743b / MB&B 743b / MCDB 743b, Advanced Eukaryotic Molecular Biology

Mark Hochstrasser, Matthew Simon, and Franziska Bleichert Selected topics in transcriptional control, regulation of chromatin structure, mRNA processing including spliceosomal splicing, mRNA turnover, RNA interference, translational regulation, protein modification, and protein degradation. Emphasis is placed on how these processes are regulated and the experiments that led to their discovery and understanding. Prerequisite: biochemistry or permission of the instructor.

GENE 760b, Genomic Methods for Genetic Analysis Bluma Lesch and Steven Reilly Introduction to the analysis and interpretation of genomic datasets. The focus is on next-generation sequencing (NGS) applications including RNA-seq, ChIP-seq, and exome and whole genome sequencing. By the end of this time-intensive, practical problem-set based course, each student will be able to process and analyze large-scale NGS datasets and interpret the results. This course is intended only for graduate students who are interested in applying genomic approaches in their thesis research. A basic familiarity with working in a UNIX/Linux computing environment or prior experience with a programming language is *not* required but can be useful. Extra resources will be made available prior to the course starting for students without any programming experience. Prerequisite: permission of the instructor. Interested students must contact the instructor early in the fall term to discuss their prior experience and expectations for the course. Enrollment limited to approximately twenty-five students.

GENE 777b / MCDB 677b, Mechanisms of Development Kaelyn Sumigray and Zachary Smith

An advanced graduate seminar on animal development focusing on conserved mechanisms that govern germline development, embryogenesis, and somatic differentiation in molecular detail. The course runs in parallel to the Spring session of the Department of Genetics Seminar Series and is divided into two components: six Yale faculty-led lectures on core concepts in development and six combined journal club/student-led discussions with outside developmental biology speakers on their cutting-edge research. Over the course of the term, small student groups are responsible for presenting one journal club-formatted discussion on two papers selected from the outside speaker's lab, as well as emceeing a dedicated question and answer session between the class and the speaker. This course provides a rare opportunity for students to actively engage with world leaders on their work in developmental genetics, epigenetics, and cell biology, as well as learn essential skills in experimental thinking and scientific communication. The course grade is based on forty percent takehome problems, forty percent class participation and twenty percent student-led journal club / distinguished speaker question and answer session. There are no official prerequisites. However, some familiarity with concepts and techniques of modern biology is necessary to get the most out of the course.

GENE 900a / CBIO 900a / MCDB 900a, Research Skills and Ethics I Patrick Lusk This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the first and second laboratory rotations.

GENE 901b / CBIO 901b / MCDB 901b, Research Skills and Ethics II Chenxiang Lin This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the third laboratory rotation.

GENE 911a / CBIO 911a / MCDB 911a, First Laboratory Rotation Patrick Lusk First laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

GENE 912a / CBIO 912a / MCDB 912a, Second Laboratory Rotation Patrick Lusk Second laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

GENE 913b / CBIO 913b / MCDB 913b, Third Laboratory Rotation Patrick Lusk Third laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

Germanic Languages and Literatures

Humanities Quadrangle, 203.432.0788 http://german.yale.edu M.A., M.Phil., Ph.D.

Chair Paul North

Directors of Graduate Studies Kirk Wetters

Professors Rüdiger Campe, Fatima Naqvi, Paul North, Sophie Schweiger, Kirk Wetters

Affiliated Faculty Jennifer Allen (*History*), Thomas Connolly (*French*), Fatima El-Tayeb (*Ethnicity, Race and Migration; Women's, Gender, and Sexuality Studies*), Paul Franks (*Philosophy*), Gundula Kreuzer (*Music; Theater and Performance Studies*), John Peters (*English; Film and Media*), Steven Smith (*Political Science*), David Sorkin (*History*), Nicola Suthor (*History of Art*), Katie Trumpener (*Comparative Literature; English; Film and Media*)

FIELDS OF STUDY

German literature and culture from the Middle Ages to the twenty-first century in Germany, Austria, and Switzerland; literary and cultural theory; literature and philosophy; literature and science; media history and theory; visuality and German cinema.

REQUIREMENTS FOR THE PH.D. DEGREE

The faculty in German considers teaching to be essential to the professional preparation of graduate students. Four terms of teaching are required, but six is the norm. Teaching usually takes place in years three and four, but students may seek teaching in any term. Students normally teach undergraduate language courses under supervision for at least three terms. Other teaching experiences are available thereafter in literature, theory, film, etc.

Students are required to demonstrate, besides proficiency in German, a reading knowledge of one other foreign language in the third term of study.

In the first two years of study, students take four courses per term. Of these sixteen courses, one must be GMAN 501, Methods of Teaching German as a World Language; and at least one must be taken in pre-nineteenth-century topics. Three of the sixteen courses in the first four terms may be audited. Up to two of the courses taken for credit may be directed readings under the supervision of a faculty member, with the approval of the DGS. Up to two credits may be awarded for prior graduate-level work, provided the student's first-year record at Yale is good and the total number of courses taken for credit at Yale are not fewer than twelve.

A written examination must be taken at the end of the fifth term of study, followed by an oral discussion approximately a week after the written exam. A dissertation prospectus should be submitted no later than the end of the sixth term. All students will be asked to defend the prospectus in a discussion with the faculty. The defense will take place before the prospectus is officially approved, usually in late April or May of the sixth term. Students are admitted to candidacy for the Ph.D. upon completion of all predissertation requirements, including the prospectus. Candidates who wish to write the dissertation in a language other than English, in this case in German, should notify the DGS at the prospectus defense.

After the submission of the prospectus, the student's time is devoted mainly to the preparation of the dissertation. A dissertation committee will be set up for each student at work on the dissertation. It is expected that students will periodically pass their work along to members of their committee, so that faculty members in addition to the dissertation adviser can make suggestions well before the dissertation is submitted. Drafts of each chapter must be submitted in a timely fashion to all members of the student's committee: the first chapter should be submitted to the committee by February 1 of the fourth year of study; the second chapter should be submitted by January 1 of the fifth year. There will be a formal review of the first chapter. After the dissertation is submitted, the DGS convenes a defense colloquium with the candidate, the committee, the department, and invited guests.

Two concentrations are available to graduate students: Germanic Literature and German Studies. There are special combined degrees with Film and Media Studies and Early Modern Studies; see below.

SPECIAL REQUIREMENTS FOR THE GERMANIC LITERATURE CONCENTRATION

During the first two years of study, students are required to take sixteen term courses, four of which may be taken outside the department. Three courses may be audited.

SPECIAL REQUIREMENTS FOR THE GERMAN STUDIES CONCENTRATION

During the first two years of study, students are required to take sixteen term courses, seven of which may be taken outside the department. Three of those courses may be audited. Students are asked to define an area of concentration and to meet with appropriate advisers from within and outside the department.

COMBINED PH.D. PROGRAM WITH FILM AND MEDIA STUDIES

The Department of Germanic Languages and Literatures also offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. in Germanic Languages and Literatures and Film and Media Studies. For further details, see Film and Media Studies. Applicants to the combined program must indicate on their application that they are applying both to Film and Media Studies and to Germanic Languages and Literatures. All documentation within the application should include this information.

COMBINED PH.D. PROGRAM WITH EARLY MODERN STUDIES

The Department of Germanic Languages and Literatures also offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in Germanic Languages and

Literatures and Early Modern Studies Program. For further details, see Early Modern Studies.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete eight graduate term courses and demonstrate the knowledge of another foreign language chosen in consultation with the DGS. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

Further information is available upon request to the Registrar, Department of Germanic Languages and Literatures, Yale University, PO Box 208210, New Haven CT 06520-8210; email, german@yale.edu.

COURSES

GMAN 501b, Methods of Teaching German as a World Language Theresa Schenker This course introduces a variety of language teaching principles and methods and discusses best practices in language teaching. Students get to know the most important second-language acquisition theories as background to our discussions on effective language teaching. We combine the principles of language teaching with observed classroom techniques as we discuss and prepare lesson plans for language-learning classrooms.

GMAN 532a / CPLT 566a / FILM 632a, Paper: Material and Medium Austen Hinkley Paper is one of the most ubiquitous and indispensable media of the modern era. Although we are (still) surrounded by it, paper tends to recede into the background, working best when we do not notice it at all. This course sets out to challenge our understanding of paper as a neutral or passive bearer of inscriptions by foregrounding its material quality. Our focus will rest in equal parts on the media history of paper and on paper works of art – among them many literary texts – that reflect or take advantage of their medium. Studying materials and histories from the early modern period to the present, we will uncover paper's status as a commodity bound up in a complex web of economic processes, as an instrument of political power, as a gendered and racialized object, and as a material that can be cut, shuffled, and even eaten. Ultimately, we will investigate the ways in which paper is still central to our lives, even in the age of tablets and PDFs. Readings will include Emily Dickinson's envelope poems, Robert Walser's "Microscripts," and M. NourbeSe Philip's "Zong!" The class will make several visits to the Beinecke Library for hands-on work with paper materials.

GMAN 544a / FILM 772a, Landscape, Film, Architecture Fatima Naqvi Movement through post-1945 landscapes and cityscapes as a key to understanding them. The use of cameras and other visual-verbal means as a way to expand historical, aesthetic, and sociological inquiries into how these places are inhabited and experienced. Exploration of both real and imaginary spaces in works by filmmakers (Wenders, Herzog, Ottinger, Geyrhalter, Seidl, Ade, Grisebach), architects and sculptors (e.g. Rudofsky, Neutra, Abraham, Hollein, Pichler, Smithson, Wurm, Kienast), photographers (Sander, B. and H. Becher, Gursky, Höfer), and writers (Bachmann, Handke, Bernhard, Jelinek). Additional readings by Certeau, Freytag, J.B. Jackson, L. Burckhardt.

GMAN 553a / ANTH 553a / CPLT 503a / SOCY 661a, Karl Marx's Capital Paul North A careful reading of Karl Marx's classic critique of capitalism, *Capital* volume 1, a work of philosophy, political economy, and critical social theory that has had a significant global readership for over 150 years. Selected readings also from *Capital* volumes 2 and 3.

GMAN 555a / CPLT 557a / FILM 655a, Habit and Habitation: On Walter Benjamin's Media Aesthetics and Philosophy of Technology Staff

In recent years, Walter Benjamin has become one of the most quoted media theorists. His philosophy of technology is not as widely known as the concept of aura he developed in his essay *The Work of Art in the Age of Its Technological Reproducibility*. The contemporary relevance of his philosophy of technology lies in the fact that Benjamin establishes a connection between technology and different forms of habitation and between the latter and the concept of habit (Gewohnheit), which is etymologically related to the concept of habitation (Wohnen). This enables a comparison of Benjamin's approach with the philosophies of technology developed by Heidegger, Deleuze/Guattari, and Simondon, all of whom associate technology with the shaping of environments and the problem of poesis. In our seminar, we reconstruct Benjamin's media anthropology of technology through a close reading of his diaries and essays and compare it to philosophies of technology very much being discussed today.

GMAN 594b / CPLT 614b / FILM 770b, East German Literature and Film Katie Trumpener

The German Democratic Republic (1949–89) was a political and aesthetic experiment that failed, buffeted by external pressures and eroded by internal contradictions. For forty years, in fact, its most ambitious literary texts and films (some suppressed, others widely popular) explored such contradictions, often in a vigilant, Brechtian spirit of irony and dialectics. This course examines key texts both as aesthetic experiments and as critiques of the country's emerging cultural institutions and state censorship, recurrent political debates, and pressing social issues. Texts by Brecht, Uwe Johnson, Heiner Müller, Christa Wolf, Johannes Bobrowski, Franz Fühmann, Wolf Biermann, Thomas Brasch, Christoph Hein; films by Slatan Dudow, Kurt Maetzig, Konrad Wolf, Heiner Carow, Frank Beyer, Jürgen Böttcher, Volker Koepp. Knowledge of German desirable but not crucial; all texts available in English.

GMAN 596a, Politics of Performance Sophie Schweiger

The stage is, and always has been, a political space. Ever since its beginnings, theatre has offered ways to rethink and criticize political systems, with the stage serving as a "moral institution" (Schiller) but also as a laboratory for models of representation. The stage also delineates the limits of representation for democratic societies (Rousseau), as it offers the space for experimentation and new modes of being together, being *ensemble*. The stage also raises the question of its own condition of possibility and the networks it depends on (Jackson). This course revisits the history of German and German-speaking theatre since the Enlightenment, and discusses the stage in its relationship to war, the nation state, the social question, femicide and gender politics, the Holocaust, globalization, and twenty-first-century migration. Readings include works by G.E. Lessing, Friedrich Schiller, Hugo v. Hofmannstahl, Georg Büchner, Peter

Weiss, Ida Fink, Dea Lohar, Elfriede Jelinek, Christoph Schlingensief, Heiner Müller, and Elsa Bernstein.

GMAN 604a or b / CPLT 510a or b, The Mortality of the Soul: From Aristotle to Heidegger Martin Hagglund

This course explores fundamental philosophical questions of the relation between matter and form, life and spirit, necessity and freedom, by proceeding from Aristotle's analysis of the soul in *De Anima* and his notion of practical agency in the *Nicomachean Ethics*. We study Aristotle in conjunction with seminal works by contemporary neo-Aristotelian philosophers (Korsgaard, Nussbaum, Brague, and McDowell). We in turn pursue the implications of Aristotle's notion of life by engaging with contemporary philosophical discussions of death that take their point of departure in Epicurus (Nagel, Williams, Scheffler). We conclude by analyzing Heidegger's notion of constitutive mortality, in order to make explicit what is implicit in the form of the soul in Aristotle.

GMAN 665b / CPLT 666b / EMST 565b, Birth of the Political: Early Modern and Twentieth Century Rudiger Campe

Early modern European works on colonial war, sovereignty, and politics, sixteenth to seventeenth centuries (by Sepúlveda, Grotius, Machiavelli, Lipsius [neo-Stoicism], Hobbes) are read in conjunction with twentieth century debates from the inter-war period to circa 1968 (by Schmitt, Kantorowicz, Benjamin, Oestreich, Foucault, authors who refer back to the modern early works and have importantly shaped our modern understanding of "the political" and, with it, the notion of the "early modern"). The course is interested in critically tracing the echoes regarding "the political" between early modernity and our own times.

GMAN 750a, Exam Preparation Colloquium: Part I Sophie Schweiger This course is designed to prepare students for the comprehensive qualifying exams. The course brings together key literary works and films across a range of periods (medieval, baroque, enlightenment, Junges Deutschland, realism, modernism, post-1945), in complex constellations. In doing so, it seeks to answer some of the following questions: What is the purpose of literary history and periodization? How can we think about genres in new and exciting ways? Where and how could one productively "decolonize" the German canon? Which types of scholarship have recently emerged to illuminate key works in an innovative manner? Guests are integrated into the course to help shed light on some of the works. The course is reading-intensive and discussion-based. This course is intended to be followed by GMAN 751 Exam Preparation Colloquium: Part II in the spring. Prerequisite: reading fluency in German.

GMAN 751b, Exam Preparation Colloquium: Part II Kirk Wetters This course is designed to prepare students for the comprehensive qualifying exams. The course brings together key literary works and films across a range of periods (medieval, baroque, enlightenment, Junges Deutschland, realism, modernism, post-1945), in complex constellations. In doing so, it seeks to answer some of the following questions: What is the purpose of literary history and periodization? How can we think about genres in new and exciting ways? Where and how could one productively "decolonize" the German canon? Which types of scholarship have recently emerged to illuminate key works in an innovative manner? Guests are integrated into the course to help shed light on some of the works. The course is reading-intensive and discussion-based. This course is intended to be preceded by GMAN 750, Exam Preparation Colloquium: Part I in the fall. Prerequisite: reading fluency in German.

History

Humanities Quadrangle, 2nd floor, 203.432.1366 http://history.yale.edu M.A., M.Phil., Ph.D.

Chair Regina Kunzel

Director of Graduate Studies Lauren Benton (203.432.1361)

Professors Sunil Amrith, Lauren Benton, Paola Bertucci, Ned Blackhawk, David Blight, Daniel Botsman, Paul Bushkovitch, Deborah Coen, Stephen Davis, Carolyn Dean, Fabian Drixler, Carlos Eire, Omnia El Shakry, David Engerman, Paul Freedman, Joanne Freeman, John Gaddis, Beverly Gage, Bruce Gordon, Greg Grandin, Valerie Hansen, Robert Harms, Elizabeth Hinton, Matthew Jacobson, Paul Kennedy, Jennifer Klein, Regina Kunzel, Noel Lenski, Kathryn Lofton, Mary Lui, Daniel Magaziner, J.G. Manning, Ivan Marcus, Joanne Meyerowitz, Alan Mikhail, Samuel Moyn, Nicholas Parrillo, Mark Peterson, Stephen Pitti, Claire Priest, Laura Robson, Naomi Rogers, Edward Rugemer, Paul Sabin, Stuart Schwartz, Marci Shore, Timothy Snyder, David Sorkin, John Harley Warner, Arne Westad, John Witt, Taisu Zhang

Associate Professors Jennifer Allen, Rohit De, Marcela Echeverri Muñoz, Anne Eller, Hussein Fancy, Crystal Feimster, Andrew Johnston, Isaac Nakhimovsky, Vanessa Ogle, Joanna Radin, William Rankin, Elli Stern, Jonathan Wyrtzen, Alden Young

Assistant Professors Alvita Akiboh, Sergei Antonov, Maura Dykstra, Benedito Machava, Nana Osei Quarshie, Carolyn Roberts, Hannah Shepherd, Nurfadzilah Yahaya

Senior Lecturer Jay Gitlin

FIELDS OF STUDY

Fields include ancient, medieval, early modern, and modern Europe (including Britain, Russia, and Eastern Europe), United States, Latin America, East Asia, South and Southeast Asia, Middle East, Africa, Jewish history; and diplomatic, environmental, ethnic, intellectual, labor, legal, military, political, religious, social, and women's history, as well as the history of science and medicine (see the section in this bulletin on the History of Science and Medicine).

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE Language Requirements

All students must pass examinations in at least one foreign language by the end of the first year. Students are urged to do everything in their power to acquire adequate linguistic training before they enter Yale and should at a minimum be prepared to be examined in at least one language upon arrival. Typical language requirements for major subfields are as follows:

African Either (1) French and German or Portuguese or Dutch-Afrikaans; (2) French or German or Portuguese and Arabic; or (3) French or German or Portuguese or

Dutch-Afrikaans and an African language approved by the director of graduate studies (DGS) and the faculty adviser.

American One language relevant to the student's research interests approved by the adviser and DGS.

Ancient German and either French or Italian and two ancient languages, one of which must be Greek or Latin and the second of which can be either the second classical language or another ancient language (e.g., Hebrew, Aramaic/Syriac, Demotic, Coptic, Classical Armenian, Sanskrit).

Chinese Chinese and Japanese; additional languages like French, Russian, or German may be necessary for certain dissertation topics.

East European The language of the country of the student's concentration plus two of the following: French, German, Russian, or an approved substitution.

Global/International Two languages to be determined by the DGS in consultation with the adviser.

Japanese Japanese and one additional language, as approved by the student's adviser and the DGS.

Jewish Modern Hebrew and German, and additional languages such as Latin, Arabic, Yiddish, Russian, or Polish, as required by the student's areas of specialization.

Latin American Spanish, Portuguese, and French.

Medieval French, German, and Latin.

Middle East Arabic, Persian, or Turkish (or modern Hebrew, depending on area of research) and a major European research language (French, German, Russian, or an approved substitute).

Modern Western European (including British) French and German; substitutions are permitted with the approval of the DGS.

Russian Russian plus French or German with other languages as required.

South Asia One South Asian language and a second relevant research language, whether another South Asian or a European or Asian language.

Southeast Asian Choice of Dutch, French, Spanish, Portuguese, Chinese, Sanskrit, or Arabic, plus one or more Southeast Asian language (e.g., Bahasa Indonesian, Burmese, Khmer, Lao, Malay, Tagalog, Thai, Tetum, or Vietnamese). In certain cases, Ph.D. dissertation research on Southeast Asia may also require knowledge of a regional or local language, e.g., Balinese or Cham.

Foreign students whose native language is not English may receive permission during their first year to hand in some written work in their own language. Since, however, the dissertation must be in English, they are advised to bring their writing skills up to the necessary level at the earliest opportunity.

Additional Requirements

During the first year of study, students normally take six term courses, including Approaching History (HIST 500), which is required of first-year students. During the second year of study, they may opt to take four to six term courses, with the approval of their adviser and the DGS. One of these courses must be the Prospectus Seminar (HIST 501), which is required of second-year students. The ten courses taken during the first two years should normally include at least six chosen from those offered by the department. Students must achieve Honors in at least two courses in the first year, and Honors in at least four courses by the end of the second year, with a High Pass average overall. Courses graded in the Satisfactory/Unsatisfactory mode (HIST 998) count toward the course work requirement but do not count toward the Honors requirement. Courses that count for less than one full credit per term do not count toward the coursework requirement, including EMST 700 and EMST 800 for those in the combined program with Early Modern Studies.

Two of the ten courses must be research seminars in which the student produces an original research paper from primary sources. The Prospectus Seminar (HIST 501) does not count as a research seminar. All graduate students, regardless of field, will be required to take two seminar courses in a time period other than their period of specialty.

Students in their second year should choose their courses so that at least one course will prepare them for a comprehensive examination field. Some fields offer reading seminars specifically designed to help prepare students for examination; others encourage students to sign up for Directed Reading (HIST 998) with one of their examiners. Students should, in consultation with their major field examiner and the DGS, register for Field Studies (HIST 525), which is a half-credit course and does not count toward the coursework requirements.

Students should discuss the following options with their advisers before choosing one:

Option 1 Students take exams during the fourth semester of graduate study (i.e., the second semester of year two). The Comprehensive Statement of Intention Form must be submitted by the end of the third semester.

Option 2 Students take exams during the fifth semester of graduate study (i.e., the first semester of year three). The Comprehensive Statement of Intention Form must be submitted by the end of the fourth semester.

Students in good academic standing may, with adviser approval, request scheduling comprehensive examinations in the sixth semester.

All students must submit the Comprehensive Statement of Intention Form by the end of the fourth semester.

Students will have a choice of selecting three or four fields of concentration: a major field and either two or three minor fields. The examination must contain one minor field that deals fifty percent or more with the historiography of a region of the world other than the area of the student's major field. The examination will have a written component that will be completed before the oral component. For their major field, students will either write a historiographical essay of 8,000 words, maximum, or prepare a syllabus for an undergraduate lecture class in the field; this is to be decided in consultation with the major field examiner. For each of the minor fields, the student will prepare a syllabus for an undergraduate lecture class in the field. All of these are to be written over the course of the examination preparation process and will be due not less than two weeks prior to the oral portion of the examination. The oral examination examines the students on their fields and will, additionally, include discussion of the materials produced for the written component of the examination. For those students who choose two minor fields, the major field will be examined for sixty minutes and the minor fields will be examined for thirty minutes each. For those students who choose three minor fields, each field will be examined for thirty minutes.

In order to advance to candidacy, all students must pass a prospectus colloquium. This should be completed by the end of the sixth term. The prospectus colloquium offers students an opportunity to discuss the dissertation prospectus with their dissertation committee in order to gain the committee's advice on the research and writing of the dissertation and its approval for the project. The dissertation prospectus provides the basis of grant proposals.

Both the comprehensive examinations and the prospectus colloquium must be held by the end of the sixth term.

Completion of ten term courses (including HIST 500 and HIST 501), the language requirements of the relevant field, the comprehensive examinations, and the prospectus colloquium will qualify a student for admission to candidacy for the Ph.D., which must take place by the end of the third year of study.

It is also possible for students who have completed extensive graduate work prior to entering the Yale Ph.D. program to complete course work sooner. Students may petition for course waivers based on previous graduate work (up to four term courses) only after successful completion of the first year.

Students normally serve as teaching fellows during four-six terms to acquire professional training. Ordinarily, students teach in their third year and two subsequent years. During their first term of teaching, students must attend training sessions run by the Poorvu Center for Teaching and Learning and work with the associate director of graduate studies to discuss any matters of concern. Students in more advanced years may have the opportunity to teach as associates in teaching (ATs), in conjunction with a faculty member, or by leading discipline-specific writing seminars on their own. Both options are available only through a competitive process. Interested students should consult with their advisers and the DGS for further information.

By the end of their ninth term, students are required to submit a chapter of their dissertation to the dissertation committee. This chapter will then be discussed with the student by the committee, in a chapter conference, to give the student additional advice and counsel on the progress of the dissertation. This conference is designed to be an extension of the conversation begun in the prospectus colloquium and is not intended as a defense. Its aim is to give students early feedback on the research, argument, and style of the first writing accomplished on the dissertation.

No less than one month before students plan to submit their dissertations, a relatively polished full draft of the dissertation should be discussed with the student by the

dissertation committee, in a dissertation defense of one to two hours, to give the students additional advice and counsel on completing the dissertation or on turning it into a book, as appropriate. Students are required to submit the draft to their committee in sufficient time for the committee to be able to read it (approximately one month). This defense is designed to give students advice on the overall arguments and the final shape of the dissertation or book, and to leave time for adjustments coming out of the discussion.

The fellowship package offered to Ph.D. students normally includes twelve months of fellowship support for two terms of research and writing without any teaching duties. With the approval of the academic adviser and the DGS, students may choose to take the fellowship terms at any point after they have advanced to candidacy and before the end of their sixth year. Students are prohibited from teaching during research and writing fellowship terms.

Students who have not submitted the dissertation by the end of the sixth year need not register in order to submit. If, however, students wish to register for a seventh year for good academic reasons, they may petition for extended registration. The petition, submitted to the History DGS, will explain the academic reasons for the request. Only students who have completed the first chapter conference will be considered for extended registration.

EVALUATION OF FIRST- AND SECOND-YEAR GRADUATE STUDENTS

At the end of each term, the DGS will ask faculty members whether they have serious concerns about the academic progress of any first- or second-year students in the Ph.D. program. Faculty members who have such concerns will provide written feedback to the DGS at the DGS's request. The DGS will use discretion in ensuring that feedback is provided in a clear and effective manner to any students about whom there are concerns. We expect such concerns to be rare.

Toward the end of the academic year, the History faculty will hold a special meeting to review each first- and second-year student in the program. The purpose of the meeting is to assess students' academic progress. In order for second-year students to proceed to the third year, they must demonstrate through written work, classroom performance, and participation in departmental activities that they have the ability to: (a) speak and write clearly; (b) conduct independent research at a high level; and (c) develop coherent scholarly arguments. A faculty vote will be taken at the conclusion of the review meeting to decide whether each second-year student may stay in the program. In the unusual case that a majority of faculty present and voting determine that a student may not continue, the student will be informed in writing and withdrawn from the program. The review meeting must be a full faculty meeting, but faculty members with no knowledge of the students under review may abstain from the vote, and their abstentions will not count in the total. Those members of the faculty who have worked with or know the students being evaluated are required to attend. In the event that any necessary faculty members absolutely cannot be present, they may send their views in writing to the DGS, who will read them at the meeting.

A student informed of a vote of dismissal from the program may submit a formal letter of appeal within two weeks, accompanied by supporting documentation (research or other scholarly work), to the Graduate Advisory Committee. The Graduate Advisory Committee will render a final decision within two weeks of receipt of the appeal. Any members of the Graduate Advisory Committee who have worked directly with the student will recuse themselves from the final vote on the case.

COMBINED PH.D. PROGRAMS History and African American Studies

The Department of History offers, in conjunction with the Department of African American Studies, a combined Ph.D. in History and African American Studies. For further details, see African American Studies.

History and Classics

The Department of History offers, in conjunction with the Department of Classics, a combined Ph.D. in History and Classics, with a concentration in Ancient History. For further details, see Classics.

History and Early Modern Studies

The Department of History offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in History and Early Modern Studies. For further details, see Early Modern Studies.

MASTER'S DEGREES

M.Phil. Students who have completed all requirements for admission to candidacy for the Ph.D. may receive the M.Phil. degree.

M.A. (en route to the Ph.D.) Students enrolled in the Ph.D. program may qualify for the M.A. degree upon completion of a minimum of seven graduate term courses at Yale, of which two must have earned Honors grades and the other five courses must average High Pass overall. Students must also pass an examination in one foreign language.

A student in the Ph.D. program in American Studies who wishes to obtain an M.A. degree in History, rather than an M.A. in American Studies, must include in the courses completed at least two research seminars in the History department.

Students enrolled in the Ph.D. program in Political Science may qualify for the M.A. degree in History, rather than an M.A. in Political Science, upon completion of a minimum of six graduate term courses in History at Yale, of which two must have earned Honors grades and the other four courses must average High Pass overall. A student must include in the six courses completed at least two research seminars in the History department.

Terminal Master's Degree Program For this terminal master's degree, students must pass seven term courses, four of which must be in History; substantial written work must be submitted in conjunction with at least two of these courses, and Honors grades are expected in two courses, with a High Pass average overall. An undergraduate language course, statistics course, or other applicable course in a technological "language" may count for one course credit toward the graduate degree. All students in this program must pass an examination in one foreign language. Financial aid is not available for this program.

More information is available on the department's website, http://history.yale.edu.

COURSES

HIST 500a, Approaching History: Problems, Methods, and Theory Greg Grandin

and Vanessa Ogle An introduction to the professional study of history, which offers new doctoral students an opportunity to explore (and learn from each other about) the diversity of the field, while also addressing issues of shared concern and importance for the future of the discipline. By the end of the term participants have been exposed to some of the key methodological and theoretical approaches historians have developed for studying different time periods, places, and aspects of the human past. Required of and restricted to first-term History Ph.D. students.

HIST 501b, Prospectus Seminar Lauren Benton

This course provides students with information, support, and exercises to guide and assist them in writing the dissertation prospectus. It also introduces students to other common forms of academic writing such as conference papers and journal articles. By the end of the term, each student will have produced a preliminary draft of the dissertation prospectus.

HIST 502a / ANTH 531a / CLSS 815a / EALL 773a / HSAR 564a / JDST 653a /

NELC 533a / RLST 803a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

HIST 507b / CLSS 829b / LING 668b / NELC 809b, Historical Sociolinguistics of the Ancient World Kevin van Bladel

Social history and linguistic history can illuminate each other. This seminar confers the methods and models needed to write new and meaningful social history on the basis of linguistic phenomena known through traditional philology. Students learn to diagnose general historical social conditions on the basis of linguistic phenomena occurring in ancient texts. Prerequisite: working knowledge of at least one ancient language.

HIST 508a / CLSS 847a, Climate, Environment, and Ancient History Joseph Manning

An overview of recent work in paleoclimatology with an emphasis on new climate proxy records and how they are or can be used in historical analysis. We examine in detail several recent case studies at the nexus of climate and history. Attention is paid to critiques of recent work as well as trends in the field.

HIST 523a / CLSS 811a / HSHM 758a, Graeco-Roman Medicine Jessica Lamont and Malina Buturovic

This course offers a graduate-level introduction to the history and study of ancient Greek and Graeco-Roman medicine, beginning with the development of "Hippocratic" medical texts in Classical Greece; these writings are set in dialogue with earlier Babylonian and Egyptian medical traditions. In addition to Hellenistic Alexandria, where anatomical research on the human body flourished, the seminar examines the works of the doctor and philosopher Galen of Pergamon. We conclude in Late Antique Alexandria, where traditions of Graeco-Roman medicine, repackaged as "Galenism," begin a multi-century, cross-cultural journey into the medieval world. Throughout the course we consider: medical theories of human difference, regimen, gynecology and reproductive labor, pulse science, temple medicine and healing cults, anatomy and dissection, zoology, theories of contagion and epidemic, and natural philosophy. Classics students enrolled in the course are asked to read some texts in ancient Greek. However, knowledge of ancient Greek is *not* required for enrollment, and we welcome and encourage students with interests in the history of medicine and science beyond the Graeco-Roman world.

HIST 525a or b / HSHM 525a or b, Field Studies Staff

This course does not count toward the coursework requirements for the Ph.D. or M.A. ½ Course cr

HIST 534a / MDVL 537a, Medieval Political History Paul Freedman

A reading and discussion course that concerns the nature of political power in Europe between approximately 1000 and 1500. Particular attention is paid to the development of state institutions, dynastic and territorial rivalries, the European balance of power, and the interaction of church and state.

HIST 560a / EMST 660a / RLST 691a, Society and the Supernatural in Early Modern Europe Carlos Eire

Readings in primary texts from the period 1500–1700 that focus on definitions of the relationship between the natural and supernatural realms, both Catholic and Protestant. Among the topics covered: mystical ecstasy, visions, apparitions, miracles, and demonic possession. All assigned readings in English translation.

HIST 596a / JDST 761a / MDVL 596a / RLST 773a, Jews and the World: From the Bible through Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings.

HIST 625b, Martyrdom and Sainthood in the Early Modern World Carlos Eire The late medieval and early modern periods saw a dramatic rise in religious violence and persecution. Heresies – such as the Hussites, Waldensians, and Lollards – unsettled religious and political authorities, leading to armed conflict and attempts to suppress movements with violence. Across northern Europe, the late Middle Ages witnessed increasing numbers of pogroms as Jewish communities continued to be eradicated. At the same time, the period saw a flourishing of the veneration of saints and the canonization of holy men and women. These conflicting trends were only heightened by the Reformation, in which martyrdom and sainthood played central roles. This course explores the willingness to die and kill for one's faith and the extraordinary growth in religious heroes, both Protestant and Catholic, who defined emerging confessional identities. The course examines a broad range of texts and visual material considering martyrdom and sainthood in Europe, Asia, and the Americas. *Also REL 757*.

HIST 656a / PLSC 629a, Histories of Political Thought Isaac Nakhimovsky The intersection between political theory and intellectual history, examined from a historiographical rather than an exclusively methodological perspective. The course aims to develop a comparative framework for discussing the kinds of preoccupations and commitments that have animated various important contributions to the history of political thought since the nineteenth century.

HIST 667b / FREN 900b / WGSS 667b, History of Gender and Sexuality in Modern Europe Carolyn Dean

An introduction to the various lines of inquiry informing the history of sexuality. The course asks how historians and others constitute sexuality as an object of inquiry and addresses different arguments about the evolution of sexuality in Europe, including the relationship between sexuality and the state and sexuality and gender.

HIST 669a, European Empires and Law Lauren Benton

Empires used law to structure conquest, establish the legitimacy of rule, justify violence, and absorb new populations and territories. Imperial interactions with conquered populations developed in important ways through the medium of law. The conflicts in and among empires helped to shape the global legal order and to mold the contents of international law. This course considers these and other topics and problems. Readings include selections from the works of key European jurists but focus mainly on providing students with a firm grasp of trends in the secondary literature on empire and law. The emphasis is on the legal history of European empires between 1500 and 1900, but students are encouraged to explore topics and interests in other imperial historiographies.

HIST 68ob, Russian History to 1725 Paul Bushkovitch

The major phases of Russian history from the tenth century, covering the major historiographical controversies and sources. Russian or German helpful but not required.

HIST 702b / AMST 802b, Readings in Early National America Joanne Freeman An introduction to the early national period and its scholarship, exploring major themes such as nationalism, national identity, the influence of the frontier, the structure of society, questions of race and gender, and the evolution of political cultures.

HIST 709a / AFAM 709a / HSHM 763a, Readings in Race and Racism in Medicine, Science, and Healthcare Carolyn Roberts

This graduate reading seminar invites students to study historical and contemporary texts related to race and racism in medicine, science, and healthcare. Our primary focus is anti-Black racism, and we study connections between the period of slavery and present-day issues in healthcare, biomedical research, reproductive justice, and medical and nursing education and practice. Students from any department and discipline are welcome to join this small seminar, which privileges deep listening, close reading, community, and care.

HIST 725a, Topics, Themes, and Methods in U.S. History Beverly Gage and Mark Peterson

Exploring key readings in U.S. history, this seminar introduces important areas of research, members of the Yale faculty, and resources for research at Yale and beyond. Highly recommended for first and second year doctoral students in US History. Open to other interested graduate students with permission of the instructors.

HIST 737b / AFAM 766b / AMST 691b, Research Seminar in U.S. Political Economy Jennifer Klein

Research seminar oriented around themes and issues in U.S. political economy from the late nineteenth century through the end of the twentieth. Readings in the first part of the term look at various approaches to writing about political economy: for example, business history, intellectual history, labor history, biography, local monograph, or transnational history. Research projects explore new possibilities for writing about labor, business, the state, and capitalism.

HIST 741a / AFAM 817a, Research Seminar on the Early Atlantic World Edward Rugemer

This research seminar explores various approaches to writing the history of the early Atlantic world, with particular emphasis on race and slavery, from 1500 to about 1850. Every student writes a publishable article based upon original research.

HIST 743a / AMST 839a / HSHM 744a, Readings in Environmental History Sunil Amrith

Readings and discussion of key works in environmental history. The course explores major forces shaping human-environment relationships, such as markets, politics, and ecological dynamics, and compares different approaches to writing about social and environmental change.

HIST 746b / AMST 903b / PHUM 903b, Introduction to Public Humanities

Matthew Jacobson and Ryan Brasseaux

What is the relationship between knowledge produced in the university and the circulation of ideas among a broader public, between academic expertise on the one hand and nonprofessionalized ways of knowing and thinking on the other? What is possible? This seminar provides an introduction to various institutional relations and to the modes of inquiry, interpretation, and presentation by which practitioners in the humanities seek to invigorate the flow of information and ideas among a public more broadly conceived than the academy, its classrooms, and its exclusive readership of specialists. Topics include public history, museum studies, oral and community history, public art, documentary film and photography, public writing and educational outreach, the socially conscious performing arts, and fundraising. In addition to core readings and discussions, the seminar includes presentations by several practitioners who are currently engaged in different aspects of the Public Humanities. With the help of Yale faculty and affiliated institutions, participants collaborate in developing and executing a Public Humanities project of their own definition and design. Possibilities might include, but are not limited to, an exhibit or installation, a documentary, a set of walking tours, a website, a documents collection for use in public schools.

HIST 760b, American Legal History John Witt

A highly selective tour, with emphasis on transformative moments and foundations. Subjects include legal controversies over European empires in the New World; legal theory of the American Revolution and creation of the U.S. Constitution; advent of the laws of capitalism and slavery; the jurisprudence of the Civil War and Reconstruction; the rise of the modern state and its accompanying intellectual formations and legal crises; the civil rights era and its aftershocks; the mass incarceration phenomenon; immigration law in the construction of the United States; and conservative legal mobilization. Materials include elite sources from the U.S. Supreme Court and elsewhere, as well as social history of the law from the bottom up. Special attention to the role of legal institutions in American economic development; relationships between law and society; and questions about the significance of studying law's history.

HIST 775a / AMST 866a / WGSS 712a, Readings in the History of Sexuality Regina Kunzel

Selected topics in the history of sexuality. Emphasis on key theoretical works and recent historical literature.

HIST 779a, Readings in Economic History, Capitalism, and Political Economy Vanessa Ogle

In this graduate reading seminar, we explore different actors and institutions that shaped the formation of the global economy since the early modern period. The readings focus on a number of forces and their interplay with the economic lives of both ordinary men and women and more elite figures: states/political institutions, the environment, law, war, empire, companies, and capitalists. The seminar provides students with a solid knowledge of the questions currently discussed in the burgeoning subfield of the so-called "new history of capitalism." We pay particular attention to the contours of these debates beyond the history of the United States, and to the international and global dimensions of economic history. No familiarity with economics or economic history required. While this is a reading seminar, students looking to write a research paper on related topics are welcome to pursue this option as part of the course. The course is designed for history Ph.D. students and others who have had previous exposure to history classes at the university level. Basic familiarity with broader historical developments since the eighteenth century is expected.

HIST 788a or b, Across the Red Sea: Race, Islam, and Geopolitics Staff In this graduate seminar, we focus on historical and contemporary texts related to the modern history of the Red Sea region. This course uses the emergent historiography of the Red Sea to focus students' attention on often overlooked connections between Africa and the Arabian Peninsula from the late eighteenth century until the present. In this course, we draw heavily on works from the discipline of history, but we also make ample use of works from the related social sciences. We touch upon issues of race, slavery, migration, imperialism, environmental change, and geopolitical competition. While this is a reading seminar, students looking to write a research paper on related topics are welcome to pursue this option as part of the course. The course is designed for history Ph.D. students and others who have had previous exposure to history classes at the university level.

HIST 797b / AFAM 797b / AMST 797b, Atlantic Abolitions Marcela Echeverri Munoz

This readings course explores the historiography on the century of abolition, when the new states of the Americas abolished racial slavery. Beginning with the first abolitions in the U.S. North during the 1780s, we consider the emergence and process of abolition

throughout the Atlantic world, including the Caribbean, Spanish America, and Brazil, through the 1880s.

HIST 799b, Global and International History Workshop Lauren Benton This workshop offers graduate students opportunities for guided interactions with a community of scholars in global and international history. Students comment on the research of leading scholars and refine their abilities in historical analysis and research presentation. The seminar runs in conjunction with the Global and International History Workshop (GIHW), which brings between six and eight scholars to present their work each year. Presenters represent different temporal and geographical specializations but share an international orientation and methodology in their work. The workshop is open to any student whose research is, broadly speaking, situated within global and international history. ¹/₂ Course cr

HIST 804a, Latin American History Speaker Series Marcela Echeverri Munoz The Latin American History Speaker Series meets eight times per year and aims to showcase ongoing research by leading historians of Latin America and create a space for dialogue about the future of the field. The series is made possible by the generous support of the Yale Council on Latin American and Iberian Studies (CLAIS) at the MacMillan Center. This course does not count toward the coursework requirements in History. ½ Course cr

HIST 810A, Introduction to Brazilian History and Historiography Stuart Schwartz This course is designed to introduce graduate students to the five-century broad sweep of Brazilian history and to the development of the historiography of that country. The course is organized around the reading and discussion of a series of books and articles that highlight the major themes and approaches in Brazilian history and that address the major theoretical and methodological issues as in writing and studying its history as well. We address themes such as the strength of regionalism, the role of the State and its relationship to society, the colonial legacy, the role of slavery and race in Brazilian society, the processes of immigration and industrialization, Brazil's emergence as a regional and a world power, and the challenges of democracy and authoritarian rule in contemporary times.

HIST 823b / FREN 785b, Haiti in the Americas Anne Eller and Marlene Daut This course broadens the temporal parameters of Atlantic history to consider the formation and impact of colonial Saint-Domingue, the import of revolutionary Haiti, and the trajectory of state making on the island through imperial projects of the twentieth century. The course engages with scholarship from the circum-Caribbean, the United States, France, and the greater Atlantic African diaspora.

HIST 836b / AFST 836b, Histories of Postcolonial Africa: Themes, Genres, and the Contingencies of Archival Research Benedito Machava

This course is both historiographic and methodological. It is meant as an introduction to the major themes that have dominated the study of postcolonial Africa in recent years, and the material circumstances in which they were produced. We pay close attention to the kinds of sources and archives that scholars have employed in their works, and how they addressed the challenges of writing contemporary histories in Africa. We center our weekly meetings around one key text and one or two supplementary readings. We engage with works on politics, detention, violence, environment and technology, women and gender, affect, fashion, leisure, and popular culture.

HIST 839b / AFST 839b, Environmental History of Africa Robert Harms An examination of the interaction between people and their environment in Africa and the ways in which this interaction has affected or shaped the course of African history.

HIST 844a / AFST 848 / HSAR 614 / HSHM 737, Human and Non-Human in African History Daniel Magaziner

This graduate reading seminar surveys recent scholarship on human interactions with non-humans in African history. Topics to be considered include human/animal interactions, histories of technology across the nineteenth and twentieth centuries, histories of urbanization (encompassing histories of popular and mechanical culture as well as histories of human/pathogen interactions), and how human beings have responded to their circumstances through mediation with non-human objects, whether as "fetish," as "art," or as "technology."

HIST 852a, Egypt, 1500-1900 Alan Mikhail

Topics in the historiography of early modern and modern Egypt. Readings include classics in the field as well as examples of recent trends and innovative new works. Emphasis is placed on methodology, source usage, questions of periodization, and other interpretive problems. Open to advanced undergraduate with permission of the instructor.

HIST 870b, Social History of the Silk Road Valerie Hansen

An introduction to the social history of the Silk Road from 200–1000 CE through close examination of six archaeological sites in China and one in Uzbekistan. Emphasis on excavated documents (as opposed to transmitted documents) and what they reveal about local society, trade relations, and religious change in the first millennium CE. Those who read classical Chinese meet separately to read handwritten documents, but knowledge of classical Chinese is not required.

HIST 877a, The History of Early Modern China Maura Dykstra

This course examines the periodization, parameters, and implications of some of the many ways that China's path to modernity has been theorizing by reviewing scholarship on what defines and constitutes China's Early Modern era. From early twentieth-century adaptations of social and historical theories from European languages into Chinese historiographical discussions to post-Mao attempts to trace the "sprouts of capitalism" that might justify China's socialist revolution as a valid one, from theories of Song dynasty absolutism and Ming autocracy, from the Great Divergence to urban history, this course surveys the many ways in which the study of China's pre-modern experiences have been shaped to answer questions about China's particular path to modernity.

HIST 889a / EAST 889a / EMST 689a, Research in Japanese History Fabian Drixler and Hannah Shepherd

After a general introduction to the broad array of sources and reference materials available for conducting research related to the history of Japan since ca. 1600, students prepare original research papers on topics of their own choosing in a collaborative workshop environment. Prerequisite: reading knowledge of Japanese.

HIST 903b, Law and Society in Modern South Asia Rohit De

South Asian history has taken a legal turn, with a slew of new self-conscious works of legal history and a range of ethnographies. Social scientists are opening the ways in which law, legal institutions, and ideologies structure and shape South Asian society and are becoming sites of mobilization and resistance. This marks a decisive shift away from decades of scholarship which focused on the idea of a gap between law and legal institutions and South Asian society and comes at a time when the postcolonial states of South Asia are embracing the language of decolonization to overturn and transform long-standing laws and convention. Covering a time period from the eighteenth century to the present, the course engages with the emergence of the colonial legal system and the modern legal profession. The seminar engages with both the canon and recent scholarship on South Asian law and society to rethink fundamental categories of analysis in South Asia: property, state, family, caste, capital, sex, labour, but also to think generatively across broader questions of law and society.

HIST 926a / AMST 877a / HSHM 703a, Problems in the History of Medicine and Public Health John Warner

An examination of the variety of approaches to the social, cultural, and intellectual history of medicine, focusing on the United States. Reading and discussion of the recent scholarly literature on medical cultures, public health, and illness experiences from the early national period through the present. Topics include the role of gender, class, ethnicity, race, religion, and region in the experience of health care and sickness and in the construction of medical knowledge; the interplay between vernacular and professional understandings of the body; the role of the marketplace in shaping professional identities and patient expectations; health activism and social justice; citizenship, nationalism, and imperialism; and the visual cultures of medicine.

HIST 931b / HSHM 702b, Problems in the History of Science Deborah Coen Surveys current methodologies through key theoretical and critical works. Students encounter major twentieth-century methodological moments that have left lasting imprints on the field: positivism and anti-positivism, the sociology of knowledge, actor-network theory, and historical epistemology, as well as newer approaches focusing on space, infrastructure, translation, and exchange. We also consider central conceptual problems for the field, such as the demarcation of science from pseudoscience; the definition of modernity and the narrative of the Scientific Revolution; vernacular science, the colonial archive, and non-textual sources.

HIST 937b / AFAM 752b / AMST 937b / HSHM 761b, Researching and Writing Medicine, Health, and Empire Carolyn Roberts

This graduate research course is limited to a small number of graduate students who are currently involved in research projects that touch on any issues related to health, medicine, and the body in the context of slavery, colonialism, or neocolonialism. The course includes visits to diverse archives on campus, discussions of archival best practices, and digital organizational tools. The course provides graduate students with a balance of support and independence as they carry out their research. Graduate students in any discipline are warmly welcomed to participate in a compassion-based research community that prioritizes values of deep listening, presence, and care.

HIST 940b / HSHM 770b / WGSS 782b, Disability Histories: Research Seminar Naomi Rogers

This course introduces students to the major issues in current disability history as well as theoretical debates in disability studies. We discuss cultural, social, and political meanings of citizenship; efforts to define and classify disabled bodies; contested notions of bodily difference; and the ways disability has and continues to be used as a metaphor for socially defined inferiority like gender, race, or sexuality. By the fourth week students have identified the topic for their research papers and discussed them in class. The next month is devoted to research and writing. We then start meeting again to read and discuss a draft of each paper.

HIST 945a / AFAM 719a / HSHM 771a, Researching and Writing Histories of Health, Medicine, and Science Carolyn Roberts

This small graduate seminar is for students currently researching and writing histories of health, science, and medicine. Students learn about slow scholarship, the politics of the archive, and research organization and management and explore the craft of writing. Preference is given to graduate students in history, the history of science and medicine, and African American studies.

HIST 958b / EMST 695b / MUSI 852b, Temporalities: Early, Modern, and Otherwise Maura Dykstra and Marlene Daut

What is the relationship between history and temporality? Perhaps a better question might be: what different relationships *have there been* between histories and temporalities, and how can interrogating those epistemic shifts generate new ways of "doing" history in the present? This interdisciplinary graduate seminar undertakes a critical genealogy of "history" itself, approaching the Enlightenment and the early-mid-twentieth century as two pivotal moments in the conceptual solidification of the relationship between time (singular) and capital-H history. Readings describing and utilizing foundational theories about time, periodization, and historicism, are juxtaposed against critiques and alternative imaginings in post/de-colonial studies, gender and sexuality studies, performance studies, and various traditions outside of (or opposed to) the canon of modernity. The syllabus includes texts by early modern theorists of history, twentieth-century social theorists, and the critical theoretical engagements that assailed and critiqued them.

HIST 963a and HIST 964b / ANTH 963a and ANTH 964b / HSAR 841a and HSAR 842b / HSHM 691a and HSHM 692b, Topics in the Environmental Humanities Staff

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. This course does not count toward the coursework requirement in history. Open only to students pursuing the Graduate Certificate in Environmental Humanities. ½ Course cr per term

HIST 965a / ANTH 541a / ENV 836a / PLSC 779a / SOCY 617a, Agrarian Societies: Culture, Society, History, and Development Jonathan Wyrtzen and Elisabeth Wood

An interdisciplinary examination of agrarian societies, contemporary and historical, Western and non-Western. Major analytical perspectives from anthropology, economics, history, political science, and environmental studies are used to develop a meaning-centered and historically grounded account of the transformations of rural society. Team-taught.

HIST 997a / HSHM 997a, Pedagogy Seminar Daniel Botsman

Faculty members instruct their Teaching Fellows on the pedagogical methods for teaching specific subject matter. o Course cr

HIST 998a, Directed Readings Staff

Offered by permission of the instructor and DGS to meet special requirements not covered by regular courses. Graded Satisfactory/Unsatisfactory.

HIST 999a, Directed Research Staff

Offered by arrangement with the instructor and permission of DGS to meet special requirements.

History of Art

Loria Center, Rm. 251, 203.432.2668 http://arthistory.yale.edu M.A., M.Phil., Ph.D.

Chair

Milette Gaifman (Loria 557, 203.432.2687, milette.gaifman@yale.edu)

Director of Graduate Studies

Edward Cooke, Jr. [F] (Loria 654, 203.432.2724, edward.cooke@yale.edu) Nicola Suthor [Sp] (Loria 655, 203.432.7210, nicola.suthor@yale.edu)

Professors Carol Armstrong, Tim Barringer, Marisa Bass, Edward Cooke, Jr., Milette Gaifman, Jacqueline Jung, Pamela Lee, Kishwar Rizvi, Nicola Suthor, Mimi Hall Yiengpruksawan

Associate Professors Craig Buckley, Jennifer Raab

Assistant Professors Nana Adusei-Poku, Alexander Ekserdjian, Joanna Fiduccia, Morgan Ng, Quincy Ngan, Catalina Ospina

FIELDS OF STUDY

African art; African American art; Byzantine art and architecture; Caribbean art; contemporary art; early modern art and architecture; East Asian art; eighteenthcentury art; film and media; global modernisms; Greek and Roman art and architecture; history of photography; Indian Ocean art; Indigenous art; Islamic art and architecture; Italian Renaissance art and architecture; Latin American art; material culture and decorative arts; medieval European art and architecture; modern architecture; modern art; Netherlandish, Dutch, and Flemish art; nineteenth-century art; North American art; Northern Renaissance art; Precolumbian art; South Asian art and architecture; Southern Baroque.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

All students must pass examinations in at least two languages pertinent to their field of study, to be determined and by agreement with the adviser and director of graduate studies (DGS). One examination must be passed during the first year of study, the other not later than the beginning of the third term. During the first two years of study, students typically take twelve term courses. In March of the second year, students submit a qualifying paper that should demonstrate the candidate's ability successfully to complete a Ph.D. dissertation in art history. During the fall term of the third year, students are expected to take the qualifying examination. Candidates must demonstrate knowledge of their field and related areas, as well as a good grounding in method and bibliography. By the end of the second term of the third year, students are expected to have established a dissertation topic. A prospectus outlining the topic must be approved by a committee at a colloquium by the end of the third year. Students are admitted to candidacy for the Ph.D. upon completion of all predissertation requirements, including the prospectus and qualifying examination. Admission to candidacy must take place by the end of the third year. The faculty considers teaching to be an important part of the professional preparation of graduate students. Students are required to complete four terms of teaching. This requirement is fulfilled in the second and third years. Students may also serve as a graduate research assistant at either the Yale University Art Gallery or the Yale Center for British Art. This can be accepted in lieu of one or two terms of teaching, but students may accept a graduate research assistant position at any time after the end of their first year. Application for these R.A. positions is competitive.

COMBINED PH.D. PROGRAMS

History of Art and African American Studies

The Department of the History of Art offers, in conjunction with the Department of African American Studies, a combined Ph.D. in History of Art and African American Studies. Students in the combined-degree program must take five courses in African American Studies as part of the required twelve courses and are subject to the language requirement for the Ph.D. in History of Art. The dissertation prospectus and the dissertation itself must be approved by both History of Art and African American Studies. For further details, see African American Studies.

History of Art and Early Modern Studies

The Department of the History of Art offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in the History of Art and Early Modern Studies. For further details, see Early Modern Studies.

History of Art and English

The Department of the History of Art also offers, in conjunction with the Department of English Language and Literature, a combined Ph.D. degree in History of Art and English Language and Literature. The requirements are designed to emphasize the interdisciplinarity of the combined degree program.

Coursework In years one and two, a student in the combined program will complete sixteen courses: ten seminars in English, including The Teaching of English (ENGL 9090) and one course in at least three out of four designated historical periods (Medieval, Renaissance, eighteenth–nineteenth century, twentieth–twenty-first century), and six in history of art, including HSAR 500 and one course outside the student's core area. Up to two cross-listed seminars may count toward the number in both units, reducing the total number of courses to fourteen.

Languages Two languages pertinent to the student's field of study, to be determined and by agreement with the advisers and directors of graduate studies. Normally the language requirement will be satisfied by passing a translation exam administered by one of Yale's language departments. One examination must be passed during the first year of study, the other by the end of the third year.

Qualifying Paper History of Art requires a qualifying paper in the spring term of the second year. The paper must demonstrate original research, a logical conceptual structure, stylistic lucidity, and the ability to successfully complete a Ph.D. dissertation. The qualifying paper will be evaluated by two professors from History of Art and one professor from English.

Qualifying Examination *Written exam:* addressing a question or questions having to do with a broad state-of-the-field or historiographic topic. Three hours, closed book, written by hand or on a non-networked computer. *Oral exam:* given one week after the written exam, covering four fields, including two in English (question periods of twenty-five minutes each, covering thirty texts each, representing two distinct fields of literary history) and two in history of art (twenty-five minutes each, fields to be agreed on in advance with advisers and DGS). Exam lists will be developed by the student in consultation with faculty examiners.

Teaching Two years of teaching – one course per term in years three and four – are required: two in English (up to two sections per course) and two in History of Art.

Prospectus The dissertation prospectus must be approved by both English and History of Art. The colloquium will take place in the spring term of the third year of study. The committee will include at least one faculty member from each department. As is implied by its title, the colloquium is not an examination, but a meeting during which the student can present ideas to a faculty committee and receive advice from its members. The colloquium should be jointly chaired by the directors of graduate studies of both departments.

First Chapter Reading Students will participate in a first chapter reading (also known as a first chapter conference) normally within a year of advancing to candidacy (spring term of year four). The dissertation committee, including faculty members from both programs, will discuss the progress of the student's work in a seminar-style format.

Dissertation Defense The hour-long defense is a serious intellectual conversation between the student and the committee. Present at the defense will be the student's advisers, committee, and the directors of graduate studies in both English and History of Art; others may be invited to comment after the committee's questioning is completed.

History of Art and Film and Media Studies

The Department of the History of Art offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. in the History of Art and Film and Media Studies. Students are required to meet all departmental requirements, but many courses may count toward completing both degrees at the discretion of the directors of graduate studies in History of Art and Film and Media Studies. For further details, see Film and Media Studies.

THE CENTER FOR THE STUDY OF AMERICAN ART AND MATERIAL CULTURE

The Center for the Study of American Art and Material Culture provides a programmatic link among the Yale faculty, museum professionals, and graduate students who maintain a scholarly interest in the study, analysis, and interpretation of American art and material culture. It brings together colleagues from a variety of disciplines – from History of Art and American Studies to Anthropology, Archaeological Studies, and Earth and Planetary Sciences – and from some of Yale's remarkable museum collections, from the Yale University Art Gallery and Peabody Museum to the Beinecke Library. Center activities will focus upon one particular theme each year and will include weekly lunch meetings in which a member makes a short presentation
centered on an artifact or group of artifacts followed by lively discussion about methodology, interpretation, and context and an annual three-day Yale-Smithsonian Seminar on Material Culture.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete eight term courses and have proficiency in one required foreign language. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

Program materials are available online at http://arthistory.yale.edu.

COURSES

HSAR 500a, First-Year Colloquium Pamela Lee

The focus of the first-year colloquium is to analyze and critique the history of art history and its methodology from a variety of disciplinary perspectives. The seminar discusses foundational texts as well as new methods relevant to the study of the history of art and architecture today, notably those concerned with issues of race, gender, and representation. It also engages with debates about museums and the ethics of collecting and display. The seminar is structured around selected readings and includes workshops with guest speakers. It also includes an option to conduct in-person research in the Yale University Art Gallery.

HSAR 506a, Teaching Art History Jacqueline Jung

Directed seminar on pedagogy focused on the genre of the introductory lecture course in the history of art. Topics include how to teach visual analysis and close looking, how to encourage participation, grading and giving written feedback, and addressing student concerns and contingencies. By invitation of the instructor only.

HSAR 520a / EAST 512a / EMST 710a, Chinese Art Modernity Quincy Ngan This seminar uses the visual and material cultures of China to examine the notion of "modernity" and the relations among the "medieval," "early modern," and "modern" periods. By comparing these concepts with the historiographical frameworks of "Song-Yuan-Ming transition" and "late imperial China," we will become familiar with the methodological concerns and contradictions that complicate these relativized temporal frameworks. Works by Craig Clunas, Jonathan Hay, and Wu Hung, along with the insights from historians, inform our discussions of Chinese prints, paintings, ceramics, and other decorative objects in the long-term development of global art history. This class is most suitable for graduate students who have background in Asian art history, the history of China, East Asian studies, or early modern studies.

HSAR 529b / AMST 630b / RLST 819b, Museums and Religion: The Politics of

Preservation and Display Sally Promey

This interdisciplinary seminar focuses on the tangled relations of religion and museums, historically and in the present. What does it mean to "exhibit religion" in the institutional context of the museum? What practices of display might one encounter for this subject? What kinds of museums most frequently invite religious display? How

is religion suited (or not) for museum exhibition and museum education? Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but also encouraged to join us. There are no set prerequisites, but, assuming available seats, permission is granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

HSAR 540a, The Decorative Threat Joanna Fiduccia

"Decoration is the specter that haunts modern painting," Clement Greenberg once claimed; it is modernism's "symptomatic shadow," wrote Peter Wollen. This course seeks to understand these statements by exploring the role of decoration in modernist aesthetics and modern ideology, in which the decorative was entangled with motifs of excess and desire, truth and deception, and gendered labor and space, along with Orientalist fantasies, bourgeois reveries, socialist aspirations, and metaphors for the interiority of the modern subject. Beginning with readings on the significance of ornamentation and decoration at the origins of modern art history, we examine the relationship between theories of modernism and the development of the decorative arts in the nineteenth and twentieth centuries. The course concludes by considering the cultural and political legacies of the decorative threat in art and art history today. Readings include Alois Riegl, John Ruskin, Gottfried Semper, Theodor Adorno, Joris-Karl Huysmans, Gertrude Stein, Clement Greenberg, Caroline Arscott, Gülru Necipo#lu, Oleg Grabar, Peter Wollen, Rae Beth Gordon, Partha Mitter, Whitney Davis, Nancy Troy, Tag Gronberg, Anne Cheng.

HSAR 564a / ANTH 531a / CLSS 815a / EALL 773a / HIST 502a / JDST 653a / NELC 533a / RLST 803a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

HSAR 593b / MDVL 593b, The Body in Medieval Art Jacqueline Jung This seminar explores the manifold approaches to the human body in the art and culture of medieval Europe (from ca. 500–ca. 1500 CE, though with an emphasis on the later end of the period). Through close consideration of works in various media – mediated to us through readings, digital images/renderings, and at least one excursion to a museum – we consider both the role represented bodies played in the social life and religious imagination of medieval communities and the implications such representations had for beholders' sense of their own embodied status. Reading knowledge of French and German is highly recommended but not required.

HSAR 605a, Russian Realist Literature and Painting Molly Brunson An interdisciplinary examination of the development of nineteenth-century Russian realism in literature and the visual arts. Topics include the Natural School and the formulation of a realist aesthetic; the artistic strategies and polemics of critical realism; narrative, genre, and the rise of the novel; the Wanderers and the articulation of a Russian school of painting; realism, modernism, and the challenges of periodization. Readings include novels, short stories, and critical works by Dostoevsky, Turgenev, Goncharov, Tolstoy, Chekhov, and others. Painters of focus include Fedotov, Perov, Shishkin, Repin, and Kramskoy. Special attention is given to the particular methodological demands of inter-art analysis.

HSAR 613a / ARCH 3110a, Architecture and Print: Techniques, Formats, Methods Craig Buckley

Architectural culture is unthinkable without the medium of print. Indeed, today architecture is printed in more and different ways than ever before. At the same time, we live at a moment when the demise of print is routinely proclaimed. Against the grain of such claims, this seminar highlights the specificity of print within the broad and multimodal communication landscape in which architects have operated. This research seminar introduces students to some of the key formats and techniques operative across 250 years of architectural publishing, beginning in the eighteenth century and continuing to the 1970s. The seminar investigates various approaches to the relationship between print history and architectural culture and asks students to develop their own approaches through the close examination of printed matter. The goal is to think critically about what role changing techniques and formats of printing played in the emergence of new concepts within architectural culture and new publics concerned with the built environment. The seminar also invites students to consider how the study of printed media might open new conceptual and material approaches to design culture today, together with new methodologies for engaging architectural history. The seminar is conducted as a semester-long course using special collections at the Beinecke Library, the Yale Center for British Art, and the Haas Library, among others. Due to collections usage, this class is capped at ten students. Priority is given to students in Ph.D. programs in the History of Art and the School of Architecture.

HSAR 615a / EAST 514a, Mapping and Translating Spaces, Cultures, and Languages (1500–1700) Angelo Cattaneo

This course combines the methods of history with those of linguistics and translation studies to promote an innovative interdisciplinary analysis of the processes of cultural (mis)communication and (mis)translation among communities across the Iberian Empires and Royal Patronages between 1500 and 1700. This course has three main objectives: (1) mapping the emergence of multilingual communities in early modernity involving cultures and languages that were previously unknown in Europe; (2) drawing up a comprehensive typological catalogue of overlooked, dispersed metalinguistic and multilingual sources (reports, letters, Christian doctrines, maps, word lists, lexicons, grammars, visual material which described linguistic practices and\or display bilingual or three-lingual evidence) produced mostly in missionary contexts; and (3) within this broad "horizontal" survey, highlighting specific area studies to carry out an indepth "vertical" comparative analysis of cultural-linguistic contacts and translations in America, Sub-Saharan Africa, and Asia, specifically chosen because they were paradigmatic, coeval, and sometimes antithetical cases detailing the different shades of cultural translations in colonial, imperial, and missionary contexts. The integration of two working strategies - the extensive typological mapping of intercultural multilingual sources and the analysis of case studies - allows us to undertake a comparative analysis of the processes related to the learning, imposing or rejection of cultures and

languages in the "troubled pasts" of missionary and colonial contexts. The course aims to document the largest possible corpora of translations in early modernity and offers new ideas on the relevance of linguistic and cultural interactions and on our multicultural and multilingual "troubled present." Participants also have the opportunity to analyze a selection of historical multilingual and metalinguistic documents (dictionaries, grammars, doctrines, maps) in the John Carter Brown Library collections, in Providence, RI, to discover how these documents have variously embodied cultural lenses, religious beliefs, and political concerns.

HSAR 620a / EMST 720a, The Mind of the Book Marisa Bass

This seminar offers an art-historical approach to the early modern book from the dawn of the printing press through the seventeenth century. We cover the interrelation of manuscript and print, collaborations among publishers, authors, and artists, and major early modern genres of visual and intellectual production (such as emblem books, natural history treatises, and cartographic atlases). Topics include the role of frontispieces, paratexts, illustration, annotation, and the idea of the book as a "body" of thought. All meetings are in Beinecke Library and centered on close firsthand study of the books themselves. The focus is on early modern Europe, but students are welcome to pursue research topics on early modern books from any cultural sphere.

HSAR 639a / CLSS 846a, Approaching Sacred Space: Places, Buildings, and Bodies in Ancient Italy Alexander Ekserdjian

This graduate-level seminar approaches sacred space in ancient Italy (ca. 500 BCE– 100 CE) from several evidential and methodological perspectives. The class probes how different kinds of sacred artifacts (places, buildings, and bodies) textured ritual space, forming its recognizable character then and now. While assessing the available evidence (material, literary, epigraphic) for each of these categories, we devote time to untangling the ways that modern scholars and Roman authors have written about ancient holy places. The emphasis on "approach" also provides an avenue to begin to reconstruct the lived experiences of sacred space, moving from the realia of locations, structures, and objects to the possible responses of ancient people.

HSAR 660a, Writing the Object, Writing the World Jennifer Raab

What does it look like to place an object at the center of inquiry, to develop modes of narration that revolve around and evolve with that object, to write history from a visual and material nexus? This course explores the paradigm and possibilities of crafting a text focused on a single object. We spend the first part of the course reading such texts (books, essays, articles) to think about method, voice, and structure. We consider ekphrasis and description, archives and ghosts, fabulation and biography, history and ethics. The second part of the course is devoted to developing student projects, research practices, and object-centered writing, with workshops of paper proposals and drafts, as well as final presentations, enabling ample feedback and emphasizing constructive, collaborative discussion and critique. This course is open to all humanities Ph.D. students whose work foregrounds objects, whether in history of art or in allied fields. Those who are already undertaking dissertation work (and are still in residence) are also considered. Instructor permission required.

HSAR 668b / ENGL 979b / FREN 668b, Ekphrasis and Art Criticism Carol Armstrong

Ekphrasis in its ancient Greek sense refers to the vivid description of an object, animal, person, place, scene, or event undertaken as an exercise in oral rhetoric. In that original

context, the practice of ekphrasis was meant to "paint" a picture in the mind of the listener, and thus pointed to both the imagistic capacities of verbal language, and the integral link between the image and the imagination. In the twentieth century, ekphrasis acquired a narrower meaning: poetry addressed to or modeled on works of visual art. While informed by both of those understandings, this seminar considers ekphrasis both more broadly, in terms of genre, and more narrowly, in relation to a partial history of art criticism as a modern form of writing in the anglophone and European worlds, with a focus on the eighteenth through the twentieth century. It treats the different writerly modes now understood to be embraced by the term ekphrasis: not only poetry, but also the prose poem and the novel, as well as the Salon and art review. It also touches on such issues as the Renaissance inversion of the phrase ut pictura poesis; the competition between the arts of word and image; the presence or absence of illustrations; the modern relations between genres and mediums and the question of mediation; and the address of the different arts to the subjectivity of the reader/spectator. In addition to weekly presentations, a short preliminary paper, and a final research paper, students organize and contribute to a workshop on ekphrasis based on their own ekphrastic exercises, undertaken in the Yale Art Gallery. (Some class time is devoted to those exercises.) This seminar is the second of two (the first is HSAR 667); our hope is that students from both seminars will collaborate on this final event.

HSAR 670a, Karkhana: Process and Collaboration Kishwar Rizvi

Karkhana, or workshop, is a collaborative seminar that considers how we think, write, and make in community. As we study historical and theoretical texts on drawings and buildings, as well as sketching and maintaining a palimpsest drawing over the course of the semester, the aim of the course is to consider how embodied practice affects cultural production. A second aim is to consider how the collaborative process may render new explorations in how one writes/makes and for whom.

HSAR 714a, Globalization of Modern Craft Edward Cooke

This seminar explores the development of self-conscious craft in the condition of modernity. Emerging from the work of the English designer-writer William Morris, modern craft has been intertwined with issues of identity (national and personal), class, and politics. Its intellectual foundation in the writings of Morris has also permitted modern craft to spread throughout the globe, taking root in different ways and at different times. The seminar investigates this geographic and temporal spread in a comparative fashion.

HSAR 720a / AMST 805a / RLST 699a / WGSS 779a, Sensational Materialities: Sensory Cultures in History, Theory, and Method Sally Promey

This interdisciplinary seminar explores the sensory and material histories of (often religious) images, objects, buildings, and performances as well as the potential for the senses to spark contention in material practice. With a focus on American things and religions, the course also considers broader geographical and categorical parameters so as to invite intellectual engagement with the most challenging and decisive developments in relevant fields, including recent literatures on material agencies. The goal is to investigate possibilities for scholarly examination of a robust human sensorium of sound, taste, touch, scent, and sight – and even "sixth senses" – the points where the senses meet material things (and vice versa) in life and practice. Topics include the cultural construction of the senses and sensory hierarchies; investigation of the sensory capacities of things; and specific episodes of sensory contention in and

among various religious traditions. In addition, the course invites thinking beyond the "Western" five senses to other locations and historical possibilities for identifying the dynamics of sensing human bodies in religious practices, experience, and ideas. The Sensory Cultures of Religion Research Group meets approximately once per month at 7 p.m. on Tuesdays; class participants are strongly encouraged, but not required, to attend. Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but encouraged to join us. There are no set prerequisites, but, assuming available seats, permission will be granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

HSAR 7644 / EMST 744a, Advanced Topics in Italian Renaissance Art Morgan Ng This seminar explores recent scholarship on Italian visual culture and architecture, c. 1400–1600. Potential themes include the relationship between art and the environment; transmedial approaches that exceed conventional definitions of painting, sculpture, and architecture; artistic production, patronage, and reception in relation to dynamics of gender, race, labor, and class; the movement of artists and materials; and expanding notions of artistic geography both within and beyond the peninsula. While sessions focus on secondary literature from recent decades, they also put newer scholarship in dialogue with longer historiographic traditions and primary sources. The course is a chance for graduate students not only to inform themselves about trends in the field but also to debate and situate their own voices in relation to them.

HSAR 814b, Japan's Global Baroque Mimi Yiengpruksawan

The intersection of art, science, and diplomacy at Kyoto and Nagasaki in the time of Japanese, Portuguese, Spanish, and Dutch cultural and mercantile interaction in the sixteenth and seventeenth centuries, with attention to the entangled political relations linking the shogun Toyotomi Hideyoshi, Philip II of Spain, Jesuit missionaries such as Alessandro Valignano, and the Christian *daimyō* of Kyushu and the Inland Sea. Focus on Japanese castle architecture, *nanban* screens, world maps, *arte sacra*, and tea ceremony practices as related to the importation of European *arte sacra*, prints and drawings, scientific instruments, and world atlases such as *Theatrum Orbis Terrarum*. Includes inquiry into back-formations such as "baroque" and "global" to describe and/ or interpret sixteenth- and seventeenth-century cultural productions.

HSAR 841a and HSAR 842b / ANTH 963a and ANTH 964b / HIST 963a and HIST 964b / HSHM 691a and HSHM 692b, Topics in the Environmental Humanities Staff

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. This course does not count toward the coursework requirement in history. Open only to students pursuing the Graduate Certificate in Environmental Humanities. $\,^{1\!\!/}_{2}$ Course cr per term

History of Science and Medicine

Humanities Quadrangle, 203.432.1365 http://hshm.yale.edu M.A., M.Phil., Ph.D.

Chair Bill Rankin

Director of Graduate Studies Joanna Radin

Faculty Sakena Abedin, Paola Bertucci, Deborah Coen, Ivano Dal Prete, Megann Licskai, Ayah Nuriddin, Nana Quarshie, Joanna Radin, Marco Ramos, William Rankin, Carolyn Roberts, Naomi Rogers, John Harley Warner

Affiliated Faculty Rene Almeling (Sociology), Alexi Baker (Collections Manager, HSI), Melissa Grafe (Librarian for Medical History), Greta LaFleur (American Studies), Alka Menon (Sociology), Lisa Messeri (Anthropology), John Durham Peters (English; Film and Media Studies), Jason Schwartz (Public Health), Kalindi Vora (Women's, Gender, and Sexuality Studies)

The Graduate Program in the History of Science and Medicine is a semi-autonomous graduate track within the Department of History. The program's students are awarded degrees in History, with a concentration in the History of Science and Medicine.

FIELDS OF STUDY

All subjects and periods in the history of science and history of medicine, especially the modern era. Special fields represented include American and European science and medicine; disease, therapeutics, psychiatry, drug abuse, and public health; science and national security; science and law, science and religion, life sciences, human genetics, eugenics, biotechnology, gender, race, and science/medicine; bioethics and medical research; environmental sciences; human and social sciences; physical and earth sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Courses

Students will ordinarily take fourteen courses by the end of the third year. In their first two years, all students will normally take the three core Problems seminars: Problems in the History of Medicine and Public Health (HSHM 701 or HSHM 703), Problems in the History of Science (HSHM 702), and Problems in Science Studies (HSHM 710). These courses are committed to exploring histories of medicine and science alongside the cultural, political, and social forces that shape them. Issues of race, gender, sexuality, disability, class, and religion are integrated into discussions of medical and scientific knowledge production and praxis in Western and non-Western contexts. In addition, students are expected to take the HSHM Program seminar (HSHM 790, a half-credit course that may be repeated for credit) during their third through sixth semesters. These courses meet every other week and teach skills related to research and professional development relevant to careers in and beyond academia.

Students are also required to take four additional graduate seminars with an HSHM course number. The remaining seven courses can be taken in HSHM, history, or any other field of demonstrated relevance to the student's scholarly objectives. Of the fourteen total courses, at least three must be seminars that result in an original research paper; at least two of these papers must be written in HSHM seminars. Students may ordinarily use up to two independent reading, independent research, or pedagogical seminars toward their course requirements. The use of additional independent credits requires approval.

Graduate school grading at Yale follows a qualitative rubric of Honors, High Pass, or Pass. During the first two years of study, students must achieve Honors in at least two courses in the first year and Honors in at least four courses by the end of the second year, with a High Pass average overall. At the end of each term, the director of graduate studies (DGS) will ask faculty members whether they have serious concerns about the academic progress of any first- or second-year students in the Ph.D. program. Faculty members who have such concerns will provide written feedback to the DGS at the DGS's request. The DGS will use discretion in ensuring that feedback is provided in a clear and effective manner to any students about whom there are concerns.

Students who enter having previously completed graduate work may obtain up to three course credits toward the completion of the total course requirement, the number being contingent on the extent and nature of the previous work and its fit with intended course of study at Yale.

Languages

All students must show proficiency in two languages in addition to English relevant to the student's research interests and approved by the DGS. Over the years, our graduate students have demonstrated proficiency in a wide range of languages, including American Sign Language, Bulgarian, French, German, Hebrew, Hindi, Italian, Japanese, Korean, Latin, Mandarin Chinese, Norwegian, Russian, Spanish, and Swedish. Students may fulfill the requirement in a variety of ways, including demonstrated command of a native language other than English, graduation from an approved foreign university where teaching is conducted in a language other than English, passing an approved language course for credit, or passing a language test administered by the faculty or by one of Yale's language departments. Language tests are administered by their respective departments (such as German, Italian, French, East Asian Languages and Literatures). Students should consult the DGS for additional details and options for uncommon languages.

Yale offers classes in a variety of languages, from introductory to advanced levels, as well as special summer courses for targeted reading proficiency. There are also opportunities to study languages outside of Yale's curriculum, including funding for summer language study, and Directed Independent Language Study (DILS) for individuals who wish to study a language not offered by Yale. For more information on these programs and foreign language tutoring at Yale, please visit the Center for Language Study's website at http://cls.yale.edu.

Students may petition to substitute a specific skill for one of their languages. Proposals require discussion of how the skill will be used in the student's research and a plan for positive demonstration of proficiency.

Second-Year Review

At the end of the academic year, the HSHM faculty will hold a special meeting to review each first- and second-year student in the program. The purpose of the meeting is to assess students' academic progress. In order for second-year students to proceed to the third year, they must demonstrate through written work, classroom performance, and participation in departmental activities that they have the ability to: (a) speak and write clearly; (b) conduct independent research at a high level; and (c) develop coherent scholarly arguments. A faculty vote will be taken at the conclusion of the review meeting to decide whether each second-year student may continue in the program. If a majority of faculty present and voting determine that a student may not continue, the student will be informed in writing and withdrawn from the program. The review meeting must be a full faculty meeting, but faculty members with no knowledge of the students under review may abstain from the vote, and their abstentions will not count in the total. Those members of the faculty who have worked with or know the students being evaluated are required to attend. In the event that any necessary faculty members absolutely cannot be present, they may send their views in writing to the DGS, who will read them at the meeting.

Qualifying Examination

Prior to beginning work on the dissertation, all students are expected to develop a broad general knowledge of the discipline. This knowledge will be acquired through a combination of course work, regular participation in HSHM colloquia and workshops, and dedicated preparation for the qualifying oral examination.

The qualifying examination has two main goals. First, it is a preparatory step toward the dissertation. Students will master the analytical vocabulary of the discipline and engage critically with key historiographic and theoretical questions. This will prepare them to select a research topic of scholarly significance and to articulate its import effectively. Second, the qualifying examination will prepare students for teaching. Students will learn to communicate a set of historical themes and narratives confidently and fluently.

Students will normally spend the summer following their second year preparing for the oral qualifying examination, which will be taken in the third year, preferably during the first half.

The qualifying examination will normally consist of four fields, each of which will be examined by a different faculty member: two fields in the history of science and/or history of medicine; one field in an area of history outside of medicine and/or science; and one field of special interest, the content and boundaries of which will be established in consultation with the student's adviser.

Possibilities for the field of special interest include a second field in history outside of history of science or medicine, a field with a scientific or medical focus (such as bioethics, health policy, public health, medical anthropology, or medical sociology), or a field at the intersection of science, medicine, and other subjects (such as law, national security, religion, culture, biotechnology, gender, race, literature, the environment, and so on).

The examination itself will be an oral exam, with each field examined for thirty minutes. Ahead of the exam students will also submit, for each field, a written syllabus for an undergraduate course. With approval, students may submit other written materials instead of a syllabus; examples could include a teaching statement, the text of a fifty-minute undergraduate lecture, a review essay, or an exhibit proposal. In rare cases students may also propose alternatives to the oral component, given sufficiently compelling intellectual or career factors.

In preparation for the qualifying examination, the program's faculty work closely with students to facilitate the successful passage of the exam. A student who does fail the qualifying examination will be permitted to retake it. A student who fails a second time will be asked to withdraw from the program.

Advising

During their first term in the program, all students will be advised by the DGS. During the second term and thereafter, each student will be advised by a faculty member of the student's choosing. The adviser will provide guidance in selecting courses and preparing for the qualifying examination. The adviser may also offer help with the development of ideas for the dissertation, but students are free to choose someone else as the dissertation adviser when the time comes to do so. Students are encouraged to discuss their interests and program of study with other members of the faculty.

Dissertation Prospectus

Students are encouraged to begin thinking about their dissertation topics during the second year. This is an opportune time, since they will be expected to submit a dissertation prospectus as soon as possible following the qualifying examination and to defend the prospectus orally before being admitted to full candidacy for the doctoral degree. The prospectus colloquium is typically held in the second term of the third year, with advancement to candidacy before the start of the fourth year.

For more information, please see the program's Guide to Prospectus and Prospectus Colloquium at https://hshm.yale.edu/sites/default/files/files/prospectus_guide.pdf.

Committee Constitution Requirement

Each Ph.D. student must have a dissertation committee and a dissertation adviser, satisfactory to the student's department and in accordance with graduate school requirements, in order to register for the fourth year of study. Students without an approved committee and dissertation adviser will normally be withdrawn from their program.

Teaching

Teaching is an important part of the professional preparation of graduate students in History of Science and Medicine. Students are encouraged to participate in programs to develop their teaching skills, including the Certificate for College Teaching Preparation, which is a comprehensive training program designed to enhance proficiency in classroom instruction.

Typically, during the third and fourth years of study, students will serve as teaching fellows, which usually means that they will lead small-group discussion sections for undergraduate courses and grade their students' exams and papers. On occasion, however, students may work as teaching fellows in the second term of the second year, particularly if they have received course credit for previous graduate studies, or if they choose to defer the completion of their required course work for the first term of the third year. Students usually work as teaching fellows for courses in the History of Science and Medicine, but they may also have the opportunity to be teaching fellows in History or other departments.

At least two terms of teaching are required for doctoral students to graduate from the Program in the History of Science and Medicine; four terms are required for students on Yale-supported fellowships, although students may elect to substitute one or two of these terms with research assistantships at the Yale Center for British Art, the Yale University Art Gallery, or other sites across campus. For more information, please contact the Office of Financial Aid.

Chapter Conference and Dissertation Completion

In the fourth or fifth year, and preferably no later than the fall term of the fifth year, students are required to submit one chapter of the dissertation (not necessarily the first chapter) to the dissertation committee. The committee will then meet as a group with the student to discuss the chapter and the student's progress on the dissertation more generally. This conference is meant to be an extension of the conversation begun in the prospectus defense, with the aim of providing feedback on the student's research, argument, and style at this early stage of the dissertations, a relatively polished full draft of the dissertation should be discussed with the student by the dissertation committee in a dissertation defense of one to two hours. This will give the students additional advice and counsel on completing the dissertation or on turning it into a book, as appropriate. Students are required to submit the draft to their committee in sufficient time for the committee to be able to read it. This defense is designed to give students advice on the overall arguments and the final shape of the dissertation or book and to leave time for adjustments coming out of the discussion.

M.D.-PH.D. AND J.D./PH.D. JOINT-DEGREE PROGRAMS

Students may pursue a doctorate in History of Science and Medicine jointly with a degree in Medicine or Law. Standard graduate financial support is provided for the doctoral phase of work toward such a joint degree. Candidates for the joint degree in Law must apply for admission to both the Law School and the graduate school. Information about the joint-degree program with Medicine can be obtained from the website of the Yale School of Medicine (http://medicine.yale.edu/mdphd) and from the website of the Section of the History of Medicine (http://medicine.yale.edu/histmed).

MASTER'S DEGREES

M.Phil. and M.A. (en route to the Ph.D.) See Degree Requirements under Policies and Regulations.

Terminal Master's Degree Program For the terminal master's degree students must pass seven term courses, four of which must be in HSHM. Course work will normally include at least two Problems graduate seminars and two additional graduate seminars in HSHM. The remaining courses are to be chosen in consultation with the DGS or a faculty adviser. Honors grades are required in two courses, with a High Pass average overall. Financial aid is not available for this M.A. program.

More information is available on the program's website, http://hshm.yale.edu.

COURSES

HSHM 525a or b / HIST 525a or b, Field Studies Staff

This course does not count toward the coursework requirements for the Ph.D. or M.A. ½ Course cr

HSHM 691a and HSHM 692b / ANTH 963a and ANTH 964b / HIST 963a and HIST 964b / HSAR 841a and HSAR 842b, Topics in the Environmental Humanities Staff

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. This course does not count toward the corrsework requirement in history. Open only to students pursuing the Graduate Certificate in Environmental Humanities. ¹/₂ Course cr per term

HSHM 702b / HIST 931b, Problems in the History of Science Deborah Coen Surveys current methodologies through key theoretical and critical works. Students encounter major twentieth-century methodological moments that have left lasting imprints on the field: positivism and anti-positivism, the sociology of knowledge, actor-network theory, and historical epistemology, as well as newer approaches focusing on space, infrastructure, translation, and exchange. We also consider central conceptual problems for the field, such as the demarcation of science from pseudoscience; the definition of modernity and the narrative of the Scientific Revolution; vernacular science, the colonial archive, and non-textual sources.

HSHM 703a / AMST 877a / HIST 926a, Problems in the History of Medicine and Public Health John Warner

An examination of the variety of approaches to the social, cultural, and intellectual history of medicine, focusing on the United States. Reading and discussion of the recent scholarly literature on medical cultures, public health, and illness experiences from the early national period through the present. Topics include the role of gender, class, ethnicity, race, religion, and region in the experience of health care and sickness

and in the construction of medical knowledge; the interplay between vernacular and professional understandings of the body; the role of the marketplace in shaping professional identities and patient expectations; health activism and social justice; citizenship, nationalism, and imperialism; and the visual cultures of medicine.

HSHM 744a / AMST 839a / HIST 743a, Readings in Environmental History Sunil Amrith

Readings and discussion of key works in environmental history. The course explores major forces shaping human-environment relationships, such as markets, politics, and ecological dynamics, and compares different approaches to writing about social and environmental change.

HSHM 755b / ANTH 615b, Anthropological Perspectives on Science and Technology Lisa Messeri

The course focuses on ethnographic work on scientific and technical topics, ranging from laboratory studies to everyday technologies. Selected texts include canonical books as well as newer work from early scholars and the most recent work of established scholars. Divided into four units, this seminar explores the theme of "boundaries," a perennial topic in anthropology of science that deals with the possibility and limits of demarcation. Each week, different kinds of boundaries are examined, and students learn to see their social constructedness as well as the power they carry. We begin by exploring where science is and isn't, followed by the boundary between ourselves and technology, which is a specific example of the third boundary we examine: the one artificially drawn between nature and culture. We end with readings on geopolitics and the technologies of delineating nation from nation as well as thinking about postnational scientific states. Class discussion guides each session. One or two students each week are responsible for precirculating a book review on the week's reading, and a third student begins class by reacting to both the texts and the review. The final assignment is a research paper or a review essay.

HSHM 757b / AMST 520b / ER&M 520b / WGSS 520b, Applied Research in Feminist Science and Technology Studies Kalindi Vora

In this seminar, participants conduct applied research on projects with the primary investigator/instructor. Structured as a lab, we learn research methods, design research activities including building bibliographies for scholarly review, and collecting data through surveys and interviews. Topics vary but are linked to active research by instructor in feminist science and technology studies. Permission of instructor is required. Undergraduates may enroll by permission of instructor.

HSHM 758a / CLSS 811a / HIST 523a, Graeco-Roman Medicine Jessica Lamont and Malina Buturovic

This course offers a graduate-level introduction to the history and study of ancient Greek and Graeco-Roman medicine, beginning with the development of "Hippocratic" medical texts in Classical Greece; these writings are set in dialogue with earlier Babylonian and Egyptian medical traditions. In addition to Hellenistic Alexandria, where anatomical research on the human body flourished, the seminar examines the works of the doctor and philosopher Galen of Pergamon. We conclude in Late Antique Alexandria, where traditions of Graeco-Roman medicine, repackaged as "Galenism," begin a multi-century, cross-cultural journey into the medieval world. Throughout the course we consider: medical theories of human difference, regimen, gynecology and reproductive labor, pulse science, temple medicine and healing cults, anatomy and dissection, zoology, theories of contagion and epidemic, and natural philosophy. Classics students enrolled in the course are asked to read some texts in ancient Greek. However, knowledge of ancient Greek is *not* required for enrollment, and we welcome and encourage students with interests in the history of medicine and science beyond the Graeco-Roman world.

HSHM 761b / AFAM 752b / AMST 937b / HIST 937b, Researching and Writing Medicine, Health, and Empire Carolyn Roberts

This graduate research course is limited to a small number of graduate students who are currently involved in research projects that touch on any issues related to health, medicine, and the body in the context of slavery, colonialism, or neocolonialism. The course includes visits to diverse archives on campus, discussions of archival best practices, and digital organizational tools. The course provides graduate students with a balance of support and independence as they carry out their research. Graduate students in any discipline are warmly welcomed to participate in a compassion-based research community that prioritizes values of deep listening, presence, and care.

HSHM 763a / AFAM 709a / HIST 709a, Readings in Race and Racism in Medicine, Science, and Healthcare Carolyn Roberts

This graduate reading seminar invites students to study historical and contemporary texts related to race and racism in medicine, science, and healthcare. Our primary focus is anti-Black racism, and we study connections between the period of slavery and present-day issues in healthcare, biomedical research, reproductive justice, and medical and nursing education and practice. Students from any department and discipline are welcome to join this small seminar, which privileges deep listening, close reading, community, and care.

HSHM 770b / HIST 940b / WGSS 782b, Disability Histories: Research Seminar Naomi Rogers

This course introduces students to the major issues in current disability history as well as theoretical debates in disability studies. We discuss cultural, social, and political meanings of citizenship; efforts to define and classify disabled bodies; contested notions of bodily difference; and the ways disability has and continues to be used as a metaphor for socially defined inferiority like gender, race, or sexuality. By the fourth week students have identified the topic for their research papers and discussed them in class. The next month is devoted to research and writing. We then start meeting again to read and discuss a draft of each paper.

HSHM 771a / AFAM 719a / HIST 945a, Researching and Writing Histories of Health, Medicine, and Science Carolyn Roberts

This small graduate seminar is for students currently researching and writing histories of health, science, and medicine. Students learn about slow scholarship, the politics of the archive, and research organization and management and explore the craft of writing. Preference is given to graduate students in history, the history of science and medicine, and African American studies.

HSHM 782a / AMST 696a / ENGL 906a / ER&M 696a / RLST 630a / WGSS 696a,

Michel Foucault I: The Works, The Interlocutors, The Critics Greta LaFleur This graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on The History of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Instructor permission required.

HSHM 783b / AMST 697b / ENGL 5197b / ER&M 697b, Michel Foucault II: The Works, the Interlocutors, The Critics Greta LaFleur

Continuing graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on *The History* of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his

critics (Mbembe, Weheliye, Butler, Said, etc, and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Previously ENGL 907.

HSHM 790a or b, HSHM Program Seminar Joanna Radin

The HSHM Program Seminar helps students navigate the requirements of the Ph.D. program in HSHM, including but not limited to the prospectus, teaching, conference presentations, the "hidden curriculum," research and publication strategies, career planning, and other topics. Along with discussion of skills specific to HSHM, the course provides opportunities for students to practice these skills in a workshop format. Some sessions will include guest speakers on topics such as non-academic careers and the publishing world. The seminar is a requirement for students in their second and third years of the Ph.D. in HSHM and is an elective for students in other years. ½ Course cr

HSHM 792a / AMST 619a / ER&M 620a / WGSS 620a, Enduring Conditions: Chronic Illness, Disability, Care, and Access Kalindi Vora

This interdisciplinary course brings together scholarship on access and care that bridges concerns in the fields of disability studies and humanistic approaches to chronic illness. Scholarly texts are drawn from the fields of critical race and ethnic studies, gender and sexuality studies, anthropology and sociology of medicine, history, and feminist science and technology studies (fSTS. Seminar participants also engage with the arts and media as critical sites for understanding culture work bringing together knowledge in disability and chronic illness spaces. To embrace community-based research and knowledge sharing, the course features regular guest lectures from grassroots disability justice organizers and culture workers. The course is offered in a hybrid format. To consider what disability studies and work on chronic illness can build together, we explore the work of Moya Bailey, Aimi Hamraie, Jina B. Kim, Sami Schalk, Akemi Nishida, Ryan Cartwright, and Arthur Kleinman, among others. Permission of instructor.

HSHM 920a or b, Independent Reading Staff

By arrangement with faculty.

HSHM 930a or b, Independent Research Staff

By arrangement with faculty.

HSHM 997a / HIST 997a, Pedagogy Seminar Daniel Botsman

Faculty members instruct their Teaching Fellows on the pedagogical methods for teaching specific subject matter. o Course cr

Immunobiology

Anlyan Center (TAC) S625, 203.785.3857 http://immunobiology.yale.edu M.S., M.Phil., Ph.D.

Chair David Schatz

Director of Graduate Studies

Carla Rothlin (TAC 625A, 203.737.4679, carla.rothlin@yale.edu)

Professors Jeffrey Bender (Internal Medicine), Marcus Bosenberg (Dermatology), Lieping Chen, Joseph Craft (Internal Medicine), Peter Cresswell, Vishwa Dixit (Comparative Medicine), Richard Flavell, David Hafler (Neurology), Kevan Herold, Andres Hildago, Akiko Iwasaki, Paula Kavathas (Laboratory Medicine), Steven Kleinstein (Pathology), John MacMicking (Microbial Pathogenesis), Ruslan Medzhitov, Markus Müschen (Hematology), Jordan Pober, Carla Rothlin, Craig Roy (Microbial Pathogenesis), Lauren Sansing (Neurology), David Schatz, John Tsang

Associate Professors Ellen Foxman (*Laboratory Medicine*), Ann Haberman, Daniel Jane-Wit (*Internal Medicine*), Nikhil Joshi, Liza Konnikova (*Medicine*), Carrie Lucas, Kevin O'Connor (*Neurology*), Noah Palm, João Pereira, Andrew Wang (*Rheumatology*), Craig Wilen (*Laboratory Medicine*)

Assistant Professors Etienne Caron, Grace Chen, Wei Hu, Jeffrey Ishizuka (*Medical Oncology*), Carolina Lucas, David Martinez, Andrew James Martins

FIELDS OF STUDY

Immunology is the study of the immune system that confers protection against infectious diseases. This complex system is also involved in the rejection of grafted tissues, in allergy, and in autoimmunity. The Department of Immunobiology is a multidisciplinary group of investigators committed to understanding the cellular, genetic, and molecular basis of these processes. The department is based on the understanding that the solution to complex biological problems requires the integration of individuals with a common goal but differing expertise. Research focuses on the molecular, cellular, and genetic underpinnings of immune system function and development, on host-pathogen interactions, and on a variety of autoimmune disorders. In addition to the growing need to apply basic science research toward human disease, we have developed a Human and Translational Immunology (HTI) section to improve our understanding and treatment of human immunological disorders. The general research interests of the Immunology track span almost all aspects of the immune system and its role in disease prevention.

RESEARCH AREAS

Fundamental Mechanisms of Immunity Research in the department examines the fundamentals of the immune system at multiple levels: development, activation, regulation, and evolution. Studies of lymphocyte and innate immune cell development examine the receptors and signals that control lineage commitment, cell maturation, and cell death; the establishment of the proper environments for cellular development; and the mechanisms by which antibody and T cell receptor genes are assembled and

diversified. A critical first step in an effective immune response is the activation of cells of the innate immune system, including monocytes, macrophages, dendritic cells, and neutrophils. Research examines the receptors and signaling molecules that control these processes, the mechanism by which cells process and present antigen, and the recognition of this antigen by T cell receptors on T lymphocytes. Upon activation, T and B cells differentiate and acquire critical effector functions including the production of cytotoxic anti-pathogen molecules and antibodies. Studies in the department examine the tissue spatial context and cellular interactions that influence effector lineage fate decisions, cytoplasmic signal transduction molecules, nuclear transcription factors, and mechanisms controlling gene expression during differentiation. Finally, resolution of the immune response (leading to scarring or healing) and the evolution of adaptive immunity are under study.

The Human Immune System The immune system has evolved to deal with many different challenges, some of which can vary widely among vertebrate species, and thus while many basic mechanisms may be shared between humans and various animal models, the human immune system has evolved to differ in important ways from that of commonly used experimental rodents. Furthermore, human diseases, especially chronic disorders, are also significantly more complex than commonly used disease models, and the approaches to studying human immunity, for ethical reasons, must often be fundamentally different from those used in experimental systems. New immunotherapies, especially those based on the use of biologicals, have created an opportunity to ethically investigate human immunology and improve the value of clinical trials. The Human and Translational Immunology (HTI) section of the Immunobiology department studies both the immune systems of healthy individuals and the roles that immunology plays in a variety of human disease and analyzes the alterations that therapies may have on the immune response. HTI investigators also develop new approaches for human investigation and create new experimental models that better replicate human immunity.

Immunology of Cancer The past several years have witnessed a revolution in cancer treatment based on the paradigm of activating a patient's own immune system to target their cancer. Cancer immunotherapy relies on the immune system's ability to not only recognize "non-self," but "altered self," detecting the remarkably subtle differences between cancer cells and healthy tissues. Moreover, many therapies rely on preexisting immune cells in the tumor microenvironment for efficacy, highlighting the potential of natural immunosurveillance mechanisms to destroy cancer. In close collaboration with the Yale Cancer Center, ongoing work in the Department of Immunobiology focuses on seeking to understand the basic mechanisms of how innate and adaptive immune responses are generated against tumors, how tumor clearance is achieved, and how the immune system can be manipulated to enhance immunotherapy.

Disorders of the Immune System Adaptive immune responses provide powerful long-lived protection from pathogens, but when misdirected, T and B cell responses can cause significant injury and disease. The mechanisms controlling inappropriate adaptive immunity to self-targets/autoantigens (autoimmunity), allergens (allergy), or transplanted tissues (alloimmunity) are being addressed by faculty in our department. Diabetes, multiple sclerosis, lupus, and rheumatoid arthritis are just some of the autoimmune diseases under study. Why and how allergens are targeted by the immune system in diseases like food allergy and asthma are questions being actively studied.

Vascular graft and red blood cell rejection are examples of alloimmune responses under investigation in our department.

Host-Microbe Interactions The immune system evolved to manage our constant exposure to diverse microbial stimuli, ranging from the smallest viruses to fifty-foot-long tapeworms. Researchers in the Department of Immunobiology investigate the full spectrum of possible host-microbe interactions, including antagonistic interactions with parasitic viruses, bacteria, and helminths, as well as mutualistic interactions with the trillions of microbes that live in and on us (our microbiota).

Inflammation Biology Inflammation is a protective response including infection and injury as well as other causes of loss of tissue homeostasis. Although primarily orchestrated by the immune system, the inflammatory response can affect virtually any physiological process, from cardiovascular and digestive functions to growth, reproduction, and behavior. However, because inflammation operates at the expense of some normal physiological processes, it can also be a source of a variety of pathological sequela. Indeed, most human diseases are now known to be associated with inflammation. Research in our department addresses multiple aspects of inflammation biology, ranging from detailed molecular mechanisms underlying the response, to human diseases.

Computational Immunology Computational immunology (or systems immunology) involves the development and application of bioinformatics methods, mathematical models, and statistical techniques for the study of immune system biology. The immune system is composed of dozens of different cell types and hundreds of intersecting molecular pathways and signals. Systems approaches can be used to predict how the immune system will respond to a particular infection or vaccination. Or it can help understand how best to design an immunotherapy: will it help ease disease, and what might the side effects be? In addition, computational approaches are increasingly vital to understanding the implications of the wealth of gene expression and epigenomics data being gathered from immune cells. Yale has a diverse research program in computational immunology that brings together expertise from a variety of scientific disciplines to bear on research projects in vaccine response, host-pathogen dynamics, cell-fate choices, immune genomics, informatics, and many other topics. Students interested in computational immunology can be co-mentored by faculty from the Immunology track and the Computational Biology and Bioinformatics tracks.

FACILITIES

More than thirty laboratories are actively involved in research in immunology. Many share adjoining or nearby laboratory space in the Anlyan Center (TAC) and include faculty who are funded by the Howard Hughes Medical Institute. The Department of Immunobiology provides one of the largest integrated training programs in immunology in the country, led by a faculty with a reputation for excellence in research. The department maintains a wide variety of major equipment. In addition, investigators have access to a wide variety of cutting-edge equipment on campus in open-access core facilities for flow cytometry, mass cytometry, EM, and imaging including light-sheet microscopy and intravital two-photon LSM.

PROGRAM ENTRY

Most students enter the Immunobiology graduate program through the Immunology track of the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), http://bbs.yale.edu. Other types of students enter from the M.D./Ph.D. program (see below), the MRSP (see below), or another BBS track, with approval of the Immunobiology director of graduate studies (DGS) and the faculty adviser.

The faculty and students of the BBS program are organized into interest-based tracks. Immunology, being one of eight tracks, encourages individualized attention to maximize scientific interactions. There is complete freedom to work with any of the 350 faculty members affiliated within any of the tracks and to take courses offered by any of the BBS departments or programs. Students are encouraged to supplement core courses in molecular and cellular immunology with additional courses selected from the wide range available in cell biology, molecular biology, developmental biology, biochemistry, genetics, pharmacology, molecular medicine, neuroscience, and bioinformatics. Research seminars and informal interactions with other graduate students, postdoctoral fellows, and faculty also form an important part of graduate education.

The Section of Human and Translational Immunology (HTI) is a component of the Immunobiology department and is located at 10 Amistad Street and 300 George Street. Its mission is to accelerate the application of new developments in the field of immunology to the treatment of human diseases. HTI faculty study the immunologic aspects of a very broad range of human diseases, encompassing investigations in the fields of cancer; transplantation of solid organs and stem cells; autoimmune diseases; and neurologic disease.

The Medical Research Scholars Program (MRSP) is open to students who have already been accepted into the BBS program. A separate application is also required, and is to be submitted to the BBS. A total of eight students each year (four first-years and four second-years) will be enrolled as Medical Research Scholars. They remain in their BBS tracks or departments but participate in the additional MRSP curriculum. The program bridges barriers between traditional predoctoral and medical training by providing Yale Ph.D. students with both medically oriented course work and a mentored clinical experience. This combination of medical knowledge and face-to-face interaction with patients and their doctors provides a new perspective to Ph.D. students and enhances the rigorous training in basic science already provided.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to take six courses for a grade in the graduate school.

Required graded courses for first- and second-year students are:

- 1. IBIO 530, Biology of the Immune System (Students have the option of passing out of IBIO 530 by taking the final exam from the previous year.)
- 2. IBIO 531, Advanced Immunology
- 3. Two Immunobiology seminar courses taken from this series: IBIO 532, IBIO 536, IBIO 537, IBIO 538, IBIO 539 (The second seminar course can be audited if a student has grades in six other science courses and has already taken one seminar course for credit.)

Required credit-only, nongraded courses for first-year students are:

- 1. IBIO 600, Introduction to Research (Immunology-track first years only)
- 2. IBIO 611, IBIO 612, IBIO 613, Research Rotations (short research projects are taken under the guidance of three Yale professors) (Immunology-track first years only)
- 3. IBIO 601, Fundamentals of Research: Responsible Conduct of Research

Fourth-year students are required to take IBIO 503, a refresher training course in the responsible conduct of research.

Additional courses are determined based on the individual needs of the student, and include courses in biochemistry, cell biology, genetics, molecular biology of prokaryotes, molecular biology of eukaryotes, animal viruses, the structure of nucleic acids and proteins, microbiology, and disease mechanisms. Students choose courses after consulting the DGS and the thesis adviser.

Honors The graduate school uses grades of Honors, High Pass, Pass, or Fail. Students are required to earn a grade of Honors in at least two courses in the first two years, and are expected to maintain a High Pass average. There is no foreign language requirement.

Teaching Students are required to serve as a science TA (teaching assistant) for two terms before the end of their sixth term. Teaching protocol and rules are as follows:

- 1. Teaching two term-long science courses is required as a fulfillment of the Ph.D.
- 2. First-year students do not teach.
- 3. Teaching opportunities are first given to students who need teaching credit.
- 4. Teaching for additional income is available when openings exist after those selected for credit are hired; approval signatures from the adviser and DGS are required.
- 5. The maximum teaching allowed is one course per term.

A one-day seminar entitled "Teaching at Yale" is offered by the Yale Poorvu Center for Teaching and Learning at the start of each term. Attending this seminar is recommended prior to teaching.

Prospectus and Qualifying Exam In the second year, early in the fourth term, or in certain circumstances, in the third term, students make a thirty-minute presentation to the department of their proposed research and initial results. Thereafter, they meet with their prospectus committee, which assigns four or five broad areas of biology and immunology that are of particular relevance to the proposed research and on which the student will be examined in the qualifying exam. During the next several weeks, students prepare a formal research proposal (in NIH grant format) concerning the proposed thesis research and study for the exam. The exam is held within three months. It is an oral exam covering all aspects of immunology generally, with a focus on the assigned areas mentioned above. The student is questioned on aspects of the thesis proposal.

Admission to Candidacy Requirements for admission to candidacy, which usually takes place after six terms of residence, are: completion of course requirements, one of the two teaching requirements, the qualifying exam, and the third-year committee meeting – at the one year anniversary of the qualifying exam – with a signed

certification form from the adviser and committee members verifying that the student has made good progress.

Progress in thesis research in the third and later years is monitored carefully by the student's thesis committee (composed of the adviser and three or four other faculty). See below.

REQUIREMENTS FOR M.D.-PH.D. STUDENTS MAJORING IN IMMUNOBIOLOGY

Six courses for a grade. Out of the six courses the following are mandatory:

- 1. IBIO 530, Biology of the Immune System (Students have the option of passing out of IBIO 530 by taking the final exam from the previous year.)
- 2. IBIO 531, Advanced Immunology
- 3. Two Immunobiology seminar courses taken from this series: IBIO 532, IBIO 536, IBIO 537, IBIO 538, IBIO 539 (The second seminar course can be audited if a student has grades in six other courses and has already taken one seminar course for credit.)

Two grades of Honors: Yale University graduate courses taken for a grade at the School of Medicine may be counted toward the Honors fulfillment and the six total required courses. Verification must be provided to the DGS.

One term of teaching: Previously taught courses in the School of Medicine may count toward this requirement. To request credit for previous teaching experience, a note from the course director describing the teaching experience (duration of the teaching experience, frequency of class meetings, number of students taught, materials covered, dates, and for whom) should be provided to the Immunobiology DGS.

Responsible Conduct of Research, Refresher Course: Fourth-year students are required to take a refresher training course in the responsible conduct of research. M.D.-Ph.D. students can fulfill this NIH requirement through Immunobiology (IBIO 503) or through the M.D.-Ph.D. program.

Annual thesis committee meetings: Each student is required to have a thesis committee meeting at least every twelve months, and more frequently if the student or committee feels that it would be appropriate or helpful. The thesis supervisor (the student's PI) then submits a thesis committee report form to the DGS summarizing the student's progress.

M.D.-Ph.D. students are not required to take:

- 1. IBIO 600, Introduction to Research
- 2. IBIO 611, IBIO 612, IBIO 613, Research Rotations
- 3. IBIO 601, Fundamentals of Research: Responsible Conduct of Research. A note from the DGS of the M.D.-Ph.D. program must be forwarded to the Immunobiology DGS stating that the student has taken a course in Research Conduct and Ethics, or its equivalent in the School of Medicine. *Include dates, titles, and faculty.* If the student has not taken this course, then registration in this class is required.

MASTER'S DEGREES

M.Phil. A student is entitled to the M.Phil. degree once all academic and prospectus requirements, and one of the two teaching requirements, have been met. Also required is a third-year committee meeting at which the members sign an approval form stating that the student is making good progress toward the student's research.

M.S. Students who withdraw from the Ph.D. program may be eligible to receive the M.S. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.S., students must successfully complete at least one year of resident graduate study at Yale with the quality of work judged satisfactory by the Department of Immunobiology faculty, as well as ten courses with an average grade of High Pass.

For additional information on the Program in Biological and Biomedical Sciences see http://bbs.yale.edu.

COURSES

For a complete listing of immunology-related courses, https://medicine.yale.edu/ immuno/graduate-program/curriculum/

IBIO 530a / MBIO 530a / MCDB 530a, Biology of the Immune System Grace Chen, Ann Haberman, Carla Rothlin, Kevin O'Connor, Carrie Lucas, Ellen Foxman, Markus Müschen, Andrew Wang, Peter Cresswell, Jordan Pober, Joao Pereira, Craig Roy, Joseph Craft, Paula Kavathas, Noah Palm, Craig Wilen, Jeffrey Ishizuka, Daniel Jane-Wit, and David Schatz

The development of the immune system. Cellular and molecular mechanisms of immune recognition. Effector responses against pathogens. Immunologic memory and vaccines. Human diseases including allergy, autoimmunity, cancer, immunodeficiency, HIV/AIDS.

IBIO 600a, Introduction to Research: Faculty Research Presentations Carla Rothlin Introduction to the research interests of the faculty. Required of all first-year Immunology/BBS students. Pass/Fail.

IBIO 601b / MBIO 601b, Fundamentals of Research: Responsible Conduct of Research Staff

A weekly seminar presented by faculty trainers on topics relating to proper conduct of research. Required of first-year Immunobiology students, first-year CB&B students, and training grant-funded postdocs. Pass/Fail.

IBIO 611a, Research Rotation 1 Carla Rothlin

Intensive experience in the design and execution of experiments in immunology or other areas of biology. Students design a focused research project in consultation with a faculty mentor and execute the designed experiments in the mentor's laboratory. Students are expected to read relevant background papers from the literature, design and perform experiments, interpret the resulting data, and propose follow-up experiments. Students are also expected to attend the mentor's weekly lab meeting(s) as well as weekly Immunobiology departmental seminars and Research in Progress seminars. The course concludes with the student giving a brief presentation of the work performed at Rotation Talks, attended by other first-year immunology-track graduate students. Evaluation is by the mentor; students also evaluate the rotation experience. Students must turn in a prioritized list of four possible mentors to the office of the DGS at least one week prior to the beginning of the course. Mentors are assigned by the DGS. Graded Satisfactory/Unsatisfactory. Minimum of 20 hours/week. Required of all first-year Immunology/BBS students.

IBIO 612a, Research Rotation 2 Carla Rothlin

Intensive experience in the design and execution of experiments in immunology or other areas of biology. Students design a focused research project in consultation with a faculty mentor and execute the designed experiments in the mentor's laboratory. Students are expected to read relevant background papers from the literature, design and perform experiments, interpret the resulting data, and propose follow-up experiments. Students are also expected to attend the mentor's weekly lab meeting(s) as well as weekly Immunobiology departmental seminars and Research in Progress seminars. The course concludes with the student giving a brief presentation of the work performed at Rotation Talks, attended by other first-year immunology-track graduate students. Evaluation is by the mentor; students also evaluate the rotation experience. Students must turn in a prioritized list of four possible mentors to Barbara Cotton in the office of the director of graduate studies at least one week prior to the beginning of the course. Mentors are assigned by the DGS. Graded Pass/Fail. 1 course credit; minimum of 20 hours/week. Required of all first-year Immunology/BBS students.

Interdepartmental Neuroscience Program

Hope Memorial Building 212, 203.785.5932 http://medicine.yale.edu/inp M.S., M.Phil., Ph.D.

Director of Graduate Studies

Marina Picciotto (*Psychiatry*; *Pharmacology*; *Neuroscience*) marina.picciotto@yale.edu

Professors Amy Arnsten (Neuroscience; Psychology), Anton Bennett (Pharmacology; Comparative Medicine), Hilary Blumberg (Psychiatry; Child Study Center; Radiology and Biomedical Imaging), Hal Blumenfeld (Neurology; Neuroscience; Neurosurgery), Angélique Bordey (Neurosurgery; Cellular and Molecular Physiology), Kristen Brennand (Psychiatry; Genetics), Tyrone Cannon (Psychology; Psychiatry), John Carlson (Molecular, Cellular, and Developmental Biology), Marvin Chun (Psychology; Neuroscience), Lawrence Cohen (Cellular and Molecular Physiology), Daniel Colón-Ramos (Cell Biology; Neuroscience), R. Todd Constable (Radiology and Biomedical Imaging; Neurosurgery), Kelly Cosgrove (Psychiatry; Radiology and Biomedical Imaging; Neuroscience), Michael Crair (Neuroscience; Ophthalmology and Visual Science), Pietro De Camilli (Cell Biology; Neuroscience), Jonathan Demb (Ophthalmology and Visual Science; Cellular and Molecular Physiology), Ralph DiLeone (Psychiatry; Neuroscience), Barbara Ehrlich (Pharmacology; Cellular and Molecular Physiology), Thierry Emonet (Molecular, Cellular, and Developmental Biology; Physics), Paul Forscher (Molecular, Cellular, and Developmental Biology), Charles Greer (Neurosurgery; Neuroscience), Jeffrey Gruen (Pediatrics; Genetics), Jaime Grutzendler (Neurology; Neuroscience), Murat Gunel (Neurosurgery; Genetics; Neuroscience), David Hafler (Neurology; Immunobiology), Joy Hirsch (Psychiatry; Comparative Medicine; Neuroscience), Tamas Horvath (Comparative Medicine; Neuroscience; Obstetrics, Gynecology, and Reproductive Sciences), Arthur Horwich (Genetics; Pediatrics), Jonathon Howard (Molecular Biophysics and Biochemistry; *Physics*), Fahmeed Hyder (*Radiology and Biomedical Imaging*; *Biomedical Engineering*), Yong-Hui Jiang (Genetics), Elizabeth Jonas (Internal Medicine; Neuroscience), Leonard Kaczmarek (Pharmacology; Cellular and Molecular Physiology), Haig Keshishian (Molecular, Cellular, and Developmental Biology), Jeffery Kocsis (Neurology; Neuroscience), Michael Koelle (Molecular Biophysics and Biochemistry), Anthony Koleske (Molecular Biophysics and Biochemistry; Neuroscience), John Krystal (Psychiatry; Neuroscience), Robert LaMotte (Anesthesiology; Neuroscience), Chiang-shan Ray Li (Psychiatry; Neuroscience), Gregory McCarthy (Psychology), James McPartland (Child Study Center; Psychology), Mark Mooseker (Molecular, Cellular, and Developmental Biology; Cell Biology), Evan Morris (Radiology and Biomedical Imaging; Biomedical Engineering; Psychiatry), Angus Nairn (Psychiatry; Pharmacology), Michael Nitabach (Cellular and Molecular Physiology; Genetics), Vincent Pieribone (Cellular and Molecular Physiology; Neuroscience), Christopher Pittenger (Psychiatry; Child Study Center), Marc Potenza (Psychiatry; Child Study Center; Neuroscience), Pasko Rakic (Neuroscience; Neurology), Carla Rothlin (Immunobiology; Pharmacology), Gary Rudnick (Pharmacology), W. Mark Saltzman (Biomedical Engineering; Cellular and Molecular Physiology; Chemical and Environmental Engineering), Laurie Santos (Psychology), Joseph Santos-Sacchi (Surgery; Cellular and Molecular Physiology; Neuroscience), Nenad Sestan (Neuroscience; Comparative Medicine; Genetics; Psychiatry), Fred Sigworth (Cellular and Molecular

Physiology; Biomedical Engineering), Dana Small (Psychiatry; Psychology), Stephen Strittmatter (Neurology; Neuroscience), Jane Taylor (Psychiatry; Psychology), Susumu Tomita (Cellular and Molecular Physiology; Neuroscience), Nicholas Turk-Browne (Psychology), Flora Vaccarino (Child Study Center; Neuroscience), Christopher van Dyck (Psychiatry; Neuroscience; Neurology), Stephen Waxman (Neurology; Pharmacology; Neuroscience), David Zenisek (Cellular and Molecular Physiology; Ophthalmology and Visual Science), Z. Jimmy Zhou (Ophthalmology and Visual Science; Cellular and Molecular Physiology; Neuroscience), Steven Zucker (Computer Science; Biomedical Engineering)

Associate Professors Nii Addy (Psychiatry; Cellular and Molecular Physiology), Meenakshi Alreja (Psychiatry; Neuroscience), Alan Anticevic (Psychiatry; Psychology), Sviatoslav Bagriantsev (Cellular and Molecular Physiology), Abhishek Bhattacharjee (Computer Science), Thomas Biederer (Neurology; Neuroscience), William Cafferty (Neurology; Neuroscience), Jessica Cardin (Neuroscience), Sreeganga Chandra (*Neurology*; *Neuroscience*), Steve Chang (*Psychology*; *Neuroscience*), Damon Clark (Molecular, Cellular, and Developmental Biology; Physics), Philip Corlett (Psychiatry; Psychology), Marcelo de Oliveira Dietrich (Comparative Medicine; Neuroscience), George Dragoi (Psychiatry; Neuroscience), Tore Eid (Laboratory Medicine; Neurosurgery), Irina Esterlis (Psychiatry; Psychology), Sourav Ghosh (Neurology; Pharmacology), Elena Gracheva (Cellular and Molecular Physiology; Neuroscience), Marc Hammarlund (Genetics; Neuroscience), Michelle Hampson (Radiology and Biomedical Imaging; Psychiatry; Child Study Center), Michael Higley (Neuroscience), Avram Holmes (Psychology), Erdem Karatekin (Cellular and Molecular Physiology; Molecular Biophysics and Biochemistry), In-Jung Kim (Ophthalmology and Visual Science; Neuroscience), Hedy Kober (Psychiatry; Psychology), Smita Krishnaswamy (Genetics; Computer Science), Ifat Levy (Comparative Medicine; Psychology; Neuroscience), Janghoo Lim (Genetics; Neuroscience), Angeliki Louvi (Neurosurgery; Neuroscience), John Murray (Psychiatry; Neuroscience; Physics), Dhasakumar Navaratnam (Neurology; Neuroscience), Timothy Newhouse (Chemistry), In-Hyun Park (Genetics), Maria Piñango (Linguistics), Helena Rutherford (Child Study Center; Psychology), Dustin Scheinost (Radiology and Biomedical Imaging; Child Study Center; Statistics and Data Science), Justus Verhagen (Neuroscience), Weimin Zhong (Molecular, Cellular, and Developmental Biology), Jiangbing Zhou (Neurosurgery; Biomedical Engineering)

Assistant Professors Moitrayee Bhattacharyya (*Pharmacology*), Joel Butterwick (*Pharmacology*), Rui Chang (*Cellular and Molecular Physiology*; *Neuroscience*), Alicia Che (*Psychiatry*), Youngsun Cho (*Psychiatry*; *Child Study Center*), Eyiyemisi Damisah (*Neurosurgery*; *Neuroscience*), Carolyn Fredericks (*Neurology*), Dylan Gee (*Psychology*), Jason Gerrard (*Neurosurgery*; *Neuroscience*), Matthew Girgenti (*Psychiatry*), Elizabeth Goldfarb (*Psychiatry*; *Psychology*), Pallavi Gopal (*Pathology*), Junjie Guo (*Neuroscience*), Abha Gupta (*Pediatrics*; *Neuroscience*), Brian Hafler (*Ophthalmology and Visual Science*; *Pathology*), Ellen Hoffman (*Child Study Center*; *Neuroscience*), Monika Jadi (*Psychiatry*; *Neuroscience*), James Jeanne (*Neuroscience*), Al Kaye (*Psychiatry*), Liang Liang (*Neuroscience*), Samuel McDougle (*Psychology*), Anirvan Nandy (*Neuroscience*), Michael O'Donnell (*Molecular, Cellular, and Developmental Biology*), Candie Paulsen (*Molecular Biophysics and Biochemistry*), Albert Powers (*Psychiatry*; *Psychology*), Hyojung Seo (*Psychiatry*; *Neuroscience*), David van Dijk (*Internal Medicine*; *Computer Science*), Ilker Yildirim (*Psychology*), Shaul Yogev (*Neuroscience*)

FIELDS OF STUDY

The Interdepartmental Neuroscience Program (INP) offers flexible but structured interdisciplinary training for independent research and teaching in neuroscience. The goal of the program is to ensure that degree candidates obtain a solid understanding of cellular and molecular neurobiology, physiology and biophysics, neural development, systems and behavior, and neural computation. In addition to coursework, graduate students participate in an annual research-in-progress talk and a regular journal club, organize the Interdepartmental Neuroscience Program Seminar Series, and attend other seminar programs, named lectureships, symposia, and an annual research retreat.

To enter the Interdepartmental Neuroscience Ph.D. program, students apply to the Neuroscience track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Each entering student is assigned a faculty advisory committee to provide guidance. This committee is responsible for establishing the student's initial course of study and for monitoring the student's progress. This committee will subsequently be modified to include faculty with expertise in the student's emerging area of interest. Although each student's precise course requirements are set individually to take account of background and educational goals, the course of study is based on a model curriculum beginning with four core required courses: Bioethics in Neuroscience (INP 580), Principles of Neuroscience (INP 701), Foundations of Cellular and Molecular Neurobiology (INP 702), and Foundations of Systems Neuroscience (INP 703), all completed in the first year of enrollment.

During the second or third year of enrollment, students are required to take one course on quantitative techniques (including, but not limited to, INP 560, PSYC 200a, INP 558, INP 562, INP 575, INP 599, PSYC 261a, and others with director's approval) as well as one elective course selected from a broad set of neurosciencerelated courses. Collectively, these courses are designed to ensure broad competence in modern neuroscience. The Graduate School uses grades of Honors, High Pass, Pass, and Fail and requires two course grades of Honors during the first two years of study. Students are expected to maintain at least a High Pass average.

Additional degree requirements are successful completion of both terms of Lab Rotations for First-Year Students (INP 511, INP 512), which includes rotating in at least three labs; both terms of Second-Year Thesis Research (INP 513, INP 514); and RCR Refresher for Senior BBS Students (INP 503) completed during the fourth year of enrollment.

In accordance with the expectations of the BBS program, Ph.D. students are also expected to participate in two terms (or the equivalent) of teaching.

Admission to candidacy requires passing a qualifying examination, normally given during the second year, and submission of a dissertation prospectus (NIH NRSA grant format) before the end of the third year.

Thesis committee meetings are required at six-month intervals after admission to candidacy. Also required are the completion and satisfactory defense of the thesis.

Requirements for M.D.-Ph.D. students are the same as for Ph.D. students with the following differences: two laboratory rotations are completed while in the medical school prior to degree-program affiliation; three courses are required (Principles of Neuroscience, INP 701; Structural and Functional Organization of the Human Nervous System, INP 510; and one elective graduate-level course). Both terms of Second-Year Thesis Research (INP 513, INP 514) are required. M.D.-Ph.D. students are required to serve for one term as teaching assistants; however, two terms of teaching are preferred.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Awarded only to students who are not continuing for the Ph.D. degree and have successfully completed the equivalent of 30 credit hours in the doctoral program. This includes a passing grade in the four required courses plus one elective courses, a minimum of two Honors grades, and successful completion of both terms of Lab Rotation for First-Year Students (INP 511, INP 512) and both terms of Second-Year Thesis Research (INP 513, INP 514). Students are not admitted for this degree. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

Program information is available at http://medicine.yale.edu/inp.

COURSES

INP 503b, Bioethics Refresher Course Marina Picciotto and Jessica Cardin The required fourth-year bioethics refresher course runs during the spring semester. This involves both an independent component based around a series of videos on ethics and an in-person discussion component. The requirement is that we have eight hours of in-person instruction time. We have a two-hour component based on video content generated by the BBS and three classroom sessions of two hours each. These sessions are NIH-mandated, so please plan to attend.

INP 510a, Structural and Functional Organization of the Human Nervous System Thomas Biederer

An integrative overview of the structure and function of the human brain as it pertains to major neurological and psychiatric disorders. Neuroanatomy, neurophysiology, and clinical correlations are interrelated to provide essential background in the neurosciences. Lectures in neurocytology and neuroanatomy survey neuronal organization in the human brain, with emphasis on long fiber tracts related to clinical neurology. Lectures in neurophysiology cover various aspects of neural function at the cellular and systems levels, with a strong emphasis on the mammalian nervous system. Clinical correlations consist of sessions applying basic science principles to understanding pathophysiology in the context of patients. Seven three-hour laboratory sessions are coordinated with lectures throughout the course to provide an understanding of the structural basis of function and disease. Case-based conference sections provide an opportunity to integrate and apply the information learned about the structure and function of the nervous system in the rest of the course to solving a focused clinical problem in a journal club format. Variable class schedule; contact course instructors. This course is offered to graduate and M.D./Ph.D. students only and cannot be audited.

INP 511a and INP 512b, Lab Rotations for First-Year Students Staff

Required of all first-year Neuroscience track graduate students. Rotation period is one term. Grading is Satisfactory/Unsatisfactory.

INP 513a and INP 514b, Second-Year Thesis Research Staff

Required of all second-year INP graduate students. Grading is Satisfactory/ Unsatisfactory.

INP 519a, Tutorial Staff By arrangement with faculty and approval of DGS.

INP 521b, Neuroimaging in Neuropsychiatry II: Clinical Applications Maggie Davis and Irina Esterlis

Neuroimaging methodologies including Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), Magnetic Resonance Imaging (MRI), functional Magnetic Resonance Imaging (fMRI), and Magnetic Resonance Spectroscopy (MRS) are rapidly evolving tools used to study the living human brain. Neuroimaging has unprecedented implications for routine clinical diagnosis, for assessment of drug efficacy, for determination of psychotropic drug occupancy, and for the study of pathophysiological mechanisms underlying neurologic and psychiatric disorders. The course is designed to provide an overview of the application of state-ofthe-art neuroimaging methods to research in neurologic and psychiatric disorders.

INP 542b, Developing and Writing Fellowship Proposals Ifat Levy and Dustin Scheinost

In this course, students learn how fellowship award review panels are run and what the selection criteria are. The NIH National Research Service Award (NRSA) Fellowship is used as the main framework for learning. Students develop NIH-style Biosketches, learn to generate key points in the NIH Research Training Plan, and learn how to write a Specific Aims page and what to consider for the Project Narrative. Through student-led groups, students learn how to critique Specific Aims pages, with input from instructors, and then develop Project Narratives with specific focuses on effective communication of the underlying hypotheses, impact and significance, and experimental plans.

INP 552a, Critical Thinking in Learning and Memory George Dragoi Are you interested in a neuroscience approach and its dual perspectives to understanding neuronal ensemble mechanisms underlying learning and episodic memory formation? This course aims to engage students in critical thinking of classic neuroscience readings in learning and memory. Pairs of key studies in the field of learning and memory are discussed and debated either as dual perspectives on a given topic or as complementary approaches to aspects of learning and memory. The course goals are twofold: first, to develop and further students' critical thinking in neuroscience and related fields; second, to acquire key concepts and knowledge in the field of learning and memory. The focus is on studies revealing the role of medial temporal lobe and limbic structures in learning and memory, primarily in humans and rodents.

INP 562b / AMTH 765b / CB&B 562b / ENAS 561b / MB&B 562b / MCDB 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns?

Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

INP 575a / CPSC 575a / ENAS 575a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students.

INP 585b / ENAS 585b, Fundamentals of Neuroimaging Fahmeed Hyder and Douglas Rothman

The neuroenergetic and neurochemical basis of several dominant neuroimaging methods, including fMRI. Topics range from technical aspects of different methods to interpretation of the neuroimaging results. Controversies and/or challenges for application of fMRI and related methods in medicine are identified.

INP 701A, **Principles of Neuroscience** William Cafferty, Ifat Levy, and Junjie Guo General neuroscience seminar: lectures, readings, and discussion of selected topics in neuroscience. Emphasis is on how approaches at the molecular, cellular, physiological, and organismal levels can lead to understanding of neuronal and brain function.

INP 702a, Foundations of Cellular and Molecular Neurobiology Janghoo Lim, Shaul Yogev, and James Jeanne

A comprehensive overview of cellular and molecular concepts in neuroscience. Each exam (of three) covers one-third of the course (cell biology, electrophysiology, and synaptic function) and is take-home, with short answer/essay questions.

INP 720a / MCDB 720a, Neurobiology Haig Keshishian and Paul Forscher Examination of the excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and intracellular mechanisms underlying the generation and control of behavior.

International and Development Economics

Economic Growth Center 27 Hillhouse Avenue, 203.432.3610 https://economics.yale.edu/ide-ma-program M.A.

Director of Graduate Studies Michael Boozer

Program Co-Directors Michael Boozer Ana Cecilia Fieler

The Department of Economics offers a one-year program of study in International and Development Economics, leading to the Master of Arts degree. IDE students are diverse in terms of their nationalities and their career paths. Many of our students now come directly from their undergraduate school or a few years of work experience, although we do not exclude any candidate on the basis of work experience or country of origin. After completion of the program, IDE students have gone into various paths, including working in research for academic and nonacademic agencies such as the World Bank, the United Nations, and the Poverty Action Lab. Other students have gone on to further academic work such as law school and to Ph.D. programs in economics, environmental sciences, public health, and similar programs. Many students have returned to their home countries to work for their government or for funding agencies there.

Some students entering the program are required to complete the summer program in English and Mathematics for Economists offered by Yale University. This requirement may be waived for applicants demonstrating exceptional training in economic analysis and a good command of English.

Yale fellowship funds are not available for the IDE program, and students are required to produce certification of the necessary funding prior to enrollment.

The course program requires the completion of eight graduate-level courses, five of which make up the core elements of the IDE program and are required; the remaining three are graduate electives. The required courses are ECON 545, Microeconomics; ECON 546, Growth and Macroeconomics; ECON 558, Econometrics; ECON 559, Development Econometrics; and one of the following: ECON 732, Advanced Economic Development, or ECON 547, Social Networks and Economic Development. These required courses are designed to provide a rigorous understanding of the economic theory necessary for economic policy analysis. In special circumstances, in consultation with the DGS, students may receive credit toward the degree for undergraduate language or mathematics classes. An option of a second year of nondegree elective study is available via the special student registration status.

Joint-program options for study with the School of the Environment (YSE) and the School of Public Health (YSPH) are also available. Application to YSE or YSPH must be made simultaneously with the application to the IDE program. Admission to these joint programs is determined by the participating professional school and must be obtained prior to beginning the program. Joint-degree students earn the Master of Arts degree in IDE and the Master of Environmental Studies (YSE) or Master of Public Health (YSPH) degree.

Prospective applicants are encouraged to visit the IDE program website at https:// economics.yale.edu/ide-ma-program. Send questions regarding the program to the Senior Administrative Assistant, International and Development Economics Program, Yale University, PO Box 208269, New Haven CT 06520-8269; email, ide@yale.edu.

Investigative Medicine

2 Church Street South, Suite 113 http://medicine.yale.edu/investigativemedicine Ph.D.

Director of Graduate Studies Joseph Craft (joseph.craft@yale.edu)

Deputy Director Eugene Shapiro (eugene.shapiro@yale.edu)

Professors Karen Anderson (*Pharmacology*), Joseph Craft (*Internal Medicine*; *Immunobiology*), James Dzuria (*Emergency Medicine*), David Fiellin (*Internal Medicine*; *Epidemiology*), Thomas Gill (*Internal Medicine*; *Epidemiology*), Fred Gorelick (*Internal Medicine*; Cell Biology), Jeffrey Gruen (*Pediatrics*; *Genetics*), Harlan Krumholz (*Internal Medicine*; *Epidemiology*), Eugene Shapiro (*Pediatrics*; *Epidemiology*), George Tellides (*Surgery*), Mary Tinetti (*Internal Medicine*)

FIELDS OF STUDY

The Investigative Medicine program offers a training pathway for highly selected physicians in clinical departments who are interested in careers in clinical research. The program is designed to develop a broad knowledge base, analytical skills, creative thinking, and the hands-on experience demanded of clinical researchers devoted to disease-oriented and patient-oriented investigation. The program provides the student with individualized experience encompassing formal course work and practical experience, under the supervision and mentorship of a graduate school faculty member.

Students will enter the program with a broad range of experience and interests. Students can undertake thesis work in a variety of disciplines. These include but are not limited to:

- 1. Evaluating risk factors and interventions for disease using modern concepts in quantitative methods and clinical study design,
- 2. Investigating the biochemical, physiologic, and genetic basis of disease including in the setting of a clinical research center, and
- 3. Exploring the molecular basis of disease in the laboratory.

For more information on the admissions process and course details please visit the Investigative Medicine Program website: https://medicine.yale.edu/investigativemedicine.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The minimum overall course requirements for the doctorate program are completion of six required courses plus two electives, either in laboratory-based patient-oriented research or clinical-based patient-oriented research. The majority of required courses are to be completed by the end of the first year of study. Prior to registering for a second year of study, students must have successfully completed IMED 630, Ethical Issues in Biomedical Research. Electives are often taken in the second year, in addition to IMED 665, with the expectation that courses be completed by the end of the second year of study. To be eligible to take the comprehensive qualifying examination, students must achieve the grade of Honors in two courses, have a minimum grade average of High Pass, and have completed a minimum of six courses. When these latter course requirements are met, at least by end of the fall term of the second year, students undertake the comprehensive qualifying examination. In order to be admitted to candidacy, students must pass both a written and oral comprehensive qualifying examination and submit a thesis prospectus that has been approved by their qualifying committee. The remaining degree requirements include completion of the dissertation project, writing of the dissertation, and its oral defense. It is expected that students will complete the program in three to five years. There is no foreign language requirement. The minimum required curriculum for each program of study is as follows:

Course Requirements

Libolation bi		
IMED 625	Principles of Clinical Research	1
IMED 630	Ethical Issues in Biomedical Research	1
IMED 635	Directed Reading in Investigative Medicine	1
IMED 645	Introduction to Biostatistics in Clinical Investigation	1
IMED 665	Writing Your K- or R-Type Grant Proposal	1
IMED 680	Topics in Human Investigation	1
Two electives: one bioinformatics course and one discipline-based course. Director		

approval required.

CLINICAL-BASED PATIENT-ORIENTED RESEARCH

LABORATORY-BASED PATIENT-ORIENTED RESEARCH

IMED 630	Ethical Issues in Biomedical Research	1
IMED 635	Directed Reading in Investigative Medicine	1
IMED 661	Methods in Clinical Research, Part II	1
IMED 662	Methods in Clinical Research, Part III	1
IMED 665	Writing Your K- or R-Type Grant Proposal	1
IMED 680	Topics in Human Investigation	1
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Two electives. Director approval required.

COURSES

IMED 625a, Principles of Clinical Research Eugene Shapiro

The purpose of this intensive two-week course is to provide an overview of the objectives, research strategies, and methods of conducting patient-oriented clinical research. Topics include competing objectives of clinical research, principles of observational studies, principles of clinical trials, principles of meta-analysis, interpretation of diagnostic tests, prognostic studies, causal inference, qualitative research methods, and decision analysis. Sessions generally combine a lecture on the topic with discussion of articles that are distributed in advance of the sessions.

IMED 630a, Ethical Issues in Biomedical Research Lauren Ferrante This term-long course addresses topics that are central to the conduct of biomedical research, including the ethics of clinical investigation, conflicts of interest, misconduct in research, data acquisition, and protection of human subjects. Practical sessions cover topics such as collaborations with industry, publication and peer review, responsible authorship, and mentoring relationships. Satisfactory completion of this course fulfills the NIH requirement for training in the responsible conduct of research.

IMED 635a or b, Directed Reading in Investigative Medicine Joseph Craft An independent study course for first-year students in the Investigative Medicine program. Topics are chosen by the student, and reading lists are provided by faculty for weekly meetings to discuss articles. Four sessions are required; dates/times by arrangement. Consent of instructor required.

IMED 645a, Introduction to Biostatistics in Clinical Investigation Veronika Shabanova

The course provides an introduction to statistical concepts and techniques commonly encountered in medical research. Previous course work in statistics or experience with statistical packages is not a requirement. Topics to be discussed include study design, probability, comparing sample means and proportions, survival analysis, and sample size/power calculations. The computer lab incorporates lecture content into practical application by introducing the statistical software package SPSS to describe and analyze data.

IMED 661a, Methods in Clinical Research, Part II Eugene Shapiro This yearlong course (with IMED 660 and 662), presented by the National Clinical Scholars Program, presents in depth the methodologies used in patient-oriented research, including methods in biostatistics, clinical epidemiology, health services research, community-based participatory research, and health policy. Permission of instructor required.

IMED 665a or b, Writing Your K- or R-Type Grant Proposal Eugene Shapiro In this term-long course, students gain intensive, practical experience in evaluating and preparing grant proposals, including introduction to NIH study section format. The course gives new clinical investigators the essential tools to design and initiate their own proposals for obtaining grants to do research and to develop their own careers. The course is intended for students who plan to submit grant proposals (for either a Ktype career development award or an R-type investigator-initiated award). Attendance and active participation are required. There may be spaces to audit the course.

IMED 680b / B&BS 680b, Topics in Human Investigation Joseph Craft and Karen Anderson

The course teaches students about the process through which novel therapeutics are designed, clinically tested, and approved for human use. It is divided into two main components, with the first devoted to moving a chemical agent from the bench to the clinic, and the second to outlining the objectives and methods of conducting clinical trials according to the FDA approval process. The first component describes aspects of structure-based drug design and offers insight into how the drug discovery process is conducted in the pharmaceutical industry. The format includes background lectures with discussions, labs, and computer tutorials. The background lectures include a historical perspective on drug discovery, the current paradigm, and important considerations for future success. The second component of the course provides students with knowledge of the basic tools of clinical investigation and how new drugs are tested in humans. A series of lectures and discussions provides an overview of the objectives, research strategies, and methods of conducting patient-oriented research, with a focus on design of trials to test therapeutics. Each student is required
to participate (as an observer) in an HIC review, in addition to active participation in class. Consent of instructor required.

Italian Studies

Humanities Quadrangle, 203.432.0595 http://italian.yale.edu M.A., M.Phil., Ph.D.

Chair Millicent Marcus

Director of Graduate Studies Serena Bassi (HQ 527, 510.993.5013)

Professors Millicent Marcus, Jane Tylus, Heather Webb

Professor in the Practice Amara Lakhous

Assistant Professor Serena Bassi, Alessandro Giammei

Senior Lecturer Pierpaolo Antonello

Senior Lectors I Michael Farina, Anna Iacovella, Simona Lorenzini, Deborah Pellegrino

Affiliated Faculty Paola Bertucci, (*History of Science, Medicine, and Public Health*), Howard Bloch (*French*), Jessica Brantley (*English*), Francesco Casetti (*Film and Media Studies*), Joanna Fiduccia (*History of Art*), Jacqueline Jung (*History of Art*), Laurence Kanter (*Yale University Art Gallery*), Gundula Kreuzer (*Music*), Morgan Ng (*History of Art*), Jessica Peritz (*Music*), David Quint (*English*; *Comparative Literature*), Ayesha Ramachandran (*Comparative Literature*), Kevin Repp (*Beinecke Library*), Lucia Rubinelli (*Political Science*), Pierre Saint-Amand (*French*), Gary Tomlinson (*Music*)

Visiting faculty from other universities are regularly invited to teach courses in the department.

FIELDS OF STUDY

The Italian Studies department brings together several disciplines for the study of the Italian language and its literature. Although the primary emphasis is on a knowledge of the subject throughout the major historical periods, the department welcomes applicants who seek to integrate their interests in Italian with wider methodological concerns and discourses, such as history, rhetoric and critical theories, comparison with other literatures, the figurative arts, religious and philosophical studies, medieval, Renaissance, and modern studies, and the contemporary state of Italian writing. Interdepartmental work is therefore encouraged and students are accordingly given considerable freedom in planning their individual curriculum, once they have acquired a broad general knowledge of the field through course work and supplementary independent study.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The department recognizes that good preparation in Italian literature is unusual at the college level and so suggests that students begin as soon as possible to acquire a broad general knowledge of the field through outside reading. Candidates must demonstrate proficiency in two languages in addition to English and Italian; these could be other Romance languages, Latin, or non-Romance languages relevant to the research interests of the individual student. Students are reminded that it is difficult to schedule beginning language courses during the academic year and are therefore encouraged to take them in the summer. (Yale Summer Session offers online languagefor-reading courses as well as Latin instruction each summer, for which incoming and continuing students will receive a tuition fellowship.) All language requirements must be fulfilled before the Ph.D. qualifying examination.

Students are required to take two years of course work (normally sixteen courses), including two graduate-level term courses outside the Italian department. After consultation with the director of graduate studies (DGS), students who join the graduate program with an M.A. in hand may have up to two courses waived. Students who have had little or no experience in Italy are generally urged to do some work abroad during the course of their graduate program. At the end of the first and second years, students' progress is analyzed in an evaluative colloquium. The comprehensive qualifying examination must take place during the third year of residence. It is designed to demonstrate the student's mastery of the language and acquaintance with the literature. The examination, which is both written and oral, will be devised in consultation with a three-member committee, chosen by the student. In the term following the qualifying examination, the student will discuss, in a session with faculty members, a prospectus describing the subject and aims of the dissertation. Students are admitted to candidacy for the Ph.D. upon completion of all predissertation requirements, including the prospectus. Admission to candidacy normally occurs by the end of the sixth term.

Teaching is considered to be an important component of the doctoral program in Italian Studies. Students will be appointed as teaching fellows in the third and fourth years of study. Guidance in teaching is provided by the faculty of the department and specifically by the director of language instruction.

COMBINED PH.D. PROGRAMS Italian and Early Modern Studies

The Department of Italian Studies also offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in Italian and Early Modern Studies. For further details, see Early Modern Studies.

Italian and Film and Media Studies

The Department of Italian Studies also offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. in Italian and Film and Media Studies. For further details, see Film and Media Studies. Applicants to the combined program must indicate on their application that they are applying both to Film and Media Studies and to Italian Studies. All documentation within the application should include this information.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.)

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete two years of course

work (normally sixteen courses), including two graduate-level term courses outside of Italian studies. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

Program materials are available upon request to the Director of Graduate Studies, Italian Studies, Yale University, PO Box 208311, New Haven CT 06520-8311.

COURSES

ITAL 691a, Directed Reading Serena Bassi

ITAL 781a / CPLT 705a, The Decameron Millicent Marcus

An in-depth study of Boccaccio's text as a journey in genre in which the writer surveys all the storytelling possibilities available to him in the current repertory of short narrative fiction – ranging from ennobling example to flamboyant *fabliaux*, including hagiography, aphorisms, romances, anecdotes, tragedies, and practical jokes – and self-consciously manipulates those forms to create a new literary space of astonishing variety, vitality, and subversive power. In the relationship between the elaborate frame-story and the embedded tales, theoretical issues of considerable contemporary interest emerge – questions of gendered discourse, narratology, structural pastiche, and reader response among them. *The Decameron* is read in Italian or in English. Close attention is paid to linguistic usage and rhetorical techniques in this foundational text of the vernacular prose tradition.

ITAL 820a, Affect Studies and the History of Emotions Staff

Focusing on transhistorical literary affect and histories of emotions, this course surveys the uses and possibilities of affect studies in a variety of historical periods. The bulk of work on affect is in modern literary studies; what happens when we extend these concepts into the Middle Ages and the Early Modern period? As cultural-historical frames change, how do conceptions of body, feeling, sensation, emotion, cognition, and affect inflect one another? Through readings in critical theory, historiography, and primary texts (mostly but not exclusively Italian), we explore the lenses of atmosphere, mood, emotions, passions, and affect.

Law

Sterling Law Building, 203.432.1696 http://law.yale.edu/phd M.A., Ph.D.

Dean Heather Gerken

Director of Graduate Studies Robert Post

FIELDS OF STUDY

The Ph.D. in Law program prepares students who have earned a J.D. from an American Bar Association accredited law school to enter law teaching or other careers that require a scholarly mastery of law. The program is designed to provide a broad foundation in the canonical texts and methods of legal scholarship and to support students in producing original scholarship in the form of a dissertation. The program strongly encourages, but does not require, interdisciplinary approaches to the study of law.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Each student will have a faculty advisory committee, which will help the student select appropriate courses. In their first year, students take a mandatory two-term seminar on the foundations of legal scholarship, legal theory, and methods or its equivalent as specified by the program's director of graduate studies (DGS). Each student may enroll in as many as four additional courses. These courses may be offered in the Law School or in other departments or schools at Yale University. Each student's advisory committee may waive up to four courses. The foundations seminar or its equivalent as specified by the program's DGS may not be waived and must be taken for a grade, not audited.

Each Ph.D. student must take two qualifying examinations. The first, administered before the start of the second term in the program, is a written examination based on materials studied in the first term of the foundations seminar. It will test the student's breadth of knowledge across the legal canon, including knowledge of canonical texts, methods, and principles. The second is an oral examination administered by the student's advisory committee at the beginning of the second year and no later than October 15 of that year. The oral examination tests the student's knowledge of the scholarship, theories, and methodologies relevant to the student's area of study. Both qualifying examinations are graded on a pass/fail basis. A student who fails a qualifying examination will have one opportunity to retake the examination in the following term.

After completion of the second qualifying examination, the student will assemble a faculty dissertation committee and prepare a dissertation prospectus. Upon approval of the prospectus, usually by the end of the fourth term, the student will devote the remaining time in the program to writing a dissertation, which may take the form of a traditional monograph or three publishable scholarly articles. The final dissertation must be approved by both the student's dissertation committee and the DGS.

Students in the Ph.D. in Law program are also expected to meet additional academic requirements in each year of the program, specified below and outlined in greater detail

in the Ph.D. in Law Program Manual available from the Graduate Programs Office at Yale Law School. Students who fail to meet program requirements will not be in good standing and may be withdrawn from the program.

All required written work must be judged satisfactory by the student's advisory committee, in consultation with the assistant dean for graduate programs and the DGS. A satisfactory article or chapter is one that the student's advisory committee, the assistant dean, and the DGS agree is appropriate and ready for professional presentation at an academic workshop, and one that offers the promise of meeting the standards expected by leading law reviews or academic presses.

First-year requirements include satisfactory performance in course work, including the foundations seminar (or its equivalent as specified by the DGS); passing the first qualifying examination; and completion of a first dissertation article or chapter. Students also must submit an approved reading list for the second qualifying examination to the assistant dean and the DGS no later than the final day of the spring examination period.

Second-year requirements include submission of the first dissertation article or chapter for publication no later than the first day of classes for the fall term of the second year and successful completion of the second qualifying examination by October 15 of that year. Second-year students shall complete a second satisfactory dissertation article or chapter by December 1 and complete their first required teaching experience by the end of their second year in the program. They shall submit their dissertation prospectus to the assistant dean and the DGS by June 1 of the second year.

In the third year, students are required to complete and submit a draft of their third dissertation article or chapter by August 1, and to workshop their article or chapter at the Law School no later than September 20 in preparation for the academic job market. For those who plan to graduate in May of their third year, a final and complete dissertation must be submitted to the assistant dean, the DGS, dissertation committee members, and the graduate school registrar no later than March 15. Students must also satisfactorily complete their second teaching experience during their third year in the program. Both teaching experiences will typically be reviewed in person or via recorded media with the assistant dean and/or the committee chair and the DGS.

The program is designed to be completed in three years and two summers, but students who do not expect to complete all program requirements before the conclusion of their third year in the program are invited to petition the Law School's Ph.D. Policy Committee for permission to enroll for a seventh and eighth semester in the program under Extended Registration or Dissertation Completion Status (DCS). Those enrolled under Extended Registration are full-time students and receive, as before, Yale Basic Health coverage and a Health Award to cover the cost of Yale Health hospitalization/ specialty coverage, but they do not receive stipendiary support. Instead, having completed their two required teaching experiences, they are eligible to teach in Yale College or, in exceptional circumstances, to assist a Yale Law School faculty member in their teaching to support their living expenses. Teaching opportunities are coordinated by the graduate school's Teaching Fellow Program.

Students on DCS are less than half-time students who retain their Yale NetID in order to access electronic library resources and their Yale e-mail accounts. Students in this

category are not eligible for stipendiary support nor a Health Award from the graduate school or the Law School; they should consult with the graduate school on other services and resources that may not be available to them as less than half-time students.

Those on both "Extended Registration" and "Dissertation Completion" status are responsible for paying the Continuous Registration Fee. (Note that the graduate school provides a fellowship to cover the cost of the Continuous Registration Fee for those teaching in Yale College.)

TEACHING

As part of their training, Ph.D. students must complete two terms of teaching experience. There are a number of ways to fulfill this requirement, depending on the availability of teaching experiences from year to year. They include: (1) serving as a teaching assistant for a Law School course, (2) serving as a student organizer for a Law School reading group, (3) serving as a teaching fellow for a course in Yale College or another school at Yale, (4) co-teaching a Law School course with a faculty member, and (5) in unusual situations, teaching their own course. In all cases, students engaged in teaching will have faculty supervision and feedback from their advisers.

MASTER'S DEGREE

M.A. The M.A. degree may be granted to Ph.D. in Law students who are not completing the program, but who successfully complete the two-term foundations seminar and at least two additional courses, pass the two qualifying examinations, and submit an academic paper that is judged to be of publishable quality. Students may substitute a third course for one of the two qualifying examinations. The degree is available retroactively to students who matriculated from September 2013 onward.

Program materials are available upon request to the Graduate Programs Office, Yale Law School, 127 Wall Street, New Haven CT 06511.

COURSES

For Law School courses, see the Law School bulletin, online at https:// bulletin.yale.edu/bulletin/law. For courses in other schools at Yale University, please see their respective bulletins or https://courses.yale.edu. Specific course selections will be approved by the student's advisory committee and by the DGS.

Linguistics

370 Temple Street, Rm. 204, 203.432.2450 http://ling.yale.edu M.A., Ph.D.

Chair Raffaella Zanuttini

Director of Graduate Studies Jim Wood

Professors Claire Bowern, Veneeta Dayal, Robert Frank, Laurence Horn (*Emeritus*), Frank Keil,* Maria Piñango, Fernando Rubio (*Center for Language Study*), Zoltán Szabó,* Raffaella Zanuttini

Associate Professors Simon Charlow, Jason Shaw, Jim Wood

Assistant Professors Tom McCoy, Natalie Weber

* A joint appointment with primary affiliation in another department.

FIELDS OF STUDY

The Department of Linguistics embraces an integrative approach to the study of language, based on the premise that an understanding of the human language faculty arises only through the combination of insights from the development of explicit formal theories with careful descriptive and experimental work. Members of the department offer courses and conduct research in which theoretical inquiry proceeds in partnership with historical and comparative studies, fieldwork, experimental work, cognitive neuroscience, and computational and mathematical modeling. Faculty expertise includes all of the major domains of linguistics (phonetics, phonology, syntax, semantics, pragmatics) and spans a wide range of languages.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE Coursework

The conception of linguistics embraced by the Yale Ph.D. program requires that students receive training that is both deep in its coverage of areas of linguistic inquiry and broad in the range of methodological approaches. The course work requirements are designed to accomplish these complementary goals. This course work includes a set of courses designed to expose students to core ideas, together with courses equipping students with a range of methodologies in linguistic research.

During their first two terms, students must take LING 519, Perspectives on Grammar. This course is taken SAT/UNSAT. A minimum of thirteen other courses are required: four foundational courses, three methodology courses, three advanced seminars, and three linguistics elective classes. No single course can simultaneously satisfy a requirement in two distinct areas. During the initial two years of course work, students must receive at least three grades of H (= Honors). Two or more grades below HP (= High Pass) during the initial two-year period constitute grounds for dismissal from the Ph.D. program. As per graduate school general regulations, grades of F cannot be counted toward degree requirements.

Foundational Courses This requirement ensures that students achieve breadth in several linguistic subfields. Students take at least one sufficiently advanced course in four or more subfields of linguistics. The following courses satisfy this requirement:

LING 612	Linguistic Change	1
LING 631	Neurolinguistics	1
LING 635	Phonology II	1
LING 639	Phonetics II: Speech Production and Perception	1
LING 654	Syntax II	1
LING 664	Semantics II	1
LING 680	Morphology	1

Students decide on their courses, in consultation with the director of graduate studies (DGS) and other faculty, when they arrive on campus. Other sufficiently advanced courses may also satisfy the requirement, subject to DGS approval.

Methodology Courses For the methodology requirement, students must take three relevant courses. The following courses, which are offered regularly by the department, qualify, but other courses may as well, to be determined in consultation with the adviser and DGS:

LING 600	Experimentation in Linguistics	1	
LING 619	The Evolution of Language and Culture	1	
LING 624	Mathematics of Language	1	
LING 627	Language and Computation I	1	
LING 631	Neurolinguistics	1	
LING 634	Quantitative Linguistics	1	
LING 636	Articulatory Phonology	1	
LING 641	Field Methods	1	
LING 796	Semantic Investigations in an Unfamiliar Language	1	
An advanced course in statistics such as the following may qualify:			
PSYC 518	Multivariate Statistics	1	
S&DS 538	Probability and Statistics	1	
S&DS 563	Multivariate Statistical Methods for the Social Sciences	1	
S&DS 661	Data Analysis	1	

One of the methodology courses must be taken during the first year of the program, and two must be completed by the end of the second year. Courses cannot simultaneously satisfy the foundational and methodology requirements.

Seminar Courses Graduate students are active participants in department reading groups and seminars. Students should participate in three advanced seminars in which they read the original literature of the field and write a research paper. With permission of their adviser and the DGS, students may enroll in the appropriate 790s-numbered

LING course and count active participation in a department reading group, including the submission of a final research paper, as satisfying this requirement.

Linguistics Electives Students must take three more linguistics courses that are at least 600 level.

Research

The primary focus of a Ph.D. program is independent research. In the course of our Ph.D. program, students carry out cutting-edge linguistic research, culminating in the completion of a dissertation. To help students in the transition from "consuming" to also "producing" linguistic research, there are a number of structures and requirements in place.

Research Adviser and First-Year Directed Readings By the end of the first term of the program, students find a department faculty member who acts as their research adviser. This choice should be made on the basis of compatibility of research interests and discussions between the student, faculty member, and DGS. Starting from the spring term of the first year, students will, with the help of their adviser, define a topic of research interest, meeting regularly (minimally once every three weeks) and carrying out a series of readings on this topic. Students should keep a research journal, describing their readings and how they fit in with work in the area, and chronicling the development of their thinking about the research topic. It is the faculty's expectation that this exploration will form the foundation for the research reported in the student's first qualifying paper (on which see below). Note however that the initial choice of research adviser is not binding: students who want to change their choice of topic or adviser for whatever reason may do so. It is the student's responsibility to find a suitable adviser, and students are expected to have a faculty adviser at all times during their enrollment in the program. Some students have two faculty co-advisers.

Portfolio At the conclusion of the first year of the program, students submit to the faculty a portfolio of two research papers, in two distinct subfields (such as Phonetics, Phonology, Morphology, Syntax, Semantics, Pragmatics, Historical Linguistics, Neurolinguistics, Computational Linguistics). These papers should demonstrate a student's mastery of the material in these fields to the level covered in the foundational courses in the area, as well as the ability to identify a significant research question and argue for a possible solution. In short, such papers should be at the level of an excellent term paper, representative of a student's best work during the first year of course work. The faculty do not expect students to write papers expressly for the portfolio. Rather, the portfolio will typically consist of term papers from courses taken during the first year in the program. The deadline for the submission of these papers is May 10 each year.

Annotated Bibliography/Research Plan On the basis of the research journal begun during the first year in the program, students will prepare an annotated bibliography and research plan (ABRP) for their first qualifying paper. The ABRP, which should be approximately twenty pages in length, should lay out the question that the student wants to explore, motivating its importance through a presentation and synthesis of relevant past literature on the topic. The deadline for submission of the ABRP is September 10.

Qualifying Papers Once the ABRP has been completed, the student will proceed to work on the qualifying papers (QPs). The goal of the QPs is to develop a student's ability to conduct independent research in linguistics at the level of current scholarship in two different areas of linguistics. The faculty expect a QP to report on the results of a substantial project, which are written up in a manner consistent with the standards of the field, and to be eventually published in an academic journal, working papers, or conference proceedings. Students are strongly encouraged to identify a target journal early in the project.

The process of writing the first QP is broken into a number of smaller steps with specific deadlines for each (all during the second year of the program).

- 1. Students discuss their preliminary results in an appropriate venue (lab meeting, reading group, seminar, etc.) by no later than the end of the fall term.
- 2. Also by the end of the fall term, the student will send a request for a QP reader to the DGS. This request must include a title and brief summary of the project, and may also request specific faculty members to be involved. On the basis of research area and faculty availability, the DGS will identify a faculty member other than the adviser to serve as a QP reader. This reader will be involved in the ultimate evaluation of the QP once it is completed. Because it is useful to get a range of feedback on one's work, we encourage students to make the best use of their QP reader by meeting with them and keeping them up to date on the progress of the project.
- 3. Students must submit a first draft of their QP to their adviser and reader no later than February 1.
- 4. Students present their work to the department at the yearly "QPFest," shortly before spring recess. This takes the form of a twenty-minute conference talk to members of the department.
- 5. Students must submit the final version of the paper to their adviser and reader by March 31. Toward the end of the spring term of the second year, the student should begin to explore possible areas and advisers for the second QP, and must have identified an area and adviser by September 1 of the third year. Students follow the same steps and deadlines listed above for the second QP, this time during the third year.

The second QP should be in a different area of linguistics, with a different adviser, from the first QP. It is particularly important that students make satisfactory progress toward the first QP and complete all work by the relevant deadlines. Failure to do so may result in being asked to leave the program.

Prospectus No later than the beginning of the sixth term (that is, the spring term of the third year), students choose a dissertation topic and dissertation director. By the beginning of the fourth year, students will present a dissertation prospectus to the entire faculty. The prospectus should lay out clearly the student's proposed dissertation topic. It should motivate the importance of the topic, present the core idea of the proposed work together with its promise and viability, and demonstrate how this work fits into past research in the area. The prospectus should also identify a dissertation committee. The committee must include at least three faculty members (including the adviser), two of whom must be ladder faculty in the Linguistics department. The

prospectus document should be about fifteen pages in length. After it is submitted, the prospectus is defended orally in front of the faculty. Upon successful completion of the prospectus defense, students advance to Ph.D. candidacy.

Dissertation By the end of the seventh term, students must complete a chapter of the dissertation, together with a detailed outline of the dissertation and comprehensive bibliography. When the dissertation committee approves the chapter and dissertation outline, students are eligible for a University Dissertation Fellowship, which will support them in their fifth year of graduate study. Once advanced to candidacy, the student will meet with the entire dissertation committee minimally once each term (but with frequency decided by the committee), to evaluate progress toward the dissertation. During this meeting, the committee will complete the committee meeting form, will provide a copy to the student, and will retain one for the department's records.

Students are expected to complete their dissertations by the end of the sixth year. At least one month prior to the dissertation filing date, the completed dissertation must be orally defended. This defense will typically involve a public presentation of the main results of the dissertation and oral examination by the members of the dissertation committee. Committee members must be given the completed dissertation no less than two weeks prior to the date of the defense.

Language Requirement

Students are expected to exhibit some breadth in their knowledge of the languages of the world beyond those most commonly studied and those most similar in structure to the student's first language. LING 641, Field Methods, fulfills this requirement; alternatively, with the permission of the DGS, the student may instead take an appropriate language structure course, or one or more courses characterized as L3 or higher at Yale or the equivalent elsewhere. This requirement must be completed before the prospectus defense, when the student advances to Ph.D. candidacy.

Teaching Fellow/Research Assistant Requirements

The faculty regard teaching experience as an integral part of the graduate training program in Linguistics. All students serve as teaching fellows for a minimum of two terms, beginning in the first term of the third year. In addition, students must complete two additional terms of teaching assistantship. These may be either as a teaching fellow, or through participation in externally supported, supervised research as a research fellow. Research assistantships may be provided by the Linguistics faculty and by various Yale and Yale-affiliated units. Before accepting a research assistantship in fulfillment of this requirement, students must receive approval from the DGS. To be approved, a research assistantship must meet the following criteria:

- It must be supervised by a Linguistics department faculty member or a faculty member from an affiliated unit, such as Haskins Laboratories or the Yale School of Medicine.
- 2. It must provide research experience that complements the student's academic plan of study and is related to the student's dissertation research plans.
- 3. It must provide at least ten hours of experience per week.

If an approved research assistantship is accepted that does not provide a stipend equal to the standard departmental stipend, a university fellowship will be provided to augment the stipend so as to bring it up to the departmental standard.

MASTER'S DEGREE

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements. For the M.A. degree, students must successfully complete the coursework, examinations, and work samples required by the end of the second year of graduate study (see above).

Program materials are available online at http://ling.yale.edu.

COURSES

LING 500a / ENGL 500a / MDVL 665a, Old English I Emily Thornbury The essentials of the language, some prose readings, and close study of several celebrated Old English poems.

LING 510a, Introduction to Linguistics Jim Wood

The goals and methods of linguistics. Basic concepts in phonology, morphology, syntax, and semantics. Techniques of linguistic analysis and construction of linguistic models. Trends in modern linguistics. The relations of linguistics to psychology, logic, and other disciplines.

LING 512b, Historical Linguistics Edwin Ko

Introduction to language change and language history. Types of change that a language undergoes over time: sound change, analogy, syntactic and semantic change, borrowing. Techniques for recovering earlier linguistic stages: philology, internal reconstruction, the comparative method. The role of language contact in language change. Evidence from language in prehistory.

LING 515a / SKRT 510a, Introductory Sanskrit I Aleksandar Uskokov An introduction to Sanskrit language and grammar. Focus on learning to read and translate basic Sanskrit sentences in the Indian Devanagari script. No prior background in Sanskrit assumed. Credit only on completion of SKRT 520/LING 525.

LING 519a or b, Perspectives on Grammar Jim Wood

This biweekly, in-person meeting of all first-year students is led by faculty members and TFs. Students are asked to reflect upon the content introduced in the courses they are taking and share their understanding of how these multiple perspectives connect with each other. The goal is to provide a forum where students can synthesize their views on the grammar of natural language and at the same time create a cohort experience for first-year students. ¹/₂ Course cr

LING 538a / SKRT 530a, Intermediate Sanskrit I Aleksandar Uskokov The first half of a two-term sequence aimed at helping students develop the skills necessary to read texts written in Sanskrit. Readings include selections from the *Hitopadesa, Kathasaritsagara, Mahabharata,* and *Bhagavadgita*. Prerequisite: SKRT 520/ LING 525 or equivalent.

LING 600b, Experimentation in Linguistics Maria Pinango

Principles and techniques of experimental design and research in linguistics. Linguistic theory as the basis for framing experimental questions. The development of theoretically informed hypotheses, notions of control and confounds, human subject research, statistical analysis, data reporting, and dissemination.

LING 612a, Linguistic Change Edwin Ko

Principles governing linguistic change in phonology and morphology. Status and independence of proposed mechanisms of change. Relations between the principles of historical change and universals of language. Systematic change as the basis of linguistic comparison; assessment of other attempts at establishing linguistic relatedness. Prerequisites: LING 512, 632, and 653.

LING 617a, Language and Mind Maria Pinango

The course is an introduction to language structure and processing as a capacity of the human mind and brain. Its purpose is to bridge traditional domains in linguistics (phonetics, morphology, syntax) with cognition (developmental psychology, memory systems, inferential reasoning). The main topics covered are morphosyntax and lexical semantics, sentence composition and sentence processing, first- and second-language acquisition, acquisition under unusual circumstances, focal brain lesions, and language breakdown.

LING 619b, The Evolution of Language and Culture Edwin Ko

Introduction to cultural and linguistic evolution. How diversity evolves; how innovations proceed through a community; who within a community drives change; how changes can be "undone" to reconstruct the past. Methods originally developed for studying evolutionary biology are applied to language and culture.

LING 620a, Phonetics I Natalie Weber

Each spoken language composes words using a relatively small number of speech sounds, a subset of the much larger set of possible human speech sounds. This course introduces tools to describe the complete set of speech sounds found in the world's spoken languages. It covers the articulatory organs involved in speech production and the acoustic structure of the resulting sounds. Students learn how to transcribe sounds using the International Phonetic Alphabet, including different varieties of English and languages around the world. The course also introduces sociophonetics, how variation in sound patterns can convey social meaning within a community, speech perception, and sound change.

LING 627a, Language and Computation I Tom McCoy

Design and analysis of computational models of language. Topics include finite state tools, computational morphology and phonology, grammar and parsing, lexical semantics, and the use of linguistic models in applied problems. Prerequisite: prior programming experience or permission of the instructor.

LING 631b, Neurolinguistics Maria Pinango

The study of language as a cognitive neuroscience. The interaction between linguistic theory and neurological evidence from brain damage, degenerative diseases (e.g., Alzheimer's disease), mental illness (e.g., schizophrenia), neuroimaging, and neurophysiology. The connection of language as a neurocognitive system to other systems such as memory and music.

LING 632b, Phonology I Natalie Weber

The structure of sound systems in particular languages. Phonemic and morphophonemic analysis, distinctive-feature theory, formulation of rules, and problems of rule interpretation. Emphasis on data description and problem solving.

LING 634a, Quantitative Linguistics

This course introduces quantitative methods in linguistics, which are an increasingly integral part of linguistic research. The course provides students with the skills necessary to organize, analyze, and visualize linguistic data using R, and explains the concepts underlying these methods, which set a foundation that positions students to also identify and apply new quantitative methods, beyond the ones covered in this course, in their future projects. Course concepts are framed around existing linguistic research, to help students use these methods when designing research projects and critically evaluating quantitative methods in the academic literature. Assignments and in-class activities are a combination of hands-on practice with quantitative tools and discussion of analyses used in published academic work. Prerequisite: one entry-level linguistics course (e.g., phonetics, phonology, syntax, and psycholinguistics) or permission of the instructor.

LING 635a, Phonology II Natalie Weber

Topics in the architecture of a theory of sound structure. Motivations for replacing a system of ordered rules with a system of ranked constraints. Optimality theory: universals, violability, constraint types, and their interactions. Interaction of phonology and morphology, as well as relationship of phonological theory to language acquisition and learnability. Opacity, lexical phonology, and serial versions of optimality theory. Prerequisite: LING 632 or permission of the instructor.

LING 641b, Field Methods Claire Bowern

Principles of phonetics, phonology, morphology, syntax, and semantics applied to the collection and interpretation of novel linguistic data. Data are collected and analyzed by the class as a group, working directly with a speaker of a relatively undocumented language.

LING 643b, Dynamics of Speech Jason Shaw and Michael Stern

Systems that change over time, from particles to climates to stock markets, are often well described as dynamical systems. Speech, like many aspects of human behavior, involves action and perception components, which are mediated and related by the central nervous system. Each of these components unfolds over time according to laws, which can be formulated using dynamical systems theory. This class provides an introduction to the types of dynamical systems that have been proposed to describe and explain human speech behavior, including (1) articulatory kinematics, i.e., the movements of speech organs such as the tongue, lips, vocal folds, etc.; (2) neural activity governing intention and control; and (3) auditory transduction and perception of speech sound waves. Prerequisites: The course makes use of key concepts from calculus, particularly differential equations. Review of the necessary math is provided in class. Most homework assignments involve light coding in the Matlab environment. No previous experience with Matlab is required; however, we expect students to have some familiarity with basic coding concepts (functions, loops, variables, matrices). Please feel free to reach out to us if you have questions about preparation.

LING 653a, Syntax I Raffaella Zanuttini

An introduction to the syntax (sentence structure) of natural language. Introduction to generative syntactic theory and key theoretical concepts. Syntactic description and argumentation. Topics include phrase structure, transformations, and the role of the lexicon.

LING 654b, Syntax II Jim Wood

Recent developments in syntactic theory: government and binding, principles and parameters, and minimalist frameworks. In-depth examination of the basic modules of grammar (lexicon, X-bar theory, theta-theory, case theory, movement theory). Comparison and critical evaluation of specific syntactic analyses. Prerequisite: LING 653.

LING 663a, Semantics I Simon Charlow

Introduction to truth-conditional compositional semantics. Set theory, first- and higher-order logic, and the lambda calculus as they relate to the study of natural language meaning. Some attention to analyzing the meanings of tense/aspect markers, adverbs, and modals.

LING 668b / CLSS 829b / HIST 507b / NELC 809b, Historical Sociolinguistics of the Ancient World Kevin van Bladel

Social history and linguistic history can illuminate each other. This seminar confers the methods and models needed to write new and meaningful social history on the basis of linguistic phenomena known through traditional philology. Students learn to diagnose general historical social conditions on the basis of linguistic phenomena occurring in ancient texts. Prerequisite: working knowledge of at least one ancient language.

LING 680a, Morphology Jim Wood

The theory of word structure within a formal grammar. Relation to other areas of grammar (syntax, phonology); basic units of word structure; types of morphology (inflection, derivation, compounding). Prerequisites: LING 632 and 653, or permission of the instructor.

LING 691b, Topics: Events, Distributivity, Durational Modifiers Veneeta Dayal and Simon Charlow

This course bridges introductory courses (LING 263, LING 264) and advanced seminars in semantics. It explores selected topics in some detail, allowing students to appreciate the nuances of semantic argumentation while at the same time emphasizing the foundational issues involved. The goal of this course is to allow students, within a structured format, to become comfortable engaging with open-ended problems and to gain confidence in proposing original solutions to such problems. Topics vary across semesters. Prerequisite: LING 263/LING 663 or permission of instructor.

LING 744b, Topics in Phonology: Prosody, Syntax, Structure Natalie Weber Introduction to the analysis of prosodic structure, with a focus on the relation of prosodic structure to syntax. Survey of current theories of the correspondence between syntactic and prosodic structure. Particular emphasis on comparing theories and their predictions for language typology. Some empirical analysis of prosodic structure in individual languages. Prerequisites: LING 632 and LING 653, or permission of the instructor. LING 635 is recommended but not required.

LING 752b, Tocharian Claire Bowern

Study of Tocharian B language, an ancient language of what is now Western China, in its historical and material context. Students learn to read the language and the place of Tocharian within the Indo-European family. Tocharian was spoken in the Tarim Basin and is known from texts dating from roughly the fourth to the eighth centuries. We study the writing system, sound system, and grammar (morphology and syntax). After finishing this class, students will have read a number of original works in Tocharian and be familiar with the grammar of the language and how it relates to other languages in the family and region. There are no prerequisites, but some familiarity with an ancient Indo-European language is helpful.

LING 777b, Topics in Syntax: Intensifiers and Degree Phrases Jim Wood

In this course, we take a detailed look at our current understanding of an area of natural language syntax and open questions in that area. This semester, we focus on the syntax of degree expressions and the nebulous category of intensifiers. We examine evaluative readings of intensifiers, cross-linguistic/cross-dialectal variation in co-occurrence restrictions in the degree phrase, and the syntax of comparative and superlative constructions.

LING 780a, Topics in Computational Linguistics: Neural Network Models of Linguistic Structure Robert Frank

An introduction to the computational methods associated with "deep learning" (neural network architectures, learning algorithms, network analysis). The application of such methods to the learning of linguistic patterns in the domains of syntax, phonology, and semantics. Exploration of hybrid architectures that incorporate linguistic representation into neural network learning. Prerequisites: Python programming, basic calculus and linear algebra, introduction to linguistic theory (LING 106, 110, 116, 217 or equivalent).

LING 784b, Computational Psycholinguistics Tom McCoy

When processing language, the human mind can perform remarkable feats. For instance, we can acquire a language from a small amount of data (thousands of times less data than current systems in artificial intelligence), and we can infer what another person means even when that person's intended message goes beyond the literal meaning of their words. This course explores how computational modeling can help us characterize our incredible capacity for language learning and processing. We focus on three modeling traditions – symbolic algorithms, Bayesian models, and neural networks – and their application to a range of psycholinguistic phenomena, including parsing, pragmatics, speech perception, word learning, and language acquisition. We also discuss how artificial intelligence can inform theories of human language processing and vice versa.

LING 793a, Topics: Semantic Dynamics Simon Charlow

These seminars provide in-depth exploration of issues in natural language meaning, with topics varying in different semesters. In fall 2024, the seminar focuses on dynamic approaches, originally developed to explain anaphoric processes (most importantly, cross-sentential and donkey anaphora). This kind of anaphora differs in crucial respects from the way variables get bound in systems like predicate logic and λ -calculus. The basic dynamic insight – that sentences express instructions for updating some body of information – was subsequently extended to a wide variety of empirical phenomena: presupposition and the projection problem, ellipsis, (epistemic) modality, conditionals, and vagueness. Dynamic aspects of meaning have recently been reconceptualized in

analogy with the "side effects" of programming languages. As these theories gained ground, a robust dissenting literature offered counter-programming. Was dynamic semantics really necessary to treat the phenomena in question, or could they be handled satisfactorily in a more austere, truth-conditional setting? One goal of this course is to become conversant with the literature on dynamics, to learn about different dynamic frameworks. Another goal is to develop an understanding of it means for a semantic theory to be dynamic. Prerequisite: LING 663 or permission of the instructor.

LING 796a, Semantic Investigations in an Unfamiliar Language Veneeta Dayal This course introduces students to semantic fieldwork. It chooses a language that is likely not known to any student in the class and has no substantive semantic literature. Students are introduced to a phenomenon in the language on which there is some syntactic literature, either in that language or in one or more related languages. This provides a starting point for students to articulate questions to investigate that are primarily semantic in nature. Working with a native speaker consultant, students elicit data that answer these initial questions but very likely lead to further questions to investigate. To keep the elicitation focused, these investigations are restricted to topics related to the primary phenomenon discussed, while allowing some margin for individual interests. In addition to the syntactic and semantic literature on the chosen topic or topics, students also read material on fieldwork methodologies for linguistics generally as well as those specifically for semantics. Students work in small groups to fulfill part of the requirements. Prerequisites: LING 653 and LING 663 or permission of the instructor.

LING 830a, Directed Research in Neurolinguistics Staff By arrangement with faculty.

LING 875a, Linguistic Meaning and Conceptual Structure Maria Pinango The meaning of a word or sentence is something in the human mind that has specific properties: it can be expressed (written/signed/spoken forms); it can be combined with other meanings; its expression is not language dependent; it connects with the world; it serves as a vehicle for inference; and it is hidden from awareness. The course explores these properties in some detail and, in the process, provides students with technical vocabulary and analytical tools to further investigate them. The course is thus intended for students interested in undertaking a research project on the structure of meaning: the nature of lexico-conceptual structure, that is, the structure of concepts, which we refer to as "word meanings," and how they may be combined through linguistic and nonlinguistic means. The course's ultimate objective is to bridge models of conceptual structure and models of linguistic semantic composition, identify their respective strengths and weaknesses, and explore some of the fundamental questions that any theory of linguistic meaning composition must answer. Evidence discussed will emerge from naturalistic, introspectional, and experimental methodologies.

Management

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Dean Kerwin Charles

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Professors Rick Antle, Nicholas Barberis, James Baron, Lorenzo Caliendo, Judith Chevalier, James Choi, Ravi Dhar, Julia DiBenigno, Shane Frederick, Stefano Giglio, William Goetzmann, Gary Gorton, Edward Kaplan, Bryan Kelly, Sang-Hyun Kim, Balázs Kovács, Song Ma, Vahideh Manshadi, Andrew Metrick, A. Mushfiq Mobarak, Tobias Moskowitz, Barry Nalebuff, Nathan Novemsky, Edieal Pinker, K. Geert Rouwenhorst, Nils Rudi, Fiona Scott-Morton, Jiwoong Shin, Kelly Shue, Alp Simsek, Deborah Small, Edward Snyder, Matthew Spiegel, K. Sudhir, Jacob Thomas, Heather Tookes, Gal Zauberman, Frank Zhang

Associate Professors Tristan L. Botelho, Jason Dana, Paul Goldsmith-Pinkham, Zeqiong Huang, Michael Kraus, Vineet Kumar, Taly Reich, Thomas Steffen, Kosuke Uetake, Tauhid Zaman

Participating Faculty from the School of Management Laura Adler, Alexander Burnap, Christopher Clayton, Corey Cusimano, Jennifer Dannals, Raphael Duguay, Paul Fontanier, Adriana Germano, Soheil Ghili, Menaka Hampole, Theis Jensen, Ivana Katic, Joowon Klusowski, Cameron LaPoint, Zhen Lian, Lesley Meng, Faidra Monachou, David Munguia Gomez, Anya Nakhmurina, Jayanti Owens, Aneesh Raghunandan, Tong Wang, Edward Watts, Alexander Zentefis

FIELDS OF STUDY

Current fields include accounting, financial economics, marketing (behavioral), marketing (quantitative), operations, and organizations and management.

CORE REQUIREMENTS FOR THE PH.D. DEGREE

All students are required to take their individual program's seminar and workshop series in every term throughout their years in residence. These are not counted as part of the required number of courses specified below for each of the individual programs. All of the programs are full-time, requiring that all students be in residence at Yale during the academic year as well as the summer months. Teaching is considered to be an important part of the doctoral program in Management. Students are expected to serve as teaching fellows in one term of their residence. Additional requirements in each program of study are listed below.

SPECIAL REQUIREMENTS IN ACCOUNTING

The Accounting Ph.D. Program prepares students to become scholars engaged in research and teaching at the highest levels in the general areas of financial information and contracting within and across organizations. The specialization in accounting is designed to develop strong theoretical and empirical skills. There is heavy emphasis

on original research, supported by courses, presentations, feedback, joint work, and informal interactions with the faculty and fellow students in accounting and other disciplines. A key aspect of the program is multifaceted interaction among students and faculty on emerging research through seminars, conferences, brown bag lunches, and informal discussions. To develop this interaction, students must be fully engaged with the program during their stay here. At the beginning of each academic year, the director of graduate studies (DGS) assigns each student to work with a member of the faculty as a research assistant. Also, students have the opportunity to serve as teaching assistants to members of the faculty and gain experience towards becoming independent instructors.

In addition to the general requirements of the graduate school, we emphasize the following:

Courses

During their first four semesters, students must pass a minimum of 12 courses, which are selected in consultation with the faculty advisers and the DGS. In addition, students are required to do the following:

- Register for the Accounting seminar (MGMT 781-02) and the Accounting preseminar (MGMT 782-02) every term in the program,
- Audit the Accounting Ph.D. seminars (MGMT 700, MGMT 701, MGMT 702, and MGMT 704) in years 3 and 4, and
- Pass all other Ph.D. level seminars taught by Accounting faculty in years 1 through 4.

Other Requirements

During the summers after the first and second year, students work on original research papers, which are due by September 1 and October 1, respectively. When submitted, copies must be sent to the Ph.D. registrar as well.

During the summer after the second year (around mid-June) students take a facultywritten three-day qualifying examination, which assesses their intellectual readiness to begin dissertation research.

The dissertation must be defended by the end of the seventh year in the program.

For the five years that they receive a stipend, students must be in residence at Yale, during the academic year as well as the summer.

Students must participate in the full range of normal academic and other intellectual engagements and activities of the University and SOM and interact with the faculty and fellow students on a day-to-day basis.

Students may be dismissed from the accounting program for any of the following reasons: (1) unsatisfactory performance at the end of the first or second year of the program, if the grade average falls below a High Pass (at least as many Honors grades as Pass), (2) failing the qualifying examination, or (3) unsatisfactory first- or second-year papers.

SPECIAL REQUIREMENTS IN FINANCIAL ECONOMICS

The Ph.D. program (and its accompanying fellowship support) provide the necessary training needed by our students to launch a promising career in academic finance. Towards this end the finance group has set up a series of requirements and milestones that must be met to help insure that students are making progress toward that career goal. It is important for everyone to understand that when a student's progress ceases, it is better for everyone concerned if that student leaves the Ph.D. program.

The requirements that have been set forth are quite difficult. Meeting them is a fulltime job. Students should not be engaged in other types of employment (other than work as a research or teaching assistant) during their period of enrollment. Because of the difficulty in fulfilling these requirements, students should plan for them carefully. Where a requirement involves faculty approval, consultation with the relevant faculty should begin well in advance of deadlines. Students should seek out faculty they may wish to work with early in the process to ensure a smooth transition from one stage of the program to the next.

Courses

Students must take and pass at least twelve Ph.D. level courses, in total, to graduate. In the first year of the program students are required to take Financial Economics I (MGMT 740). Students must also take Microeconomics I & II (ECON 500; ECON 501) and Econometrics I & II (ECON 550; ECON 551). Some students with limited math or economics backgrounds may be advised to postpone taking some of these courses until their second year in the program. In addition to Financial Economics I, students are also required to take the Ph.D. level courses offered by the Finance faculty. In the recent past this has included courses on Financial Econometrics, Financial Crises, Behavioral Finance, Household Finance, and Applied Empirical Methods. Availability and topic varies by year. Since most students take the qualifying exam in their second year, they are required to take the topics courses offered that year.

To be admitted to candidacy, a student must pass all required courses and must maintain at least an HP grade point average. Students who fail a required course may retake it once, and the grade of the second instance will replace the first on their transcript. The required courses are ECON 500, ECON 501, ECON 550, ECON 551, MGMT 740, and the other Ph.D. courses offered by the finance faculty in the student's first two years of the program.

Students must also receive a grade of Honors in at least one full-year or two term-long graduate courses. Students must also satisfy the general program and graduate school grade requirements.

Seminar and Pre-Seminar Series

The finance seminar takes place every Friday from 11:10 to 12:30. Every week during the school year, a prominent academic speaker presents his or her latest work. Seminars allow both students and faculty to get an in-depth look at papers in progress and to see first-hand what elements strengthen or weaken a research piece. Seminars are also useful for generating new research ideas which can help students to formulate their dissertation topics. The pre-seminar takes place at a regularly scheduled date and time prior to the actual seminar. The only exceptions are the weeks when Yale students are giving their "job talk." The pre-seminar is typically run by the member of the faculty who scheduled the regular seminar series that term. The pre-seminar's format is similar to that of the regular seminar series except that a student, rather than the paper's author, does the presentation. Attendance at both the seminar and pre-seminar is mandatory during a student's entire time at Yale.

The Finance Lunch Starting in their third year of the program, students should attend the Finance Lunch, which takes place every Tuesday and features presentations by Yale faculty and students. In the Finance Lunch, students in their third year or beyond are required to do one forty-minute presentation per term on their research. Students on the job market will do a full eighty-minute talk. Students in their first or second year of the program should attend the Finance Lunch if their schedules allow.

Qualifying Exam

The qualifying exam covers the Ph.D.-level finance courses taken in the two prior years of study. Unless given a waiver by the director of the finance Ph.D. program, students must take the qualifying exam before the last business day before June 15.

Format The qualifying exam is a closed book test. It will be either open-note or closednote; this will be determined by the examining faculty in the spring of the year in which the exam is offered. If there is any other pertinent information about the exam, it will be provided by the finance Ph.D. program director at least four weeks before the exam.

Passing and Failing If a student fails the exam he or she may request to take it, at most, one more time. The makeup exam must be taken by the final business day before August 1st. However, if the student took the exam in their first year and failed, they may delay retaking it until June 15th after their second year. If the makeup exam is also failed, the student will be dismissed from the program. The format of the makeup exam will be identical to that of the original.

First- and Second-Year Papers

These papers are designed to help students begin the process of writing a dissertation by acquainting them with the recent literature in an area. In addition, these papers are meant to give students practice in the art of communicating their results. If you cannot clearly explain, in writing, what you have discovered, it does not matter what you have done. Nobody will read it, and thus nobody will know about it. Papers must meet the literary standards (with regard to both prose and grammar) required by the academic journals to pass. Both papers must be solo-authored, except in cases where a co-author is required in order to access the data needed for the project. These cases must be approved by the DGS.

First-Year Paper Students are required to write a research paper during the summer between their first and second year in the program. The topic of the first-year paper requires written approval by the faculty member acting as the student's adviser. The deadline to submit that approval to DGS is May 15th. An acceptable paper is a literature review that goes over several recent papers in an area, explains their relationship to each other, discusses one or more potential areas for original research, and provides at least some original analysis. Examples of what qualifies as original analysis include the reproduction of at least part of an empirical study on a new data set, or the extension of a theoretical paper along some lines. Of course, more ambitious works are welcome. This paper is due by the second Monday in August and should be turned into the finance group's Ph.D. program director with a copy sent to the Ph.D registrar.

Second-Year Paper Students are required to write a research paper during the summer between their second and third years in the program. This paper should look more like a potential journal article than the first-year paper. It should include an abstract, an introduction, a main body, and a conclusion. The paper must include at least a preliminary analysis of some problem in finance. While this paper does not need to be as complete as a dissertation chapter, it must demonstrate an ability to identify and set out an agenda to solve an academically interesting problem. By May 15 the second-year paper proposal must be approved by a member of the finance faculty that has agreed to supervise the project. The paper itself is due by the second Monday in August and should be turned into the student's adviser with a copy sent to the Ph.D. registrar.

Papers that Receive a Failing Grade Students whose papers receive a failing grade may be dismissed from the program at the faculty's discretion. For those students that are allowed to continue in the program the deadline for the revised manuscript depends upon the paper's shortcomings.

• If a paper does not pass, due to the quality of the analysis, the student will have until the second Monday in October (of the same year in which the paper was submitted) to produce an acceptable manuscript.

• If a paper does not pass due to the quality of the writing, the student will be required to take an English composition class in the fall term. An acceptable draft of the paper must be turned in prior to the start of the following spring term.

Ph.D. Prospectus

The graduate school requires that, prior to the start of a student's fourth year in the program, he or she must produce a prospectus and line up a dissertation committee. *The finance group requires students to do this prior to the start of the spring term of their third year.* The prospectus provides an overview of the dissertation's first essay and should include at least a paragraph describing two other potential essays. Enough detail should be provided to convince the faculty that the first essay will be completed by the end of the calendar year and that a second essay will be nearly complete. The early deadline for the prospectus reflects the finance group's desire to ensure that students make progress towards their dissertation throughout their stay in the program. Most students are expected to seek an academic position during their fifth year in the program and complete their dissertation by the end of their fifth year.

Unless a dissertation committee is formed and a prospectus is approved by the spring of a student's third year, it is nearly impossible for him or her to finish in four years. The student's dissertation committee must have at least four members: three to act as readers and the dissertation adviser to act as chair. Dissertation advisers may not act as a reader. All four committee members must sign off on the prospectus. At least two members of the committee must be from the finance group unless a waiver is given by the finance group's Ph.D. program director. *If a student cannot form a committee prior to the start of the spring of their third academic year, the student cannot continue in the program.* Most dissertation committees have a primary adviser and two secondary advisers. The primary adviser is the person the student should turn to for most questions regarding their progress towards an acceptable dissertation and job

market strategies. Dissertation advisers play a critical role in a student's career. As such, students are strongly encouraged to seek out potential advisers early on as they progress through the program; the first year is not too early. Students may not remain in the program longer than seven years without the written permission of the DGS.

Dissertation

A typical dissertation contains three essays. They do not need to be that closely related. An acceptable thesis might be titled "Three Essays in Finance." Prior to final acceptance of the dissertation, students must pass a public defense. Before a public defense can be scheduled, all three members of the committee must agree that the student and the dissertation itself are ready. All members of the faculty are invited to a dissertation. The faculty may pass or fail the student. In addition they may grant a conditional pass. This is done when the faculty believe there are only some minor problems with the dissertation and delegate the final decision regarding these corrections to the committee. After the faculty pass on the dissertation (or the committee passes on the dissertation in the case of a conditional pass), the dissertation is submitted to the graduate school. The graduate school will assign readers who make a final acceptance on the dissertation. The reader assignment is governed by the graduate school; however, they usually assign the two secondary advisers and one other faculty member.

The "Job Market"

The job market for Ph.D. candidates seeking academic positions in finance takes place at the annual meetings of the Financial Management Association in October, and of the American Finance Association (AFA) in early January. Students wishing to interview at these meetings must mail "job market" packets to potential employers at least six weeks prior to the meetings. The packets consist of at least one finished essay and three letters of recommendation. Those seeking positions at the top-level universities interviewing at the AFAs should expect that some of the competition will arrive with two or more finished essays, one of which may have been accepted for publication. As a practical matter students cannot go on the job market unless their dissertation committee approves. As part of their preparation for the job market, students are expected to present their work at the Tuesday Finance Lunch in the fall of the year in which they are going on the market. Students should ask the chair of their dissertation committee for information regarding the scheduling of this seminar.

Critical Dates

Failing any item in *italics* will result in dismissal from the program.

First Year Students must take and pass Financial Economics I.

Summer of the First Year First-year papers are due by the second Monday in August. Revised papers that did not initially pass due to the quality of the analysis are due the second Monday in October. Revised papers that did not pass due to issues related to writing quality are due prior to the start of the spring term.

Second Year Students must take and pass the topics courses offered by the finance faculty. Students must take and pass the qualifying exam. This exam will be offered

about one month after the final topics class in that academic year. Students that fail the qualifying exam may, at the faculty's discretion, take a makeup exam about a month later. *To continue in the program, students must pass the qualifying exam, pass all the required courses, and keep an HP grade point average.* If a student fails a required course, they may retake it and the grade of the second instance will replace the first on their transcript.

Summer of the Second Year Second-year paper proposals are due and must be approved by a member of the faculty that has agreed to act as the project's supervisor by May 15. The paper itself is due by the second Monday in August. *Revised papers that did not initially pass due to the quality of the analysis are due the second Monday in October. Revised papers that did not pass due to issues related to writing quality are due prior to the start of the spring term.*

Spring of the Third Year Students must produce a thesis prospectus and line up a thesis committee by start of the spring term of their third year in the program. The committee must have at least three members and at least two members must be from the finance group. *Students that do not meet this deadline cannot continue in the program.*

Every Term while Enrolled Students must attend both the weekly seminar and preseminars.

SPECIAL REQUIREMENTS IN MARKETING (BEHAVIORAL)

Admission to the Ph.D. program in Behavioral Marketing is highly selective. We admit two to three of the most promising students annually from an impressive pool of applicants. Academic backgrounds of admitted students are typically in the behavioral sciences or the liberal arts, but we welcome applications from students with degrees in economics, statistics, computer science, mathematics, and engineering. We do not require graduate degrees for admission to the doctoral program.

The Marketing department at Yale is consistently rated as one of the most productive in the field. We have an excellent placement record for our doctoral students, many of whom have gone on to secure tenure-track positions at top research institutions including Harvard, Stanford, Northwestern, and Columbia. The behavioral marketing faculty at Yale are all research-active scholars who specialize in consumer behavior, behavioral economics, and judgment and decision-making. Many of the behavioral faculty have joint appointments in the departments of Psychology and Cognitive Sciences. Ph.D. students are not assigned to a primary adviser prior to admission and are free (and encouraged) to work with multiple faculty members. Research interests and recent publications for the behavioral faculty are provided on the faculty page.

Courses

Students are encouraged to complete their doctoral training within five years. Required coursework is commonly restricted to the first two years of study, while the remaining time is spent completing the dissertation. Students are required to pass twelve Ph.D.-level courses in their first two years. These include the following:

Three behavioral marketing core courses (MGMT 753, Behavioral Decision-Making I: Choice; MGMT 754, Behavioral Decision-Making II: Judgment and; MGMT 758, Foundations of Behavioral Economics); two empirical methods courses that cover the topics of experimental design and statistics; one breadth course that covers the topic

of quantitative marketing; and six electives in behavioral sciences (example course subjects include social cognition, cognitive development, cognitive science of morality, foundations of neuroscience, cognitive science of pleasure, psychology of free will, or an independent study course).

Regular Activities

In order to remain in good standing, students are required to attend three seminar series regularly, including the weekly Ph.D. Research Workshop in Behavioral Marketing (Sprouts), the weekly Marketing Seminar series, the Ph.D. Pre-Workshop in Marketing (immediately prior to most weekly Marketing Seminars). Additionally, students are expected to meet regularly with their primary adviser and any collaborating faculty.

Qualifying Examinations

First-Year Paper and Presentation During their first year, students are expected to develop a project in collaboration with one or more faculty members. During the summer between the first and second year, students are required to write a ten- to twelve-page paper reporting this research, due September 1. Students are also required to give a thirty-minute research presentation summarizing this research in the fall semester of their second year.

Second-Year Paper and Presentation During the second year, students are expected to develop a more in-depth investigation (either an extension of their first year or a new line of work in a related area). Over the summer between the second and third year, students are required to write a paper of at least fifteen pages reporting this research, due September 1. This paper should include an extensive introduction that demonstrates mastery of the relevant literature. Students are also required to give a sixty-minute research presentation summarizing this research in the fall term of their third year. Assessment of the second-year paper and presentation serves as the qualifying exam for the advancement to the Ph.D. candidacy.

Dissertation

The dissertation typically consists of three essays which are completed in years three to five.

Dissertation Prospectus Prior to starting work on the dissertation, students submit a dissertation prospectus that consists of brief descriptions (one to two pages per essay) of the essays to be contained in the dissertation. At this stage, students must also finalize their dissertation committee consisting of the principal adviser and three other faculty members. The prospectus must be completed and accepted by the dissertation committee by the end of the student's third year.

Thesis Defense After completing the dissertation, students must defend it before their doctoral committee, other faculty members, and interested doctoral students. The faculty can accept the dissertation as is, require minor changes, or not accept the dissertation and ask the student to redo one or more essays. (The third result occurs very rarely.) If minor revisions have to be made, the student makes these revisions, gets

them approved by the principal adviser, and submits the dissertation to the graduate school.

Students should consult the graduate school calendar for the March and October deadlines to submit their dissertations for the May or December degrees.

Students may not remain in the program longer than six years unless they obtain permission for a seventh year from the DGS. Very rarely, students may request an eighth year of registration due to serious circumstances beyond their control that have prevented them from completing the dissertation by the end of the seventh year of study. Approval for an eighth year must come from the Dean of the Graduate School of Arts and Sciences. In either case, an Extended Registration Request Form must be submitted.

SPECIAL REQUIREMENTS IN MARKETING (QUANTITATIVE) Courses

Students are required to pass twelve Ph.D.-level courses in their first two years of study: two microeconomics courses (ECON 500 and ECON 501); two empirical methods courses (ECON 550 and ECON 551); three depth courses in the student's primary area of study (including one behavioral marketing course); and five electives (examples of suitable electives include ECON 520, ECON 521, ECON 527, ECON 530, ECON 531, ECON 552, ECON 553, ECON 554, ECON 555, ECON 557, ECON 600, ECON 601; MGT 611; MGMT 703; S&DS 551, S&DS 565).

These twelve courses have to be taken in the first two years. Students can take other courses not listed above as electives if their faculty adviser permits. The grade requirements are as follows: Students are expected to obtain at least two Honors grades and maintain a High Pass grade point average in ten of the twelve courses on the list. Off-list courses are not included when factoring grade point average.

Seminar Attendance

In addition to coursework, students must attend three seminar series regularly: the Ph.D. Workshop in Marketing, the Ph.D. Pre-Workshop in Marketing, and Quantitative Marketing Student Presentation Workshops. The first two seminars are held weekly. The Pre-Workshop consists of a discussion of the paper to be presented in the Ph.D. Workshop in Marketing that day. The discussion is led by a faculty member, and all the students are expected to participate in the discussion. Also, doctoral students make presentations in workshops arranged by the department. Marketing students are expected to attend all presentations made by marketing students and are encouraged to attend seminars in other areas.

Research Paper Requirements

Students are expected to complete an original research paper during the summer following their first year in the Ph.D. program. Students must select faculty advisers for their first-summer paper and work with them during the summer to develop their papers. These papers have to be presented in the PhD Workshop in Marketing (MGMT 781) during the fall of a student's second year. Students must turn in their paper within a week of presentation and will be graded by the adviser. Please note that students must submit their paper to both their faculty advisor and the PhD Registrar.

Students are also expected to complete another original research paper in the summer following their second year in the program. Again, students select faculty advisers to assist them in writing their papers. These papers must be presented in the PhD Workshop in Marketing (MGMT 781) in a student's third year. Students must turn in their second-year paper by October 1 of their third year. If the paper does not pass, they may turn in a revised paper by February 1 of their third year. After that date, no further revisions will be considered.

While the primary goal of the first-summer paper is to introduce doctoral students to the world of academic research, the second-summer paper is expected to be comparable in quality with papers published in *Marketing Science*. The first- and second-summer papers could be co-authored with other students or faculty.

Qualifying Examinations

Students have to successfully complete the marketing qualifying examination at the end of their second year in the program. The exam is administered no later than June 15. The examination consists of two sections given over two days with each section administered as a closed-book, four-hour examination. The general section of the examination covers a variety of empirical and theoretical concepts within Marketing while the specialization section consists of questions relating to a single area of research which the student chooses in co-ordination with the marketing faculty.

The Qualifying exams receive a grade of either Pass, Unsatisfactory, or Fail. Students with a failing grade cannot retake the exam and will be dismissed from the program. Those receiving a grade of Unsatisfactory will be given one opportunity to retake the exam and must do so during August of the year in which the student first took the exam. Failure to earn a passing grade on either the first or second Qualifying exam will result in dismissal from the program.

Dissertation

The dissertation typically consists of three essays which are completed in years three to five. Prior to starting work on their dissertation, students have to write a dissertation prospectus which consists of brief descriptions (one-and-a-half pages per essay) of the essays to be contained in the dissertation. At this juncture, students must also finalize their dissertation committees, consisting of a principal adviser and three other faculty members. The prospectus must be completed and accepted by the dissertation committee by the end of the student's third year.

After a dissertation is complete, students must defend it before their committee, other faculty members, and interested doctoral students. The faculty can accept the dissertation as is, require minor changes (e.g., a more complete bibliography or better writing of the introduction), or not accept the dissertation and ask the student to redo one or more essays.

Students should consult the graduate school calendar for the March and October deadlines to submit their dissertations for the May or December degrees.

Students may not remain in the program longer than six years without written permission of the DGS.

SPECIAL REQUIREMENTS IN OPERATIONS

Admitted students must satisfy six program requirements: (1) twelve courses, (2) a first-year paper, (3) a general exam, (4) operations seminar participation, (5) a dissertation prospectus, and (6) a dissertation. A grade point average of High Pass (HP) must be maintained. Students must also comply with all other rules of the graduate school and of the Yale School of Management Doctoral program. On average, students will need five years to complete these requirements.

Courses

All students must pass at least twelve courses:

- three core courses (ENAS 649, Policy Modeling, (MGMT 720, Models of Operations Research and Management; and MGMT 721, Modeling Operational Processes),
- five required methods courses (S&DS 541, Probability Theory & Applications; ENAS 502, Stochastic Processes; S&DS 542, Theory of Statistics; S&DS 431, Optimization and Computation; and ECON 501, General Economic Theory: Microeconomics), and
- four elective courses scheduled upon approval by the student's course adviser.

Typically, all of these courses are completed in the first two years of the program. Under unusual circumstances and with the approval of both their adviser and the DGS, students may fulfill some of the methods course requirements with alternative offerings.

First-Year Paper

During the summer after the first year of coursework, students will work with an operations faculty member on an ongoing research project. By September 30, the students should prepare written reports on their work and prepare presentations on this work for the operations group internal seminar. Continuation in the program is contingent upon the faculty's approval of the report.

General Exam

The General Exam has two components: a coursework exam, based upon the coursework of the first two years, and a second-year research paper. The coursework exam will be scheduled by faculty sometime after the last day of exams of the spring term and prior to June 16. After the coursework exam, students will be provided with a list of research topics by the operations faculty and must choose to work on one of these or, with the approval of the faculty, a topic of their own choosing, with the aim of delivering a paper by September 30. Faculty will evaluate a student's continued enrollment in the program based upon course grades, the coursework exam, and the second-year paper. In rare exceptions, students who do not pass the exam will, at the discretion of the faculty, be offered a chance for remediation sometime prior to the end of the fall term.

Operations Seminar

Approximately every other week, leading operations scholars will visit to present their latest research. Doctoral students will meet with Operations faculty prior to these seminars to review the papers and related literature. Participation in this seminar is required throughout the program.

Dissertation

No later than the end of their third summer in the program, students must submit a prospectus for their dissertation as an application to doctoral candidacy. Based upon this proposal and a student's previous performance, the faculty will decide whether to admit the student to candidacy. Submission and approval of a completed dissertation will follow the policies of the graduate school. Students failing to complete their dissertation within six years of advancing into candidacy will be dropped from the program.

SPECIAL REQUIREMENTS IN ORGANIZATIONS AND MANAGEMENT

The Yale Organizations and Management doctoral program is designed to prepare individuals for faculty positions in organizational behavior, management, and strategic management at research-oriented business schools. It is unique in its multi-disciplinary orientation, introducing students to psychological, sociological, and economic perspectives both on the internal dynamics of organizations and on how organizations interact with their environments, as well as in the depth of its training in empirical methods. The Yale Organizations and Management program is small, ensuring that each student receives ample faculty attention, and is highly flexible, allowing the program to be tailored to each student's interests. Upon admission, each student will be assigned to a faculty adviser who will help the student to design an individualized program that prepares the student well for doing research in his or her area of interest.

Students in the Ph.D. program in Organizations and Management must satisfy five requirements: (1) pass twelve courses, (2) seminar and workshop participation, (3) a first-year paper, (4) a second-year paper/qualifying exam, and (5) a dissertation (usually consisting of three journal-quality papers). Students must also comply with all other rules of the graduate school and of the Yale SOM doctoral program.

Courses

All students must pass twelve courses: two methods courses (PLSC 503 and PLSC 504; or ECON 550 and ECON 551; or, students who believe they will primarily do experimental research may take PLSC 503 and a methods course in psychology such as PSYC 518 for ECON 551); four depth courses (MGMT 731, MGMT 733, MGMT 734, MGMT 736); four social science courses in psychology or sociology (e.g., PSYC 505, PSYC 509, PSYC 557, PSYC 621; SOCY 511, SOCY 544, SOCY 625, SOCY 633); one breadth course outside the student's area of study, chosen in consultation with the student's adviser; and at least one additional elective chosen in consultation with the adviser.

Seminars and Workshops

Organizations and Management Seminar Roughly every other week, the area invites world-class scholars to present their research to Yale faculty and students. Doctoral students are expected to attend these seminars in every term of the program. Prior to the seminar, students will meet with one of the faculty members to discuss the paper being presented.

MGMT 730, **Organizational Behavior in Development (OBID)** Ph.D. students, in each term of the program, are required to regularly attend this weekly internal brown-bag seminar series. The seminar is jointly taught by the Organizations and Management faculty doing research with large-scale (usually archival) data sets, behavioral experiments, or qualitative data. These meetings provide a venue for the discussion of study design, research methods, the interpretation of research results, the crafting of papers, and important published research. Beginning in their third year, students are also expected to present in the seminar once per year.

Research Papers and Qualifying Exam

First-Year Paper In the summer between their first and second year in the program, each student must collaborate on a research paper together with a faculty member in the SOM Organizational Behavior group. The idea for this paper may originate with either the student or the faculty member. In either case, an initial draft of the paper must be completed by September 30 of their second year, and the completed paper must be approved by two faculty members and submitted by 5 p.m. of the last day of classes of their fall term, and a copy must be emailed to the Ph.D. registrar. Students will present these co-authored papers in the OBID Workshop in the fall of the second year. Generally, these papers will be submitted to journals and will result in publications prior to the end of a student's time in the program.

Second-Year Paper (Qualifying Exam) In the summer between their second and third year in the program, each student must work on a research paper under the guidance of a faculty member in the SOM Organizational Behavior group. The idea for this paper must originate with the student, though the faculty member may assist in developing the paper for publication. An initial draft of the paper must be completed and submitted by 5 p.m. of the last business day in October of their third year, and a copy must be sent to the Ph.D. registrar. Students will present these papers in the OBID Workshop in their third year. The expectation is that these papers will be submitted to journals.

The second-year paper is considered the qualifying exam and will be vetted by both the Organizations and Management faculty and the DGS. If a student receives a failing grade on their second-year paper, they have ninety days from the date they are notified to submit a passing paper.

Dissertation

Admission to Candidacy Once students have completed their coursework and firstand second-year papers, they may apply for admission to candidacy. As part of this application, students must submit a proposal for their planned dissertation. Admission to candidacy depends on a comprehensive review of the student's performance by the faculty; completion of the requirements listed above does not guarantee admission. Students must be admitted to candidacy prior to their fourth year in the program. In order to give the faculty enough time to review the prospectus, admission to candidacy paperwork is due to the student's adviser by August 1 before submission to the Doctoral Program registrar.

By the fall of year three, students should propose ideas for their dissertation and form a four-person dissertation committee to advise this research. The dissertation committee's chair must come from the School of Management's Organizations and Management ladder-rank faculty. Students will generally present progress on these papers in the Ph.D. Student Research Workshop on an annual basis.

JOINT J.D./PH.D. IN FINANCE

Students in the joint J.D./Ph.D. in Finance program must meet the following requirements:

Course Requirements, Ph.D. Eight courses, including the following five required courses: ECON 500; ECON 501; ECON 550 and ECON 551; MGMT 740 and two additional Ph.D.-level finance courses. Upon reaching the Ph.D. candidacy, students are required to attend MGMT 781 and MGMT 782.

Course Requirements, J.D. 71 credit units at Yale Law School, including the required first-term courses taken in one term (Contracts, Constitutional Law, Criminal Law and Administration, and Procedure), Torts and Regulation, a course satisfying the legal ethics requirement, Business Organizations, and six credit units satisfying the experiential learning requirement.

Predissertation Writing Requirements (1) A paper fulfilling the Ph.D. secondyear research paper requirement, and (2) a paper fulfilling one of the J.D. writing requirements (substantial or supervised analytic writing). Note: an accepted Ph.D. second-year research paper will fulfill the student's remaining J.D. paper requirement by registration for independent research credit with the student's law school faculty adviser. One of these papers must qualify as the student's prospectus.

Qualifying Examination in Finance The qualifying exam is in three courses: the section of the qualifying exam pertaining to MGMT 740 and two additional doctoral finance courses. The qualifying exam is taken after the student has completed all required graduate finance courses.

MASTER'S DEGREES

M.Phil. A student who is admitted to candidacy will be eligible to receive the M.Phil. upon the recommendation of the program's faculty and the approval of the graduate school.

M.A. Applications for a terminal master's degree are not accepted. The M.A. degree is awarded only to students not continuing in the Ph.D. program. The student must complete eight graduate-level term courses approved for credit in their program and maintain an average grade of High Pass. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.A.

Program materials are available upon request to the Director of Graduate Studies, Management, Yale University, PO Box 208200, New Haven CT 06520-8200. For information on the M.B.A. degree, please contact the admissions office at the School of Management.

COURSES

MGMT 521a / ECON 728a, Workshop: International Trade Staff Workshop/seminar for presentations and discussion on topics in the field of international trade.

MGMT 700a, Seminar in Accounting Research I Zeqiong Huang

Study of analytical modeling techniques in accounting research that covers topics such as performance measurement for incentives, the consequences of asymmetric information in economic relationships and the role of accounting therein, information sharing within and across firms, and the pricing of related-party transactions.

MGMT 701b, Seminar in Accounting Research II Staff

Study of analytical modeling techniques in accounting research that covers topics such as performance measurement for incentives, the consequences of asymmetric information in economic relationships and the role of accounting therein, and information sharing within and across firms.

MGMT 720b / ECON 675, Models of Operations Research and Management Staff The course exposes students to main stochastic modeling methods and solution concepts used to study problems in operations research and management. The first half of the class covers analysis of queuing models such as Markovian queues, networks of queues, and queues with general arrival or service distributions, as well as approximation techniques such as heavy traffic approximation. The second half focuses on control of stochastic processes; it covers finite and infinite-horizon dynamic programming problems, and special classes such as linear quadratic problems, optimal stopping, and multi-armed bandit problems. ½ Course cr

MGMT 721a or b, Modeling Operational Processes Staff

MGMT 737b, Applied Empirical Methods Staff

This course is designed for graduate Ph.D. students interested in econometric methods used in empirical research. The goal of this class is to provide an overview of different empirical methods, with an emphasis on practical implementation. In the first half of the course, we will discuss the properties of an effective empirical research design, and review topics in linear regression and discrete choice. In the second half of the course, we will cover the new applied econometrics literature on difference-in-differences, regression discontinuity, instrumental variables (including Bartik IV, simulated instruments, and examiner designs), machine learning, and partial identification. ECON 550 (or similar) is a prerequisite.

MGMT 740a / ECON 670, Financial Economics I Stefano Giglio

Current issues in theoretical financial economics are addressed through the study of current papers. Focuses on the development of the problem-solving skills essential for research in this area.

MGMT 742a or b, Financial Econometrics and Machine Learning Staff

This course provides a theoretical treatment of major topics in corporate finance and banking, including: capital structure; incomplete contract and ownership; agency theory, information, and financial contracting; corporate finance and financial market; banking and intermediaries; and recent topics relating to financial crises. Economics Ph.D.students need to take both this course and Empirical Corporate Finance (ECON 676/MGMT 748) to obtain credit; then, together, they will be counted as one credit. The first class session for this course meets Friday, October 27, 2023. ¹/₂ Course cr

MGMT 745b / ECON 672, Behavioral Finance Staff

Much of modern financial economics works with models in which agents are rational, in that they maximize expected utility and use Bayes's law to update their beliefs. Behavioral finance is a large and active field that studies models in which some agents are less than fully rational. Such models have two building blocks: limits to arbitrage, which make it difficult for rational traders to undo the dislocations caused by less rational traders; and psychology, which catalogues the kinds of deviations from full rationality we might expect to see. We discuss these two topics and then consider a number of applications: asset pricing (the aggregate stock market and the crosssection of average returns); individual trading behavior; and corporate finance (security issuance, corporate investment, and mergers).

MGMT 753a / PSYC 553a, Behavioral Decision-Making I: Choice Ravi Dhar and Nathan Novemsky

The purpose of this seminar is to provide Ph.D.-level coverage of the psychology of decision making, focusing on choice. Although the normative issue of how choices should be made is relevant, the descriptive issue of how choices *are* made is the main focus of the course. In addition to examining prior choice research, the goal of this seminar is to improve your ability to identify interesting research questions and develop effective experiments for testing them. Students generally enroll from a variety of disciplines, including cognitive and social psychology, behavioral economics, finance, marketing, political science, medicine, and public health.

MGMT 756b, Empirical Methods in Marketing Staff

This course introduces students to structural models of demand and supply dynamics, market entry, and product positioning through a mix of lectures and detailed discussions of specific papers. Emphasis on implementing models using software such as Matlab and Gauss through structured homework assignments.

MGMT 758b / PSYC 602, Foundations of Behavioral Economics Staff

The course explores foundational topics in behavioral economics and discusses the dominant prescriptive models (which propose what decision makers should do) and descriptive models (which aim to describe what decision makers actually do). The course incorporates perspectives from economics, psychology, philosophy, decision theory, and finance, and engages long-standing debates about rational choice.

MGMT 759b, Moral Consumer Decision Making Staff

1/2 Course cr

MGMT 760a, Current Topics in Judgement and Decision-Making Gal Zauberman This doctoral seminar is centered on current topics in judgment and decision research and the related fields of behavioral economics, cognitive psychology, and social psychology. The goal is to have in-depth discussion about behavioral research that addresses contemporary issues that society is facing (inequality, discrimination, etc.).

MGMT 761b, Corporate Finance Staff

This course surveys corporate finance research, including both classic topics and more recent developments in this broad literature. Typically, a class session provides background and context for a given topic and talks about several papers in detail. Major topics covered include corporate capital structure, banking, corporate governance, executive compensation, merger acquisitions, entrepreneurial finance, private equity, corporate innovation, and behavioral corporate finance. This course is designed for Ph.D. students in finance, economics, accounting, and other related fields.

MGMT 762a / ECON 678a, Macro Finance Alp Simsek

MGMT 763a, Organizations and Management II: Macro and Meso Perspectives on Organizations and Their Environment Julia DiBenigno

MGMT 781a or b, Workshop Staff

781-01, Accounting/Finance Workshop; 781-03, Marketing Workshop; 781-04, Organizations and Management Workshop; 781-05, Operations Workshop.

MGMT 782a or b, Doctoral Student Pre-Workshop Seminar Staff 782-01 Financial Economics Doctoral Student Pre-Workshop Seminar; 782-02 Accounting Doctoral Student Pre-Workshop Seminar; 782-03, Marketing Doctoral Student Pre-Workshop Seminar; 782-04, Organizations and Management Doctoral Student Pre-Workshop Seminar; 782-05, Operations Doctoral Student Pre-Workshop Seminar.

MGMT 791a or b, Independent Reading and Research Staff By arrangement with individual faculty.

Mathematics

219 Prospect St http://math.yale.edu M.S., M.Phil., Ph.D.

Chair Wilhelm Schlag

Director of Graduate Studies Van Vu

Professors Richard Beals (*Emeritus*), Jeffrey Brock, Andrew Casson (*Emeritus*), Ronald Coifman, Igor Frenkel, Howard Garland (*Emeritus*), Alexander Goncharov, Roger Howe (*Emeritus*), Peter Jones, Richard Kenyon, Ivan Loseu, Gregory Margulis (*Emeritus*), Yair Minsky, Vincent Moncrief (*Physics*), Andrew Neitzke, Hee Oh, Nicholas Read (*Physics*; *Applied Physics*), Vladimir Rokhlin (*Computer Science*), Wilhelm Schlag, John Schotland, George Seligman (*Emeritus*), Charles Smart, Daniel Spielman (*Computer Science*), Van Vu, Lu Wang, John Wettlaufer (*Earth and Planetary Sciences*; *Physics*), Gregg Zuckerman (*Emeritus*)

Assistant Professor Junliang Shen

FIELDS OF STUDY

Fields include real analysis, complex analysis, functional analysis, classical and modern harmonic analysis; linear and nonlinear partial differential equations; dynamical systems and ergodic theory; probability; random matrix theory, Kleinian groups, low dimensional topology and geometry; differential geometry; finite and infinite groups; geometric group theory; finite and infinite dimensional Lie algebras, Lie groups, and discrete subgroups; representation theory; automorphic forms, L-functions; Langlands program; algebraic number theory and algebraic geometry; mathematical physics, relativity; numerical analysis; probabilistic combinatorics; additive combinatorics; and spectral graph theory.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

In order to qualify for the Mathematics Ph.D., all students are required to:

- · complete eight term courses at the graduate level, at least two with Honors grades;
- · pass qualifying examinations on their general mathematical knowledge;
- submit a dissertation prospectus;
- participate in the instruction of undergraduates;
- be in residence for at least three years; and
- complete a dissertation that clearly advances understanding of the subject it considers.

All students must also complete any other Graduate School of Arts and Sciences degree requirements; see Degree Requirements under Policies and Regulations.

The normal time for completion of the Ph.D. program is five years. Requirement (1) normally includes basic courses in algebra, analysis, and topology. A sequence of three qualifying examinations (algebra and number theory, real and complex analysis,
topology) is offered each term. All qualifying examinations must be passed by the end of the second year. There is no limit to the number of times that students can take the exams, and so they are encouraged to take them as soon as possible.

The dissertation prospectus should be submitted during the third year.

The thesis is expected to be independent work, done under the guidance of an adviser. This adviser should be contacted not long after the student passes the qualifying examinations. A student is admitted to candidacy after completing requirements (1)–(5) and obtaining an adviser.

In addition to all other requirements, students must successfully complete MATH 991, Ethical Conduct of Research, prior to the end of their first year of study. This requirement must be met prior to registering for a second year of study.

HONORS REQUIREMENT

Students must meet the Graduate School's Honors requirement by the end of the fourth term of full-time study.

TEACHING

Teaching experience is integral to graduate education at Yale. Therefore, teaching is required of all graduate students, typically one term per year. Generally, first-year students work as coaches for calculus classes, meeting with small discussion sections of undergraduates. Second-year students often work as teaching assistants for a linear algebra class (MATH 222, MATH 225, or MATH 226), real analysis (MATH 255 or MATH 256), or discrete mathematics (MATH 244); duties usually include holding office hours or leading discussion sections.

In the spring of their second year, graduate students attend the Lang Teaching Seminar (MATH 827). In this lunch seminar, experienced faculty help students understand the challenges of teaching and prepare students to lead their own section of calculus in the following year and beyond.

Students who require additional support from the Graduate School after the fifth year of study must teach additional terms, if needed.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Students who withdraw from the Ph.D. program may be eligible to receive the M.S. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.S., students must successfully complete six term courses with at least one Honors grade, perform adequately on the general qualifying examination, and be in residence at least one year.

COURSES

MATH 500a, Algebra Junliang Shen

The course serves as an introduction to commutative algebra and category theory. Topics include commutative rings, their ideals and modules, Noetherian rings and modules, constructions with rings such as localization and integral extension, connections to algebraic geometry, categories, functors and functor morphisms, tensor product and Hom functors, and projective modules. Other topics may be discussed at the instructor's discretion. Prerequisites: MATH 350 and MATH 370.

MATH 515b, Intermediate Complex Analysis Richard Kenyon Topics may include argument principle, Rouché's theorem, Hurwitz theorem, Runge's theorem, analytic continuation, Schwarz reflection principle, Jensen's formula, infinite products, Weierstrass theorem; functions of finite order, Hadamard's theorem, meromorphic functions; Mittag-Leffler's theorem, subharmonic functions.

MATH 520a, Measure Theory and Integration Charles Smart

Construction and limit theorems for measures and integrals on general spaces; product measures; Lp spaces; integral representation of linear functionals.

MATH 525b, Introduction to Functional Analysis Hanwen Zhang

Hilbert, normed, and Banach spaces; geometry of Hilbert space, Riesz-Fischer theorem; dual space; Hahn-Banach theorem; Riesz representation theorems; linear operators; Baire category theorem; uniform boundedness, open mapping, and closed graph theorems. After MATH 520.

MATH 526a, Introduction to Differentiable Manifolds Tamunonye Cheetham-West This is an introduction to the general theory of smooth manifolds, developing tools for use elsewhere in mathematics. A rough plan of topics (with the later ones as time permits) includes (1) manifolds, tangent spaces, vector fields and flows; (2) natural examples, submanifolds, quotient manifolds, fibrations, foliations; (3) vector and tensor bundles, differential forms; (4) Lie derivatives, Lie algebras and groups; (5) embedding, immersions and transversality; (6) Sard's theorem, degree and intersection. Prerequisites: some multivariable calculus, linear algebra, and topology.

MATH 533b, Introduction to Representation Theory Igor Frenkel An introduction to basic ideas and methods of representation theory of finite groups and Lie groups. Examples include permutation groups and general linear groups. Connections with symmetric functions, geometry, and physics.

MATH 536b, Combinatorics Staff

Combinatorics is a relatively new and very active area of mathematics, focusing on the study of discrete systems. It has applications in all areas of mathematics, from probability and physics to representation theory and algebraic geometry. It also plays an essential role in computing and data science. The course covers the basic topics of combinatorics, including generating functions, partitions, symmetric polynomials, random matrices, probabilistic methods, additive combinatorics, and graph theory. Prerequisite: Math 345.

MATH 544a, Introduction to Algebraic Topology Alexander Goncharov This is a one-term graduate introductory course in algebraic topology. We discuss algebraic and combinatorial tools used by topologists to encode information about topological spaces. Broadly speaking, we study the fundamental group of a space, its homology, and its cohomology. While focusing on the basic properties of these invariants, methods of computation, and many examples, we also see applications toward proving classical results. These include the Brouwer fixed-point theorem, the Jordan curve theorem, Poincaré duality, and others. The main text is Allen Hatcher's *Algebraic Topology*, which is available for free on his website.

MATH 640b / AMTH 640b / CPSC 640b, Topics in Numerical Computation Vladimir Rokhlin

This course discusses several areas of numerical computing that often cause difficulties to non-numericists, from the ever-present issue of condition numbers and ill-posedness to the algorithms of numerical linear algebra to the reliability of numerical software. The course also provides a brief introduction to "fast" algorithms and their interactions with modern hardware environments. The course is addressed to Computer Science graduate students who do not necessarily specialize in numerical computation; it assumes the understanding of calculus and linear algebra and familiarity with (or willingness to learn) either C or FORTRAN. Its purpose is to prepare students for using elementary numerical techniques when and if the need arises.

MATH 665a, Topics in Quantum Algebra Minh-Tam Trinh

We discuss the relationship between representations of linear groups over finite and p-adic fields, a part of Lie theory, and isotopy invariants of knot and links, a part of geometric topology. The bridge is the theory of Hecke algebras and their cocenters. We begin with the classical references, potentially including works of Jones, Deligne–Lusztig, and Macdonald and, working our way through the categorification program of Frenkel, Khovanov, and others, aim to arrive at recent works about double affine Hecke algebras and algebraic links.

MATH 666a / AMTH 666a / ASTR 666a / EPS 666a, Classical Statistical

Thermodynamics John Wettlaufer

Classical thermodynamics is derived from statistical thermodynamics. Using the multiparticle nature of physical systems, we derive ergodicity, the central limit theorem, and the elemental description of the second law of thermodynamics. We then develop kinetics, the origin of diffusion, transport theory, and reciprocity from the linear thermodynamics of irreversible processes. Topics of focus include Onsager reciprocal relations, the Fokker-Planck and Cahn-Hilliard equations, stability in the sense of Lyapunov, time invariance symmetry and maximum principles. We explore phenomena cross a range of problems in science and engineering. Prerequisites for Yale College students: PHYS 301, PHYS 410, MATH 246 or similar and/or permission of instructor.

MATH 675a / AMTH 675a, Numerical Methods for Partial Differential Equations Vladimir Rokhlin

(1) Review of the classical qualitative theory of ODEs; (2) Cauchy problem. Elementary numerical methods: Euler, Runge-Kutta, predictor-corrector. Stiff systems of ODEs: definition and associated difficulties, implicit Euler, Crank-Nicolson, barrier theorems. Richardson extrapolation and deferred corrections; (3) Boundary value problems. Elementary theory: finite differences, finite elements, abstract formulation and related spaces, integral formulations and associated numerical tools, nonlinear problems;
(4) Partial differential equations (PDEs). Introduction: counterexamples, Cauchy–Kowalevski theorem, classification of second-order PDEs, separation of variables;
(5) Numerical methods for elliptic PDEs. Finite differences, finite elements, Richardson and deferred corrections, Lippmann–Schwinger equation and associated numerical tools, classical potential theory, "fast" algorithms; (6) Numerical methods for parabolic PDEs. Finite differences, finite elements, integral formulations and related numerical tools; (7) Numerical methods for hyperbolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, integral formulations and related numerical tools; (7) Numerical methods for hyperbolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, time-invariant problems and Fourier transform.

MATH 680a, Fourier Analysis and PDEs Wilhelm Schlag

This course covers some of the finer techniques in Fourier analysis relevant to nonlinear PDEs. We cover some multilinear estimates of the Coifman-Meyer type and the related para-differential calculus. Classical results in time-frequency analysis including the Beurling-Malliavin theorem and its ramifications might also be included. Students should have taken multivariable calculus, Math 305 and 325. In addition, exposure to complex analysis is recommended as well.

MATH 685a, Topics in Representation Theory Igor Frenkel

The course is dedicated to modern directions in representation theory developed in the last several decades and to related subjects. The program largely depends on the interests of the audience. The participants are encouraged to give presentations on the representation theory topics related to their research. The directions covered may include (but are not limited to): representations of infinite-dimensional Lie algebras including Virasoro algebra and quaternionic analysis, vertex operator algebras, geometric representation theory, categorification and Khovanov homology, cluster algebras, and quantum Teichmuller spaces.

MATH 690a, Introduction to Quantum Invariants of Knots and Three Manifolds Ka Ho Wong

This course is an introduction to quantum invariants of knots and three manifolds and their relationships with hyperbolic geometry. Topics include the skein-theoretic constructions of the Jones and colored Jones polynomials, the Witten-Reshetikhin-Turaev invariants, the Turaev-Viro invariants, and their underlying Topological Quantum Field Theory. Interactions between quantum topology and hyperbolic geometry, such as the Kashaev-Murakami-Murakami volume conjecture and its generalizations, are also discussed in this course.

MATH 695a, High-Dimensional Probability Pei-Chun Su

The course introduces the fundamental concepts and advanced techniques of concentration inequalities and classical results like Hoeffding's and Chernoff's inequalities alongside modern developments such as the matrix Bernstein's inequality. Discover the potency of stochastic processes through Slepian's, Sudakov's, and Dudley's inequalities, as well as generic chaining and bounds rooted in VC dimension.

MATH 827b, Lang Teaching Seminar Brett Smith

This course prepares graduate students for teaching calculus classes. It is a mix of theory and practice, with topics such as preparing classes, presenting new concepts, choosing examples, encouraging student participation, grading fairly and effectively, implementing active learning strategies, and giving and receiving feedback. Open only to mathematics graduate students in their second year.

MATH 991a / CPSC 991a, Ethical Conduct of Research Inyoung Shin This course forms a vital part of research ethics training, aiming to instill moral research codes in graduate students of computer science, math, and applied math. By delving into case studies and real-life examples related to research misconduct, students grasp core ethical principles in research and academia. The course also offers an opportunity to explore the societal impacts of research in computer science, math, and applied math. This course is designed specifically for first-year graduate students in computer science, applied math, and math. Successful completion of the course necessitates in-person attendance on eight occasions; virtual participation does not fulfill this requirement. In cases where illness, job interviews, or unforeseen circumstances prevent attendance, makeup sessions are offered. o Course cr

Mechanical Engineering and Materials Science

17 Hillhouse Avenue, 203.432.4220 M.S., M.Phil., Ph.D.

Chair Udo Schwarz

Director of Graduate Studies

Jan Schroers (jan.schroers@yale.edu)

Professors Charles Ahn,[†] Ira Bernstein (*Emeritus*), Juan Fernández de la Mora, Aaron Dollar, Alessandro Gomez, Sohrab Ismail-Beigi,^{*} Shun-Ichiro Karato,^{*} Marshall Long (*Emeritus*), Corey O'Hern, Vidvuds Ozolins,^{*} Brian Scassellati,^{*} Jan Schroers, Udo Schwarz, Mitchell Smooke

Associate Professors Rebecca Kramer-Bottiglio, Madhusudhan Venkadesan

Assistant Professors Ian Abraham, Yimin Luo, Amir Pahlavan, Diana Qiu, Daniel Wiznia*

Senior Lecturer Beth Anne Bennett

Lecturers Joran Booth, Lawrence Wilen, Joseph Zinter

- * A secondary appointment with primary affiliation in another department or school.
- ⁺ A joint appointment with another department.

FIELDS OF STUDY

Fluids and Thermal Sciences Electrospray theory and characterization; electrical propulsion applications; aerodynamic instrumentation for separation of clusters and aerosol particles; heterogeneous nucleation in the gas phase; combustion and flames; computational methods for fluid dynamics and reacting flows; interfacial flows and instabilities and transport phenomena in disordered media.

Soft Matter/Complex Fluids Jamming and slow dynamics in gels, glasses, and granular materials; mechanical properties of soft and biological materials; rheology and statistical mechanics of muscle; structure and dynamics of proteins and other macromolecules and wetting of soft solids, elastocapillarity, poroelasticity, microrheology, and scattering.

Materials Science Studies of structure-property-processing relationships; thin films; metallic glasses; nanoscale effects on electronic, mechanical, kinetic, optical, and emergent properties of one- and two-dimensional layered materials; correlated electron systems; molecular beam epitaxy; sustainable metallurgy; data-centered research approaches; nanomaterials; characterization of crystallization and other phase transformations; nanoimprinting; atomic-scale investigations of surface interactions and properties; classical and quantum nanomechanics; nanostructured energy applications; combinatorial materials science; data science and machine learning in materials science; materials genome; scanning probe microscopy; theoretical spectroscopy and computational materials science; and halide perovskites. **Robotics/Mechatronics** Machine and mechanism design; dynamics and control; robotic grasping and manipulation; legged locomotion; multi-agent search and exploration; optimal control for learning; model-predictive control; reinforcement learning; human-machine interface; rehabilitation robotics; haptics; soft robotics; flexible and stretchable electronics; soft material manufacturing; responsive material actuators; artificial muscle; soft-bodied control; electromechanical energy conversion; biomechanics of human movement and human-powered vehicles.

Bioengineering Engineering sciences of living systems; biomechanics; motor control; animal locomotion; cell and tissue mechanics; biomaterials and therapeutics; human health and orthopaedics; bio-inspired computation and design; biomaterials and cell-material interaction.

For degree requirements and courses, see Engineering & Applied Science.

Medieval Studies

Humanities Quadrangle, Rms. 431 and 438, 203.432.0672 http://medieval.yale.edu M.A., M.Phil., Ph.D.

Chair and Director of Graduate Studies

Emily Thornbury

Core Faculty Tarren Andrews, Lucas Bender, R. Howard Bloch, Jessica Brantley, Ardis Butterfield, Stephen Davis, John Dillon, Maria Doerfler, Adam Eitel, Marcel Elias, Hussein Fancy, Paul Freedman, Felicity Harley, Samuel Hodgkin, Jacqueline Jung, Volker Leppin, Ivan Marcus, Vasileios Marinis, Christiana Purdy Moudarres, Emily Thornbury, Shawkat Toorawa, Kevin van Bladel, Jesús Velasco, Mimi Hall Yiengpruksawan, Travis Zadeh, Anna Zayaruznaya

Additional Affiliated Faculty Giulia Accornero, Adel Allouche (*Emeritus*), Felisa Baynes-Ross, Gerhard Bowering (*Emeritus*), Orgu Dalgic, Carlos Eire, Roberta Frank (*Emerita*), Alexander Gil Fuentes, Walter Goffart (*Emeritus*), Harvey Goldblatt (*Emeritus*), Eric Greene, Dimitri Gutas (*Emeritus*), Valerie Hansen, Peter Hawkins (*Emeritus*), Christina Kraus, Traugott Lawler (*Emeritus*), Noel Lenski, Giuseppe Mazzotta (*Emeritus*), Alastair Minnis (*Emeritus*), Robert Nelson (*Emeritus*), Morgan Ng, James Patterson, Agnieszka Rec, Barbara Shailor (*Emerita*), Jane Tylus

FIELDS OF STUDY

Fields in this interdisciplinary program include history, history of art, history of music, religious studies, languages and literatures, linguistics, and philosophy, among others.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to demonstrate proficiency in at least one medieval language of scholarship (Arabic, classical Chinese, classical Persian, Greek, Hebrew, or Latin) and in two modern languages appropriate to their field of study. Language proficiency may be demonstrated either by passing a departmental examination within the first two years of study, or by achieving at least a High Pass in an advanced language or literature course, as approved by the DGS.

Students will design their programs in close contact with the director of graduate studies (DGS). During the first two years, students take fourteen term courses in at least three disciplinary fields, and must receive an Honors grade in at least four term courses the first year. Students take an oral examination, usually in the fifth term, on a set of three topics worked out in consultation with the DGS. Then, having nurtured a topic of particular interest, the student submits a dissertation prospectus that must be approved by the end of the third year. Upon completion of all predissertation requirements, including the prospectus, students are admitted to candidacy for the Ph.D. degree. What remains, then, is the writing, submission, and approval of the dissertation during the final years.

Students in Medieval Studies participate in the Teaching Fellows Program, usually in the third year and one year thereafter.

MASTER'S DEGREES

M.Phil. See degree requirements under Policies and Regulations. The M.Phil. degree may be requested after all requirements but the dissertation are met.

M.A. Students may apply for a terminal master's degree in Medieval Studies. For the M.A. degree, students must successfully complete either seven term courses or six term courses and a special project. One course must have a focus on the study of original manuscripts or documents. There must be at least one grade of Honors, and there may not be more than one grade of Pass. Students must maintain a minimum average of High Pass each term. Students must take two consecutive terms of a language relevant to the study of the medieval period, appropriate to the student's particular needs and interests. Students must also demonstrate knowledge of one or more of Arabic, classical Chinese, classical Persian, Greek, Hebrew, or Latin, as relevant to their research. Doctoral students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the above requirements and have not already received the M.Phil. degree.

For more information, please visit the program website: http://medieval.yale.edu.

COURSES

MDVL 502b / CPLT 582b / ENGL 6545b / FREN 802b, Chaucer and Translation Ardis Butterfield

An exploration of the works of Geoffrey Chaucer (ca. 1340–1400), brilliant writer and translator. Using modern postcolonial as well as medieval theories of translation, memory, and bilingualism, we investigate how texts in French, Latin, and Italian are transformed, cited, and reinvented in his writings. Some key questions include: What happens to language under the pressure of crosslingual reading practices? What happens to the notion of translation in a multilingual culture? How are ideas of literary history affected by understanding Chaucer's English in relation to the other more prestigious language worlds in which his poetry was enmeshed? Texts include material in French, Middle English, Latin, and Italian. Proficiency in any one or more of these languages is welcome, but every effort is made to use texts available in modern English translation, so as to include as wide a participation as possible in the course. Formerly ENGL 545.

MDVL 526a / MUSI 526a, Theorizing Musical Time in the Medieval Islamicate World Giulia Accornero

This class is an introduction to medieval Islamicate music theory, with a particular focus on the theorization of musical time, motion, and rhythmic patterns as proposed by polymath Abū Na#r al-Fārābī. After a deep dive in al-Fārābī's music theory, we survey rhythmic theories and diagrams by Ibn Sīnā (Avicenna) and al-Urmawī. While focusing on music theory, we also learn about music performance in the Abbasid caliphate, the "translation movement" and the integration of Greek music theory (with a focus on Aristoxenus) and philosophy, and discuss historiographical issues. Prerequisite: Basic music theoretical knowledge and/or knowledge of medieval Islamicate culture/philosophy is expected.

MDVL 537a / HIST 534a, Medieval Political History Paul Freedman A reading and discussion course that concerns the nature of political power in Europe between approximately 1000 and 1500. Particular attention is paid to the development of state institutions, dynastic and territorial rivalries, the European balance of power, and the interaction of church and state.

MDVL 571a / CLSS 601a, Introduction to Latin Paleography Agnieszka Rec Latin paleography from the fourth century CE to ca. 1500. Topics include the history and development of national hands; the introduction and evolution of Caroline minuscule, pre-gothic, gothic, and humanist scripts (both cursive and book hands); the production, circulation, and transmission of texts (primarily Latin, with reference to Greek and Middle English); advances in the technical analysis and digital manipulation of manuscripts. Seminars are based on the examination of codices and fragments in the Beinecke Library; students select a manuscript for class presentation and final paper.

MDVL 593b / **HSAR 593b**, **The Body in Medieval Art** Jacqueline Jung This seminar explores the manifold approaches to the human body in the art and culture of medieval Europe (from ca. 500–ca. 1500 CE, though with an emphasis on the later end of the period). Through close consideration of works in various media – mediated to us through readings, digital images/renderings, and at least one excursion to a museum – we consider both the role represented bodies played in the social life and religious imagination of medieval communities and the implications such representations had for beholders' sense of their own embodied status. Reading knowledge of French and German is highly recommended but not required.

MDVL 596a / HIST 596a / JDST 761a / RLST 773a, Jews and the World: From the Bible through Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings.

MDVL 613a or b, Medieval Latin: Medieval Mystics from Bernard of Clairvaux to Thomas à Kempis John Dillon

This reading course in Medieval Latin is intended to help students improve their command of Latin through working directly with medieval texts. We read selections from major mystics of the Middle Ages, including works by Bernard of Clairvaux (1090–1153), Hildegard of Bingen's *Scivias* (ca. 1151/1152), the thirteenth-century Latin translation of Mechthild of Magdeburg's *Das fließende Licht der Gottheit (Lux divinitatis fluens*, ca. 1250–80), and Thomas à Kempis's *Imitatio Christi* (Imitation of Christ, ca. 1418–27). Prerequisite: one year of formal study of Latin, equivalent to LATN 110 and LATN 120 or LATN 125.

MDVL 619a / CPLT 552a / NELC 619a, The Medieval Court Shawkat Toorawa What are the features of the medieval court? To answer this, we look at courts in Western Europe, Byzantium, the Islamic world, and East Asia to learn about courtly culture, court poetry, and court society. Readings include van Berkel et al., *Crisis and Continuity in the Caliphate of al-Muqtadir*; Castiglione, *Book of the Courtier*; Duinden, *Vienna and Versailles*; Elias, *The Court Society*; Maguire, *Byzantine Court Culture*; Miner, *Introduction to Japanese Court Poetry*; al-Washshā, *al-Muwashshā*. Knowledge of French desirable.

MDVL 663a, From House Churches to Medieval Cathedrals: Christian Art and Architecture to the End of Gothic Orgu Dalgic

This course examines the art associated with, or related to, Christianity from its origins to the end of Gothic. It analyzes major artistic monuments and movements in a variety of regions, paying particular attention to how art shapes and is shaped by the social and historical circumstances of the period and culture. The class considers art in diverse media, focusing on painting, sculpture, architecture, and decorative arts. Trips to the Yale Art Gallery and the Beinecke Rare Book and Manuscript Library are included. The course aims to familiarize students with key monuments of Christian architecture, sculpture, painting, and related arts, analyzing each within its particular sociocultural and theological perspective. The course stresses the importance of looking at works of art closely and in context and encourages students to develop skills of close observation and critical visual analysis. Additionally, students are encouraged to examine the ways parallel developments in Christian theology, dogma, and liturgy are influenced by art. Prerequisites: basic knowledge of Christian history and familiarity with the Bible.

MDVL 665a / **ENGL 500a** / **LING 500a**, **Old English I** Emily Thornbury The essentials of the language, some prose readings, and close study of several celebrated Old English poems.

MDVL 666b / ENGL 6501b, Old English II Emily Thornbury

Readings in a variety of pre-Conquest vernacular genres, varying regularly, with supplementary reading in current scholarship. Current topic: Old English devotional literature, especially poetry; our readings explore early medieval strategies for cultivating emotion and understanding. Formerly ENGL 502.

MDVL 668a, The Gawain Poet Jessica Brantley

The course offers a contextual study of four of the greatest (and most enigmatic) Middle English poems – *Pearl, Patience, Cleanness,* and *Sir Gawain and the Green Knight.* At its center is British Library MS Cotton Nero A.x, the single medieval book that contains them all. In addition to reading the poems closely in their manuscript context, we examine associated artworks, from the twelve illustrations in the Cotton MS that constitute a medieval reading of the poems, to *St. Erkenwald,* a poem preserved elsewhere that some argue was written by the same author. Finally, we think about the modern reception of the poems through a serious engagement with scholarly debate surrounding them, and also through comparative work with translations.

MDVL 756a, The Cult of Mary: Early Christian and Byzantine Art Felicity Harley and Vasileios Marinis

This course examines the origins and development of the veneration of Mary as the Mother of God, focusing specifically on the treatment of Mary in the visual and material culture of early Christianity and Byzantium. Its aim is to introduce students to key points in the history of the cult through the close study of images preserved on a range of objects in different media (including frescoes, glassware, sculpture, coins, textiles, mosaic), made for a variety of purposes. This visual material is analyzed in conjunction with relevant literary, theological, and liturgical evidence for the development of the cult. It is designed as a seminar for students who have interest or background in the material, textual, and religious culture of early Christianity.

MDVL 802a / NELC 632a, The Islamic Near East from Muhammad to the Mongol Invasion Kevin van Bladel

The shaping of society and polity from the rise of Islam to the Mongol conquest of Baghdad in 1258. The origins of Islamic society; conquests and social and political assimilation under the Umayyads and Abbasids; the changing nature of political legitimacy and sovereignty under the caliphate; provincial decentralization and new sources of social and religious power.

MDVL 992a, Art and Ritual at Mount Sinai – Travel Seminar Vasileios Marinis and Robert Nelson

This course looks at art and ecclesiastical and pilgrimage rituals at the monastery of St. Catherine in the Sinai. Founded by Emperor Justinian on a site already venerated by Christians as the place where, supposedly, Moses encountered the Burning Bush, the monastery is one of the oldest continuously inhabited Christian communities in the world. Its holdings of icons have no parallel and offer the opportunity to study Christian imagery in the context of both devotional use and corporate rituals, if not place of origin. This course introduces various aspects of Orthodox liturgy and religious pilgrimage relevant to the explication of the surviving church arts at the monastery and the surrounding area.

Microbiology

Boyer Center for Molecular Medicine 354F, 203.737.1087 http://medicine.yale.edu/micropath M.S., M.Phil., Ph.D.

Director of Graduate Studies Walther Mothes

Professors Serap Aksoy (Epidemiology), Susan Baserga (Molecular Biophysics and Biochemistry; Genetics; Therapeutic Radiology), Choukri Ben Mamoun (Internal Medicine; Microbial Pathogenesis), Ronald Breaker (Molecular, Cellular, and Developmental Biology; Molecular Biophysics and Biochemistry), Richard Bucala (Internal Medicine; Epidemiology; Pathology), Michael Cappello (Pediatrics; Epidemiology; Microbial Pathogenesis), Yung-Chi Cheng (Pharmacology), Jason Crawford (Chemistry; Microbial Pathogenesis), Peter Cresswell (Immunobiology; Cell Biology), Daniel DiMaio (Genetics; Molecular Biophysics and Biochemistry; Therapeutic Radiology), Erol Fikrig (Internal Medicine; Epidemiology; Microbial Pathogenesis), Richard Flavell (Immunobiology), Jorge Galán (Microbial Pathogenesis; Cell Biology), Wendy Gilbert (Molecular Biophysics and Biochemistry), Andrew Goodman (Microbial Pathogenesis), Eduardo Groisman (Microbial Pathogenesis), Margarett Hosstetter (Pediatrics), Akiko Iwasaki (Immunobiology; Molecular, Cellular, and Developmental Biology), Barbara Kazmierczak (Internal Medicine; Microbial Pathogenesis), Albert Ko (Epidemiology; Internal Medicine), Jun Liu (Microbial Pathogenesis), Ruslan Medzhitov (Immunobiology), I. George Miller (Pediatrics; Epidemiology; Molecular Biophysics and Biochemistry), Walther Mothes (Microbial Pathogenesis), Melinda Pettigrew (Epidemiology), Carla Rothlin (Immunobiology; Pharmacology), Craig Roy (Microbial Pathogenesis; Immunobiology), Dieter Söll (Molecular Biophysics and Biochemistry; Chemistry), Richard Sutton (Internal Medicine; Microbial Pathogenesis), Jeffrey Townsend (Biostatistics; Ecology and Evolutionary Biology), Christian Tschudi (Epidemiology), Paul Turner (Ecology and Evolutionary Biology), Yong Xiong (Molecular Biophysics and Biochemistry)

Associate Professors Murat Acar (Molecular, Cellular, and Developmental Biology; Physics), Charles Dela Cruz (Internal Medicine; Microbial Pathogenesis), Nathan Grubaugh (Microbial Diseases), Ya-Chi Ho (Microbial Pathogenesis; Internal Medicine/ Infectious Diseases), Farren Isaacs (Molecular, Cellular, and Developmental Biology), Priti Kumar (Internal Medicine/Infectious Diseases), John MacMicking (Microbial Pathogenesis; Immunobiology), Kathryn Miller-Jensen (Biomedical Engineering; Molecular, Cellular, and Developmental Biology), Noah Palm (Immunobiology), E. Hesper Rego (Microbial Pathogenesis), Christian Schlieker (Molecular Biophysics and Biochemistry; Cell Biology)

Assistant Professors Amy Bei (Epidemiology of Microbial Diseases), Allison Didychuk (Molecular Biophysics and Biochemistry), Ellen Foxman (Laboratory Medicine; Immunobiology), Benjamin Goldman-Israelow (Medicine), Stavroula Hatzios (Molecular, Cellular, and Developmental Biology), Caroline Johnson (Environmental Health Sciences), Yelizaveta Konnikova (Pediatrics/Neonatology), Maudry Laurent-Rolle (Infectious Diseases), David Martinez (Immunobiology), Michael O'Donnell (Molecular, Cellular and Developmental Biology), Hualiang Pi (Microbial Pathogenesis), Craig Wilen (Laboratory Medicine; Immunobiology), Jing Yan (Molecular, Cellular, and Developmental Biology)

FIELDS OF STUDY

The Graduate Program in Microbiology is a multidepartmental, interdisciplinary Ph.D. program in training and research in the study of microorganisms and their effects on their hosts. The faculty of the program share the view that understanding the biology of microorganisms requires a multidisciplinary approach; therefore, the Microbiology graduate program emphasizes the need for strong multidisciplinary training. The program is designed to provide individualized education in modern microbiology and to prepare students for independent careers in research and teaching. Students can specialize in various areas, including bacteriology, virology, microbe-host interactions, microbial pathogenesis, cell biology and immunobiology of microbial infections, microbial genetics and physiology, structural biology, parasitology, microbiome, and microbial ecology and evolution.

ADMISSIONS REQUIREMENTS

To enter the Ph.D. program, students apply to the Microbiology track within the interdepartmental graduate program in the Biological and Biomedical Sciences (BBS), http://bbs.yale.edu. An undergraduate major in biology, biophysics, biochemistry, microbiology, or molecular biology is recommended; the GRE General Test or MCAT is no longer required, and scores will not be considered if submitted.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Coursework generally occupies the first two years of study. Each student, together with a faculty committee, outlines a course of study tailored to the individual's background and career goals. A program of course work may include general microbiology, virology, parasitology, and/or microbial genetics, as well as complementary courses in such areas as epidemiology, cell biology, immunology, biochemistry, and genetics. Students must take a minimum of four courses, three of which have to be in microbiology. Students must receive a grade of Honors in two full-term courses. All students participate in three laboratory rotations (MBIO 670, MBIO 671, and MBIO 672), with different faculty members, in their area of interest. Laboratory rotations ensure that students quickly become familiar with the variety of research opportunities available in the program. A qualifying proposal, defended in an exam on the student's thesis project, is given before the end of the second year. Students then undertake an original research project under the direct supervision of a faculty member. In the third year, students organize their thesis committee and prepare a dissertation prospectus, which is submitted to the graduate school after approval by their committee. The student is then admitted to candidacy. Upon completion of the student's research project, the Ph.D. requirements conclude with the writing of a dissertation and its oral defense.

An important aspect of graduate training in microbiology is the acquisition of teaching skills through participation in courses appropriate for the student's scientific interests. These opportunities can be drawn from a diverse menu of lecture, laboratory, and seminar courses given at the undergraduate, graduate, and medical school levels. Ph.D. students are expected to participate in two terms (or the equivalent) of teaching. Students are not permitted to teach during their first year.

In addition to all other requirements, students must successfully complete IBIO 601, Fundamentals of Research: Responsible Conduct of Research, prior to the end of their first year of study. This requirement must be met prior to registering for a second year of study. In their fourth year of study, all students must successfully complete B&BS 503, RCR Refresher for Senior BBS Students.

MASTER'S DEGREES

M.Phil. The M.Phil. degree can be awarded to Ph.D. students who have been admitted to candidacy. See Degree Requirements under Policies and Regulations.

M.S. This degree may only be granted to students who are withdrawing from the Ph.D. program prior to advancing to candidacy. To be eligible for this degree, a student must have completed at least four graduate-level term courses at Yale, chosen from a number of main courses including, but not limited to: MBIO 530, MBIO 680, MBIO 685, MBIO 686, MBIO 734, and CBIO 602. Two of these four courses must be related to microbiology. Students must have received at least one Honors or two High Pass grades. In addition, students must have received a Satisfactory grade in the following courses: IBIO 601, MBIO 670, MBIO 671, MBIO 672, MBIO 701, and MBIO 702. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

MBIO 530a / IBIO 530a / MCDB 530a, Biology of the Immune System Grace Chen, Ann Haberman, Carla Rothlin, Kevin O'Connor, Carrie Lucas, Ellen Foxman, Markus Müschen, Andrew Wang, Peter Cresswell, Jordan Pober, Joao Pereira, Craig Roy, Joseph Craft, Paula Kavathas, Noah Palm, Craig Wilen, Jeffrey Ishizuka, Daniel Jane-Wit, and David Schatz

The development of the immune system. Cellular and molecular mechanisms of immune recognition. Effector responses against pathogens. Immunologic memory and vaccines. Human diseases including allergy, autoimmunity, cancer, immunodeficiency, HIV/AIDS.

MBIO 601b / IBIO 601b, Fundamentals of Research: Responsible Conduct of Research Staff

A weekly seminar presented by faculty trainers on topics relating to proper conduct of research. Required of first-year Immunobiology students, first-year CB&B students, and training grant-funded postdocs. Pass/Fail. o Course cr

MBIO 670a and MBIO 671a and MBIO 674b, Laboratory Rotations Ya-Chi Ho Rotation in three laboratories. Required of all first-year graduate students.

MBIO 685b, The Biology of Bacterial Pathogens II Hesper Rego This interdisciplinary course focuses on current topics related to host-pathogen interactions. Each week a lecture is given on the topic, followed by student presentations of seminal papers in the field. All participants are required to present a paper.

MBIO 686a, The Biology of Bacterial Pathogens I Jorge Galan and Maria Lara-Tejero The course provides an introduction to basic principles in bacterial pathogenesis. Topics focus on the bacterial determinants mediating infection and pathogenesis, as well as strategies to prevent and treat diseases. Each week a lecture is given on the topic, followed by student presentations of seminal papers in the field. All participants are required to present a paper.

MBIO 700b, Seminal Papers on the Foundations of Modern Microbiology Priti Kumar

A required course for Microbiology first-year students; not for credit. The course is offered every spring. Students present and discuss papers describing fundamental discoveries in areas related to microbiology. The goal is to familiarize students with the process of scientific discovery and with the history of major developments in the field. Topics include important discoveries involving major human pathogens, fundamental processes in molecular biology, and the development of technology that has a major impact on current biomedical research. o Course cr

MBIO 701a and MBIO 702b, Research in Progress Priti Kumar

All students, beginning in their third year, are required to present their research once a year at the Graduate Student Research in Progress. These presentations are intended to give each student practice in presenting the student's own work before a sympathetic but critical audience and to familiarize the faculty with the research.

MBIO 703a and MBIO 704b, Microbiology Seminar Series Ya-Chi Ho

All students are required to attend all Microbiology seminars scheduled throughout the academic year. Microbiologists from around the world are invited to describe their research.

MBIO 734b / GENE 734b / MB&B 734b, Molecular Biology of Animal Viruses

Walther Mothes and Maudry Laurent-Rolle Lecture course with emphasis on mechanisms of viral replication, oncogenic transformation, and virus-host cell interactions.

Molecular Biophysics and Biochemistry

334A Bass Center, 203.432.5662 https://mbb.yale.edu M.S., M.Phil., Ph.D.

Chair Ronald Breaker

Director of Graduate Studies

Wendy Gilbert (SHM C-127, 203.785.7580, wendy.gilbert@yale.edu)

Professors Karen Anderson (Pharmacology), Susan Baserga, Ronald Breaker (Molecular, Cellular, and Developmental Biology), Gary Brudvig (Chemistry), Sandy Chang (Laboratory Medicine), Enrique De La Cruz, Daniel DiMaio (Genetics; Therapeutic Radiology), Donald Engelman, Mark Gerstein, Wendy Gilbert, Nigel Grindley (Emeritus), Mark Hochstrasser, Jonathon Howard, Michael Koelle, Anthony Koleske, William Konigsberg (Emeritus), Mark Lemmon (Pharmacology), J. Patrick Loria (Chemistry), I. George Miller (Pediatric Infectious Diseases; Public Health), Andrew Miranker, Peter Moore (Emeritus; Chemistry), Karla Neugebauer, Lynne Regan (Emerita), Karin Reinisch (Cell Biology), David Schatz (Immunobiology), Christian Schlieker, Robert Shulman (Emeritus), Fred Sigworth (Cellular and Molecular Physiology; Biomedical Engineering), Dieter Söll (Emeritus), Mark Solomon, Joan Steitz, Scott Strobel, Kenneth Williams (Adjunct; Research), Yong Xiong, Carl Zimmer (Adjunct)

Associate Professors Julien Berro, Titus Boggon (*Pharmacology*), Erdem Karatekin (*Cellular and Molecular Physiology*), Nikhil Malvankar, Matthew Simon, Sarah Slavoff (*Chemistry*), Seyedtaghi Takyar (*Internal Medicine/Pulmonary*), Yongli Zhang (*Cell Biology*)

Assistant Professors Franziska Bleichert, Allison Didychuk, Luisa Escobar-Hoyos (*Therapeutic Radiology*), Lilian Kabeche, Wei Mi (*Pharmacology*), Candice Paulsen, Shaogeng (Steven) Tang, Kai (Jack) Zhang

FIELDS OF STUDY

The principal objective of members of the department is to understand living systems at the molecular level. Laboratories in MB&B focus on a diverse collection of problems in biology. Some specialize in the study of DNA dynamics, including replication, recombination, transposition, and/or functional genomics. Others focus on transcriptional regulation, from individual transcription factors to the control of lymphocyte activation, the interferon response, and organismal development. Other groups study RNA catalysis, RNA-protein interactions, and ribonucleoproteins including spliceosomes and the ribosome. Additionally there are those that emphasize protein folding and design, transmembrane signaling, cell cycle control, cytoskeletal dynamics, and neuroscience. Structural and computational biology is a strong component of many of these research efforts.

To enter the Ph.D. program, students apply to an interest-based track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to one of four tracks of the Biological and Biomedical Sciences program may simultaneously apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

All first-year students (except M.D.-Ph.D.) perform three laboratory rotations (encompassed by MB&B 650 and MB&B 651, Lab Rotation for BQBS First-Year Students). All students from the BQBS track who affiliate with MB&B are required to take, for credit, six one-term science courses. To obtain the desired breadth and depth of education, students coming from the BQBS track are required to take MB&B 720, MB&B 730, one course in molecular biophysics or quantitative biology, and one course in molecular biology (MB&B 743 is strongly recommended but not required). The credit in molecular biophysics or quantitative biology and the credit in molecular biology may be satisfied by taking appropriate courses from an approved list available each fall and listed in the MB&B graduate handbook. Students originating from a BBS track other than BQBS must discuss their curriculum with the MB&B DGS prior to joining the department to ensure equivalent foundational course work in MB&B topic areas; these students are strongly encouraged to take or audit MB&B 720. Additional courses, chosen from within MB&B or from related graduate programs, should form a coherent background for the general area in which the student expects to do dissertation research. All students also attend MB&B 676, Responsible Conduct of Research. In their fourth year of study, all students must complete MB&B 677, RCR Refresher for Senior MB&B Students. Students with an extensive background in biochemistry or biophysics are permitted to substitute advanced courses for the introductory courses. There is no foreign language requirement. The student's research committee (see below) makes the final decision concerning the number and selection of courses required of each student.

All students are required to assist in teaching two terms during their graduate careers, usually during the second and third years. Students who require additional support from the Graduate School must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

The student selects a research adviser by the end of the second term of residence. At that time two additional faculty members are chosen to form a research committee, with the total committee including at least two MB&B faculty members. The chair of the committee will be an MB&B faculty member who is not the research adviser. Students are required to meet with this committee in the spring of years two and three, and in both the fall and spring of subsequent years. The qualifying examination, usually taken in the fall of the second year, is an oral defense of a research proposal consisting of (1) thesis aims and (2) extended goals on the same topic. The extended

goals should include approaches beyond those in the thesis aims, typically beyond those generally employed by the host lab. Thus, a predominantly molecular biological set of thesis aims should be accompanied by biophysical approaches in the extended goals section, and vice versa. The three-member oral examination committee usually includes at least one of the two members of the research committee excluding the thesis adviser. Requirements for admission to candidacy, which usually takes place after four terms of residence, include (1) completion of course requirements; (2) completion of the qualifying examination; (3) certification of the student's research abilities by vote of the faculty upon recommendation from the student's research committee; and (4) submission of a brief prospectus of the proposed thesis research. Completion of the teaching requirement is not required for admission to candidacy. Once final drafts of the thesis chapters have been approved by the research committee, the student presents a dissertation seminar to the entire department, and only afterward may the thesis be submitted. Students must have written at least one first-author paper that is submitted, in press, or published by the time of the thesis seminar.

HONORS REQUIREMENT

Students must meet the graduate school's Honors requirement by the end of the fourth term of full-time study; see Degree Requirements under Policies and Regulations. Students must also maintain an overall High Pass average. Student progress toward these goals is reviewed at the ends of the first and second terms.

M.D.-PH.D. STUDENTS

M.D.-Ph.D. students must satisfy the requirements listed above for the Ph.D. with the following modifications: Laboratory rotations are not required but are available. Assisting in teaching of one lecture course is required. Students are required to take MB&B 800 as part of their medical curriculum in addition to the two courses in molecular biophysics described above. Students with weak backgrounds in molecular biology will need to take MB&B 743.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations. Awarded only to students admitted to candidacy who are continuing for the Ph.D. Students need not have completed their teaching requirement to receive the M.Phil. Students are not admitted for this degree.

M.S. Students are not admitted for this degree. It may only be awarded to a student in the Ph.D. program who is in good standing upon completion of at least two terms of graduate study and who will not continue in the Ph.D. program. A student must receive grades of Pass or higher in at least five courses approved by the DGS as counting toward a graduate degree, exclusive of seminars or research. Students must have taken at least ten courses. A typical schedule would consist of six traditional courses, two terms of MB&B 650 and MB&B 651, and one term each of MB&B 675 and MB&B 676. A student must also meet the graduate school's Honors requirement for the Ph.D. program and maintain a High Pass average. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

More detailed program materials are available upon request to the Director of Graduate Admissions, Department of Molecular Biophysics and Biochemistry, Yale University, PO Box 208114, New Haven CT 06520-8114.

COURSES

MB&B 500a or b / MCDB 500a or b, Biochemistry Staff

An introduction to the biochemistry of animals, plants, and microorganisms, emphasizing the relations of chemical principles and structure to the evolution and regulation of living systems.

MB&B 517b / ENAS 517b / MCDB 517b / PHYS 517b, Methods and Logic in

Interdisciplinary Research Corey O'Hern and Emma Carley

This full PEB class is intended to introduce students to integrated approaches to research. Each week, the first of two sessions is student-led, while the second session is led by faculty with complementary expertise and discusses papers that use different approaches to the same topic (for example, physical and biological or experiment and theory).

MB&B 520a, Boot Camp Biology Corey O'Hern and Emma Carley An intensive introduction to biological nomenclature, systems, processes, and techniques for graduate students with previous backgrounds in non-biological fields including physics, engineering, and computer science who wish to perform graduate research in the biological sciences. Counts as 0.5 credit toward MB&B graduate course requirements. ¹/₂ Course cr

MB&B 523a / CB&B 523a / ENAS 541a / PHYS 523a, Biological Physics Yimin Luo This course has three aims: (1) to introduce students to the physics of biological systems, (2) to introduce students to the basics of scientific computing, and (3) to familiarize students with characterization methods and analysis tools. We focus on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, entropic forces, membranes, and cell motion using computational tools and methods. We provide intensive tutorials for Matlab including basic syntax, arrays, functions, plotting, and importing and exporting data.

MB&B 529b / PHAR 529b, Structural Biology and Drug Discovery Titus Boggon and Ya Ha

A comprehensive introduction to the concepts and practical uses of structural biology and structural biology-related techniques in drug discovery. The first half of the course focuses on techniques used to discover and optimize small and macromolecule drugs. Students are introduced to topics such as small molecule lead discovery, X-ray crystallography, cryo-electron microscopy, and biophysical techniques. The first half of the course also includes a practical component where students conduct hands-on structural biology experiments and learn about biophysical techniques in a laboratory setting. The second half of the course focuses on drug discovery, particularly for protein kinases. It includes a field trip to the Yale Center for Drug Discovery, where the students are introduced to the in-house Yale screening facilities for small molecule drug discovery. Two half-credit courses – PHAR 530 and PHAR 531 – are also offered for the two halves of PHAR 529.

MB&B 545b, Methods and Logic in Molecular Biology Julien Berro and Andrew Miranker

An examination of fundamental concepts in molecular biology through analysis of landmark papers. Development of skills in reading the primary scientific literature and in critical thinking. Open only to MB&B students pursuing the B.S./M.S. degree.

MB&B 561a / MCDB 561a / PHYS 561a, Modeling Biological Systems I Thierry Emonet and Kathryn Miller-Jensen

Biological systems make sophisticated decisions at many levels. This course explores the molecular and computational underpinnings of how these decisions are made, with a focus on modeling static and dynamic processes in example biological systems. This course is aimed at biology students and teaches the analytic and computational methods needed to model genetic networks and protein signaling pathways. Students present and discuss original papers in class. They learn to model using MatLab in a series of in-class hackathons that illustrate the biological examples discussed in the lectures. Biological systems and processes that are modeled include: (1) gene expression, including the kinetics of RNA and protein synthesis and degradation; (2) activators and repressors; (3) the lysogeny/lysis switch of lambda phage; (4) network motifs and how they shape response dynamics; (5) cell signaling, MAP kinase networks and cell fate decisions; and (6) noise in gene expression. Prerequisites: MATH 115 or 116, BIOL 101–104, or with permission of instructors. This course also benefits students who have taken more advanced biology courses (e.g. MCDB 200, MCDB 310, MB&B 300/301).

MB&B 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MCDB 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

MB&B 565b, Biochemistry and Our Changing Climate Karla Neugebauer Climate change is impacting how cells and organisms grow and reproduce. Imagine the ocean spiking a fever: cold-blooded organisms of all shapes, sizes, and complexities struggle to survive when water temperatures go up two-four degrees. Some organisms adapt to extremes, while others cannot. Predicted and observed changes in temperature, pH, and salt concentration do and will affect many parameters of the living world, from the kinetics of chemical reactions and cellular signaling pathways to the accumulation of unforeseen chemicals in the environment, the appearance and dispersal of new diseases, and the development of new foods. In this course, we approach climate change from the molecular point of view, identifying how cells and organisms#from microbes to plants and animals#respond to changing environmental conditions. To embrace the concept of "one health" for all life on the planet, this course leverages biochemistry, cell biology, molecular biophysics, and genetics to develop an understanding of the impact of climate change on the living world. We consider the foundational knowledge that biochemistry can bring to the table as we meet the challenge of climate change. Prerequisites: MB&B 500, MB&B 600, and MB&B 601, or permission of the instructor.

MB&B 570a and MB&B 571b, Intensive Research for B.S./M.S. Candidates Staff Required of students in the joint B.S./M.S. program with Yale College. 2 Course cr per term

MB&B 591a / ENAS 991a / MCDB 591a / PHYS 991a, Integrated Workshop Yimin Luo

This required course for students in the PEB graduate program involves a series of modules, co-taught by faculty, in which students from different academic backgrounds and research skills collaborate on projects at the interface of physics, engineering, and biology. The modules cover a broad range of PEB research areas and skills. The course starts with an introduction to MATLAB, which is used throughout the course for analysis, simulations, and modeling.

MB&B 600a, Principles of Biochemistry I Matthew Simon, Michael Koelle, and Candie Paulsen

Discussion of the physical, structural, and functional properties of proteins, lipids, and carbohydrates, three major classes of molecules in living organisms. Energy metabolism, hormone signaling, and muscle contraction as examples of complex biological processes whose underlying mechanisms can be understood by identifying and analyzing the molecules responsible for these phenomena. o Course cr

MB&B 601b, Principles of Biochemistry II Christian Schlieker, Karla Neugebauer, and Franziska Bleichert

A continuation of MB&B 600 that considers the chemistry and metabolism of nucleic acids, the mechanism and regulation of protein and nucleic acid synthesis, and selected topics in macromolecular biochemistry.

MB&B 602a / CBIO 602a / MBIO TBD-2 / MCDB 602a, Molecular Cell Biology

Thomas Melia and Patrick Lusk

A comprehensive introduction to the molecular and mechanistic aspects of cell biology for graduate students in all programs. Emphasizes fundamental issues of cellular organization, regulation, biogenesis, and function at the molecular level. Graduate Prerequisites: Some knowledge of basic cell biology and biochemistry is assumed. Students who have not taken courses in these areas can prepare by reading relevant sections in basic molecular cell biology texts. We recommend Pollard et al., *Cell Biology* (3rd ed., 2016), Alberts et al., *Molecular Biology of the Cell* (6th ed., 2014), or Lodish et al., *Molecular Cell Biology* (8th edition, 2016). Undergraduate Prerequisites: This is a graduate-level cell biology class. Any undergraduates wishing to enroll must have already taken MCDB 205. In addition, undergraduates are strongly encouraged to reach out to the course directors prior to enrollment.

MB&B 625a / GENE 625a / MCDB 625a, Basic Concepts of Genetic Analysis Jun Lu The universal principles of genetic analysis in eukaryotes are discussed in lectures. Students also read a small selection of primary papers illustrating the very best of genetic analysis and dissect them in detail in the discussion sections. While other Yale graduate molecular genetics courses emphasize molecular biology, this course focuses on the concepts and logic underlying modern genetic analysis.

MB&B 630b / MCDB 630b, Biochemical and Biophysical Approaches in Molecular and Cellular Biology Sigrid Nachtergaele and Jing Yan

In this course, we provide an overall of various biochemical and biophysical approaches used in modern research in molecular and cellular biology, ranging from spectroscopic tools, microscopy, to X-ray crystallography. The goal of the course is to make students familiar with these techniques so that they can find relevant materials in their future research. Does not count for graduate course credit for BQBS graduate students.

MB&B 635a / CBIO 635 / ENAS 518a, Quantitative Methods in Biophysics Nikhil Malvankar, Julien Berro, and Yong Xiong

An introduction to quantitative methods relevant to analysis and interpretation of biological data. Topics include statistical testing, data presentation, and error analysis; introduction to artificial intelligence-based data analysis tools, Alpha Fold Tutorial, introduction to mathematical modeling of biological dynamics; and Fourier analysis in signal/image processing and macromolecular structural studies. Instruction in basic programming skills and data analysis using MATLAB; study of real data from MB&B research groups. Prerequisites: MATH 120 and MB&B 600 or equivalents, or permission of the instructors.

MB&B 650a and MB&B 651b, Lab Rotation for BQBS First-Year Students Christian Schlieker

Required of all first-year BQBS graduate students. Credit for full year only.

MB&B 675a, Seminar for First-Year Students Christian Schlieker, Thierry Emonet, and Karen Anderson

Required of all first-year BQBS graduate students.

MB&B 676b, Responsible Conduct of Research Andrew Miranker, Titus Boggon, Michael Koelle, Sandy Chang, Nikhil Malvankar, Mark Lemmon, Mark Gerstein, David Schatz, Donald Engelman, and Karin Reinisch

Designed for students who are beginning to do scientific research. The course seeks to describe some of the basic features of life in contemporary research and some of the personal and professional issues that researchers encounter in their work. Approximately six sessions, run in a seminar/discussion format. Required of and open only to first-year graduate students in BQBS.

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MB&B 677b, RCR Refresher for Senior MB&B students Mark Solomon, Christian Schlieker, Karen Anderson, and Mark Hochstrasser
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This course meets the NIH requirement that students receive training in the responsible conduct of research at least every four years. The course consists of eight half-hour recorded lectures combined with four one-hour small-group discussions. Required of and open only to senior MB&B graduate students, typically in their fourth year. The course is graded Satisfactory/Unsatisfactory.

MB&B 710b / C&MP 710b, Electron Cryo-Microscopy for Protein Structure Determination Staff

Understanding cellular function requires structural and biochemical studies at an ever-increasing level of complexity. The course is an introduction to the concepts and applications of high-resolution electron cryo-microscopy. This rapidly emerging new technique is the only method that allows biological macromolecules to be studied at all levels of resolution from cellular organization to near atomic detail. ¹/₂ Course cr

MB&B 711b / C&MP 711b, Practical cryo-EM Workshop Yong Xiong and Franziska Bleichert

This laboratory course provides hands-on training in the practical aspects of macromolecular structure determination by cryo-electron microscopy (cryo-EM). Topics include cryo-EM data collection, image preparation and correction, single-

particle picking and 2-D classification, 3-D classification, refinement and postprocessing, model building, refinement and evaluation. The course includes training in the use of computer programs used to perform these calculations. Prerequisite: MB&B 710/C&MP 710. ½ Course cr

MB&B 720a, Macromolecular Structure and Biophysical Analysis Yong Xiong, Joe Howard, Steven Tang, and Franziska Bleichert

An in-depth analysis of macromolecular structure and its elucidation using modern methods of structural biology and biochemistry. Topics include architectural arrangements of proteins, RNA, and DNA; practical methods in structural analysis; and an introduction to diffraction and NMR. Prerequisites: physical chemistry (may be taken concurrently) and biochemistry.

MB&B 730a, Methods and Logic in Molecular Biology Wendy Gilbert, Candie Paulsen, Mark Solomon, and Matthew Simon

The course examines fundamental concepts in molecular biology through intense critical analysis of the primary literature. The objective is to develop primary literature reading and critical thinking skills. Required of and open only to first-year graduate students in BQBS.

MB&B 734b / GENE 734b / MBIO 734b, Molecular Biology of Animal Viruses

Walther Mothes and Maudry Laurent-Rolle

Lecture course with emphasis on mechanisms of viral replication, oncogenic transformation, and virus-host cell interactions.

MB&B 743b / GENE 743b / MCDB 743b, Advanced Eukaryotic Molecular Biology

Mark Hochstrasser, Matthew Simon, and Franziska Bleichert Selected topics in transcriptional control, regulation of chromatin structure, mRNA processing including spliceosomal splicing, mRNA turnover, RNA interference, translational regulation, protein modification, and protein degradation. Emphasis is placed on how these processes are regulated and the experiments that led to their discovery and understanding. Prerequisite: biochemistry or permission of the instructor.

MB&B 752b and MB&B 753b and MB&B 754b / CB&B 752b / CPSC 752b /

MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon

Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

MB&B 800a, Advanced Topics in Molecular Medicine Susan Baserga and Mark Solomon

The seminar, which covers topics in the molecular mechanisms of disease, illustrates timely issues in areas such as protein chemistry and enzymology, intermediary

metabolism, nucleic acid biochemistry, gene expression, and virology. M.D. and M.D./ Ph.D. students only. Prerequisite: biochemistry (may be taken concurrently).

MB&B 900a or b, Reading Course in Molecular Biophysics and Biochemistry Staff Directed reading course in molecular biophysics and biochemistry. Term paper required. By arrangement with faculty. Open only to graduate students in MB&B. Please see the syllabus for additional requirements.

Molecular, Cellular, and Developmental Biology

Yale Science Building, 203.432.3538 http://mcdb.yale.edu M.S., Ph.D.

Chair Scott Holley

Director of Graduate Studies Joshua Gendron

Professors Ronald Breaker, John Carlson, Lynn Cooley,* Craig Crews, Stephen Dellaporta, Thierry Emonet, Paul Forscher, Valerie Horsley, Mark Hochstrasser,* Scott Holley, Vivian Irish, Farren Isaacs, Akiko Iwasaki,* Douglas Kankel, Paula Kavathas,* Haig Keshishian, Mark Mooseker, Jon Morrow,* Anna Pyle, Hugh Taylor*

Associate Professors Shirin Bahmanyar, Damon Clark, Nadya Dimitrova, Joshua Gendron, Stavroula Hatzios, Yannick Jacob, Megan King,* Kathryn Miller-Jensen,* Weimin Zhong

Assistant Professors David Breslow, Binyam Mogessie, Jacob Musser, Sigrid Nachtergaele, Michael O'Donnell, Josien van Wolfswinkel, Jing Yan

Lecturers Robert Bazell, Edgar Benavides, Francine Carland, Surjit Chandhoke,* Seth Guller,* Richard Harrington, Amaleah Hartman, Ronit Kaufman, Thomas Loreng, Maria Moreno, Kenneth Nelson, Aruna Pawashe,* Joseph Wolenski

* A secondary appointment with primary affiliation in another department or school.

FIELDS OF STUDY

Research in the Department of Molecular, Cellular, and Developmental Biology spans biology from the organismal to the molecular levels. Topics in genetics and molecular biology include studies of non-coding RNAs, genome engineering, genome organization and regulation, gene dosage, bacterial chemotaxis, oncogenes, and systems and synthetic biology. Research topics in cellular and developmental biology include structure and dynamics of the cell cytoskeleton, molecular motors, chemical biology, the nuclear envelope, lncRNAs, regeneration, developmental biomechanics, vertebral column development, stem cell biology, and systems developmental biology. Research in neurobiology focuses on growth cone motility, neural differentiation, synaptogenesis, visual perception, olfaction, and the formation of topographic maps. Research in the plant sciences provides training in the molecular genetics of flowering, meristematic activity, epigenetics, the physiology of hormone action, sex determination, and the circadian clock. Because of the breadth of the department, students are provided with unique training and research opportunities for interdisciplinary studies.

To enter the Ph.D. program, students apply to the Molecular Cell Biology, Genetics, and Development (MCGD) track; the Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BQBS) track; or the Plant Molecular Biology (PMB) track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the MCGD or BQBS track of the Biological and Biomedical Sciences program may simultaneously apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Each student is expected to take at least three courses, in addition to MCDB 900/MCDB 901, Research Skills and Ethics I and II. With the help of a faculty committee, each student will plan a specific program that includes appropriate courses, seminars, laboratory rotations, and independent reading fitted to individual needs and career goals. There is no foreign language requirement. At the beginning of the third term of study, the student meets with a faculty committee to decide on a preliminary topic for dissertation work and to define the research areas in which the student is expected to demonstrate competence. By the end of the fall term of the second year, each student prepares a dissertation prospectus outlining the research proposed for the Ph.D. The student is admitted to candidacy for the Ph.D. when (1) the prospectus is accepted by a dissertation committee of faculty members, (2) the committee is satisfied that the student has demonstrated competence in the areas necessary to conduct the proposed work, and (3) the other requirements indicated above are fulfilled. The student should complete the requirements for admission to candidacy by the end of the fall term of the second year and no later than the end of the second year of study. Following admission to candidacy, students are required to meet with their thesis advisory committee at least once a year. The remaining requirements include completion of the dissertation research, presentation and defense of the dissertation, and submission of acceptable copies of the dissertation to the graduate school and to the Marx Science and Social Science Library. All students are required to teach in two one-term courses during their Ph.D. study, but not during the first year of graduate study. Students who require additional support from the graduate school must teach additional terms, if needed, after they have fulfilled the academic teaching requirement. Requirements for M.D.-Ph.D. students are the same as for Ph.D. students, except that a single term of teaching is required. During their first year of study, students must successfully complete MCDB 900/MCDB 901, Research Skills and Ethics I and II, to fulfill the responsible conduct and ethics in research requirement. This requirement must be met prior to registering for a second year of study. Further, in the fourth year of study, all students must successfully complete MCDB 504, RCR Refresher for Senior BBS Students.

HONORS REQUIREMENT

Students must meet the Graduate School's Honors requirement by the end of the fourth term of full-time study. (See Degree Requirements under Policies and Regulations.)

MASTER'S DEGREE

M.S. (en route to the Ph.D.) The minimum requirements for award of the Master of Science degree are (1) two academic years registered and in residence full-time in the graduate program; (2) satisfactory completion of the first two years of study and

research leading to the Ph.D.; this requirement may be met either (a) by completing a minimum of five courses with an average grade of High Pass and at least one Honors grade, in addition to satisfactory performance in MCDB 900/MCDB 901, or (b) by (i) successfully completing at least three courses with an average grade of High Pass and at least one Honors grade, (ii) satisfactory performance in MCDB 900/MCDB 901, and (iii) passing the prospectus examination; (3) recommendation by the department for award of the degree, subject to final review and approval by the degree committee. No courses that were taken prior to matriculation in the graduate program, or in Yale College, or in summer programs may be applied toward these requirements.

Prospective applicants are encouraged to visit the BBS website (https://medicine.yale.edu/bbs), MCGD, BQBS, and PMB tracks.

COURSES

MCDB 500a or b / MB&B 500a or b, Biochemistry Staff

An introduction to the biochemistry of animals, plants, and microorganisms, emphasizing the relations of chemical principles and structure to the evolution and regulation of living systems.

MCDB 517b / ENAS 517b / MB&B 517b / PHYS 517b, Methods and Logic in Interdisciplinary Research Corey O'Hern and Emma Carley

This full PEB class is intended to introduce students to integrated approaches to research. Each week, the first of two sessions is student-led, while the second session is led by faculty with complementary expertise and discusses papers that use different approaches to the same topic (for example, physical and biological or experiment and theory).

MCDB 530a / IBIO 530a / MBIO 530a, Biology of the Immune System Grace Chen, Ann Haberman, Carla Rothlin, Kevin O'Connor, Carrie Lucas, Ellen Foxman, Markus Müschen, Andrew Wang, Peter Cresswell, Jordan Pober, Joao Pereira, Craig Roy, Joseph Craft, Paula Kavathas, Noah Palm, Craig Wilen, Jeffrey Ishizuka, Daniel Jane-Wit, and David Schatz

The development of the immune system. Cellular and molecular mechanisms of immune recognition. Effector responses against pathogens. Immunologic memory and vaccines. Human diseases including allergy, autoimmunity, cancer, immunodeficiency, HIV/AIDS.

MCDB 550a / C&MP 550a / ENAS 550a / PHAR 550a / PTB 550a, Physiological SystemsW. Mark Saltzman and Stuart Campbell

The course develops a foundation in human physiology by examining the homeostasis of vital parameters within the body, and the biophysical properties of cells, tissues, and organs. Basic concepts in cell and membrane physiology are synthesized through exploring the function of skeletal, smooth, and cardiac muscle. The physical basis of blood flow, mechanisms of vascular exchange, cardiac performance, and regulation of overall circulatory function are discussed. Respiratory physiology explores the mechanics of ventilation, gas diffusion, and acid-base balance. Renal physiology examines the formation and composition of urine and the regulation of electrolyte, fluid, and acid-base balance. Organs of the digestive system are discussed from the perspective of substrate metabolism and energy balance. Hormonal regulation is applied to metabolic control and to calcium, water, and electrolyte balance. The biology of nerve cells is addressed with emphasis on synaptic transmission and simple neuronal circuits within the central nervous system. The special senses are considered in the framework of sensory transduction. Weekly discussion sections provide a forum for in-depth exploration of topics. Graduate students evaluate research findings through literature review and weekly meetings with the instructor.

MCDB 561a / MB&B 561a / PHYS 561a, Modeling Biological Systems I Thierry Emonet and Kathryn Miller-Jensen

Biological systems make sophisticated decisions at many levels. This course explores the molecular and computational underpinnings of how these decisions are made, with a focus on modeling static and dynamic processes in example biological systems. This course is aimed at biology students and teaches the analytic and computational methods needed to model genetic networks and protein signaling pathways. Students present and discuss original papers in class. They learn to model using MatLab in a series of in-class hackathons that illustrate the biological examples discussed in the lectures. Biological systems and processes that are modeled include: (1) gene expression, including the kinetics of RNA and protein synthesis and degradation; (2) activators and repressors; (3) the lysogeny/lysis switch of lambda phage; (4) network motifs and how they shape response dynamics; (5) cell signaling, MAP kinase networks and cell fate decisions; and (6) noise in gene expression. Prerequisites: MATH 115 or 116, BIOL 101–104, or with permission of instructors. This course also benefits students who have taken more advanced biology courses (e.g. MCDB 200, MCDB 310, MB&B 300/301).

MCDB 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

MCDB 564a, Light Microscopy: Techniques and Image Analysis Joseph Wolenski and Joe Howard

A rigorous study of principles and pertinent modalities involved in modern light microscopy. The overall course learning objective is to develop competencies involving advanced light microscopy applications common to multidisciplinary research. Laboratory modules coupled with critical analysis of pertinent research papers cover all major light microscope methods – from the basics (principles of optics, image contrast, detector types, fluorescence, 1P and 2P excitation, widefield, confocal principle, TIRF), to more recent advances, including super-resolution, light sheet, FLIM/FRET, motion analysis and force measurements. Enrollment is capped at eight to promote interactions and ensure a favorable hands-on experience. Priority is given to students who are planning on using these techniques in their independent research.

MCDB 570b, Biotechnology Craig Crews, Yannick Jacob, Joseph Wolenski, and F Kenneth Nelson

The principles and applications of cellular, molecular, and chemical techniques that advance biotechnology. Topics include the most recent tools and strategies used by government agencies, industrial labs, and academic research to adapt biological and chemical compounds as medical treatments, as industrial agents, or for the further study of biological systems.

MCDB 585a or b, Research in MCDB for B.S./M.S. Candidates Douglas Kankel A two-credit course taken in the third-to-last term (typically the second term of the junior year). At the start of this course, each student forms a committee composed of the student's adviser and two faculty members that meets to discuss the research project. At the end of this course, students complete a detailed prospectus describing their thesis project and the work completed thus far. The committee evaluates an oral and written presentation of this prospectus; the evaluation determines whether the student may continue in the combined program. Required of students in the joint B.S./ M.S. program with Yale College. 2 Course cr

MCDB 591a / ENAS 991a / MB&B 591a / PHYS 991a, Integrated Workshop Yimin Luo

This required course for students in the PEB graduate program involves a series of modules, co-taught by faculty, in which students from different academic backgrounds and research skills collaborate on projects at the interface of physics, engineering, and biology. The modules cover a broad range of PEB research areas and skills. The course starts with an introduction to MATLAB, which is used throughout the course for analysis, simulations, and modeling.

MCDB 595a and MCDB 596b, Intensive Research in MCDB for B.S./M.S. Candidates Douglas Kankel

A four-credit, yearlong course (two credits each term) that is similar to MCDB 495/496 and is taken during the senior year. During this course, students give an oral presentation describing their work. At the end of the course, students are expected to present their work to the department in the form of a poster presentation. In addition, students are expected to give an oral thesis defense, followed by a comprehensive examination of the thesis conducted by the thesis committee. Upon successful completion of this examination, as well as other requirements, the student is awarded the combined B.S./M.S. degree. Required of students in the joint B.S./M.S. program with Yale College. 2 Course cr per term

MCDB 602a / CBIO 602a / MB&B 602a / MBIO TBD-2, Molecular Cell Biology

Thomas Melia and Patrick Lusk

A comprehensive introduction to the molecular and mechanistic aspects of cell biology for graduate students in all programs. Emphasizes fundamental issues of cellular organization, regulation, biogenesis, and function at the molecular level. Graduate Prerequisites: Some knowledge of basic cell biology and biochemistry is assumed. Students who have not taken courses in these areas can prepare by reading relevant sections in basic molecular cell biology texts. We recommend Pollard et al., *Cell Biology* (3rd ed., 2016), Alberts et al., *Molecular Biology of the Cell* (6th ed., 2014), or Lodish et al., *Molecular Cell Biology* (8th edition, 2016). Undergraduate Prerequisites: This is a graduate-level cell biology class. Any undergraduates wishing to enroll must have already taken MCDB 205. In addition, undergraduates are strongly encouraged to reach out to the course directors prior to enrollment.

MCDB 603a / CBIO 603a, Seminar in Molecular Cell Biology Megan King A graduate-level seminar in modern cell biology. The class is devoted to the reading and critical evaluation of classical and current papers. The topics are coordinated with the CBIO 602 lecture schedule. Thus, concurrent enrollment in CBIO 602 is required. Prerequisites: Any undergraduates wishing to enroll must have already taken MCDB 205. In addition, undergraduates are strongly encouraged to reach out to the course directors prior to enrollment.

MCDB 625a / GENE 625a / MB&B 625a, Basic Concepts of Genetic Analysis Jun Lu The universal principles of genetic analysis in eukaryotes are discussed in lectures. Students also read a small selection of primary papers illustrating the very best of genetic analysis and dissect them in detail in the discussion sections. While other Yale graduate molecular genetics courses emphasize molecular biology, this course focuses on the concepts and logic underlying modern genetic analysis.

MCDB 630b / MB&B 630b, Biochemical and Biophysical Approaches in Molecular and Cellular Biology Sigrid Nachtergaele and Jing Yan

In this course, we provide an overall of various biochemical and biophysical approaches used in modern research in molecular and cellular biology, ranging from spectroscopic tools, microscopy, to X-ray crystallography. The goal of the course is to make students familiar with these techniques so that they can find relevant materials in their future research. Does not count for graduate course credit for BQBS graduate students.

MCDB 650a, Epigenetics Yannick Jacob and Nadya Dimitrova Study of epigenetic states and the various mechanisms of epigenetic regulation, including histone modification, DNA methylation, nuclear organization, and regulation by noncoding RNAs. A detailed critique of papers from primary literature and discussion of novel technologies, with specific attention to the role of epigenetics in development and its impact on human health.

MCDB 677b / GENE 777b, Mechanisms of Development Kaelyn Sumigray and Zachary Smith

An advanced graduate seminar on animal development focusing on conserved mechanisms that govern germline development, embryogenesis, and somatic differentiation in molecular detail. The course runs in parallel to the Spring session of the Department of Genetics Seminar Series and is divided into two components: six Yale faculty-led lectures on core concepts in development and six combined journal club/student-led discussions with outside developmental biology speakers on their cutting-edge research. Over the course of the term, small student groups are responsible for presenting one journal club-formatted discussion on two papers selected from the outside speaker's lab, as well as emceeing a dedicated question and answer session between the class and the speaker. This course provides a rare opportunity for students to actively engage with world leaders on their work in developmental genetics, epigenetics, and cell biology, as well as learn essential skills in experimental thinking and scientific communication. The course grade is based on forty percent take-home problems, forty percent class participation and twenty percent student-led journal club / distinguished speaker question and answer session. There are no official prerequisites. However, some familiarity with concepts and techniques of modern biology is necessary to get the most out of the course.

MCDB 700b, Molecular and Biochemical Principles of Gene Function Anna Marie Pyle and Farren Isaacs

Although many graduate students in the physical sciences begin conducting their thesis work on problems in the biological sciences, many of them lack preparation

in the molecular foundations of the discipline. MCDB200 provides these students with a strong foundational and practical knowledge of the contemporary field of molecular biology and genetic manipulation, greatly facilitating their thesis research. Prerequisites: CHEM 161 or 163, and BIOL 101 (or placement out of BIOL 101 via BIOL 101 placement exam, or via AP5 or IB7HL with permission of core course instructor). o Course cr

MCDB 720a / INP 720a, Neurobiology Haig Keshishian and Paul Forscher Examination of the excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and intracellular mechanisms underlying the generation and control of behavior.

MCDB 743b / GENE 743b / MB&B 743b, Advanced Eukaryotic Molecular Biology

Mark Hochstrasser, Matthew Simon, and Franziska Bleichert Selected topics in transcriptional control, regulation of chromatin structure, mRNA processing including spliceosomal splicing, mRNA turnover, RNA interference, translational regulation, protein modification, and protein degradation. Emphasis is placed on how these processes are regulated and the experiments that led to their discovery and understanding. Prerequisite: biochemistry or permission of the instructor.

MCDB 752b / CB&B 752b / CPSC 752b / MB&B 752b and MB&B 753b and MB&B 754b / MB&B 753b and MB&B 754b / MB&B 754b, Biomedical Data

Science: Mining and Modeling Mark Gerstein and Matthew Simon Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

MCDB 900a / CBIO 900a / GENE 900a, Research Skills and Ethics I Patrick Lusk This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the first and second laboratory rotations.

MCDB 901b / CBIO 901b / GENE 901b, Research Skills and Ethics II Chenxiang Lin This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the third laboratory rotation.

MCDB 902a and MCDB 903b, Advanced Graduate Seminar Staff

The course allows students to hone their presentation skills through yearly presentation of their dissertation work. Two students each give thirty-minute presentations in each class session. Students are required to present every year beginning in their third year in the MCDB program. Each MCDB graduate student is expected to attend at least 80 percent of the class sessions. Two faculty members co-direct the course, attend the seminars, and provide feedback to the students. MCDB 911a / CBIO 911a / GENE 911a, First Laboratory Rotation Patrick Lusk First laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

MCDB 912a / CBIO 912a / GENE 912a, Second Laboratory Rotation Patrick Lusk Second laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

MCDB 913b / CBIO 913b / GENE 913b, Third Laboratory Rotation Patrick Lusk Third laboratory rotation for Molecular Cell Biology, Genetics, and Development (MCGD) and Plant Molecular Biology (PMB) track students.

MCDB 940a, Developing and Writing a Scientific Research Proposal Farren Isaacs Through lectures, discussions, writing activities, and revisions, students become familiar with the principles of scientific grant writing, including language, style, content, and how to formulate a hypothesis and specific aims. Students effectively articulate their overall research plan and the significance of their research in writing and in oral presentations, and they learn to critique and review grant proposals by engaging in peer-review activities with fellow classmates. By the end of the term, students review, revise, and complete the research strategy for an NRSA F31 or NSF and/or the foundation for their qualifying proposal.

MCDB 950a and MCDB 951b, Second-Year Research Josh Gendron By arrangement with faculty.

Music

Stoeckel Hall, 203.432.2986 http://yalemusic.yale.edu M.A., M.Phil., Ph.D.

Chair Ian Quinn

Director of Graduate Studies Gundula Kreuzer (Stoeckel, 203.432.2986, dgs.music@yale.edu)

Professors Ardis Butterfield, Richard Cohn, Gundula Kreuzer, Richard Lalli (*Adjunct*), Pauline LeVen, Ian Quinn, Markus Rathey (*Adjunct*), Gary Tomlinson, Michael Veal

Associate Professors Robert Holzer (*Adjunct*), Brian Kane, Braxton Shelley, Anna Zayaruznaya

Assistant Professor Giulia Accornero, Ameera Nimjee, Jessica Peritz, Daniel Walden, Lindsay Wright

FIELDS OF STUDY

Fields include music history, music theory, and ethnomusicology. (Students interested in degrees in performance, conducting, or composition should apply to the Yale School of Music.)

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Two years of coursework, comprising a minimum of fourteen courses. All students must take the proseminars in ethnomusicology, music history, and music theory. In addition, students in the theory program must take both of the history of theory seminars; students in the music history program must take one history of theory seminar; and students in the ethnomusicology program must take at least two but no more than five graduate seminars or non-introductory undergraduate courses in other departments or schools within the university. In consultation with the director of graduate seminars or non-introductory undergraduate to two graduate seminars or non-introductory undergraduate to take up to two graduate seminars or non-introductory undergraduate courses outside the department. Consult the Music Graduate Student Handbook for further details specific to each program.

A student must receive at least four Honors grades in departmental seminars in order to proceed to the qualifying examination, administered in August following the second year. Reading proficiency in two languages – for historians and theorists, German and usually either French or Italian; for ethnomusicologists, two languages relevant to their research, one of which must be a European language – is demonstrated by examinations (with dictionary access) offered once per term. A style and repertory examination must be taken upon entering in August, and retaken every term until passed before the end of the third year. Third-year students attend a weekly prospectus/dissertation colloquium. Approval of the dissertation prospectus admits a student to candidacy, provided that all other requirements are met. Only students admitted to candidacy can continue into the fourth year of study. Fourth- and fifth-year students attend the dissertation colloquium in the spring terms.

The faculty considers teaching to be essential to the professional preparation of graduate students in Music. Students in Music participate in the Teaching Fellows Program in their third and fourth years.

COMBINED PH.D. PROGRAMS

Music and African American Studies

The Department of Music offers, in conjunction with the Department of African American Studies, a combined Ph.D. degree in Music and African American Studies. For further details, see African American Studies.

Music and Early Modern Studies

The Department of Music offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in Music and Early Modern Studies. For further details, see Early Modern Studies.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students may apply for a terminal master's degree in music. For the M.A. degree, students must successfully complete seven courses, at least six of which are seminars given in the department, along with the passing of the style and repertory examination and an examination in one foreign language. Of the six departmental seminars, at least two grades must be Honors; the remaining five grades must average High Pass. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met. Doctoral students who withdraw from the Ph.D. program may be eligible to receive the M.A. if they have met the above requirements and have not already received the M.Phil.

COURSES

MUSI 509a, Music and Mysticism of the Indian Subcontinent Staff

In South Asia, music, melodic verse (chant, recitation), and the politics of spirituality have long been interlinked. While many elite expressive traditions reinforced caste hierarchies and imperial ideologies, some popular Bhakti (Hindu mysticism) and Sufi (mystical dimension of Islam) traditions critiqued orthodoxies, indignities, exclusions, and even patriarchies, constituting what some have termed as social movements. Looking through the lens of ethnomusicology, this course emphasizes the connections between musicians and mystics found in classical, vernacular (devotional and folk), and popular musical styles. An introduction to the history, theory, and practice of music as it relates to religion, sets the context for students' to do musical practice along with academic study. We have guest musicians and films to watch.

MUSI 514a, Opera Studies Workshop Gundula Kreuzer

A weekly workshop surveying the bourgeoning world of contemporary opera and performative musical multimedia as well as the field of opera studies, broadly conceived. We address recent publications of interest (including but not limited to opera, musical theater, dance, media, and performance studies), discuss current performances and programming trends, workshop our own in-progress writing, and engage with various guest speakers, including both scholars and practitioners. Parts of the workshop are also devoted to developing the next YOST (Y | Opera | Studies Today) conference in spring 2025. o Course cr

MUSI 526a / MDVL 526a, Theorizing Musical Time in the Medieval Islamicate World Giulia Accornero

This class is an introduction to medieval Islamicate music theory, with a particular focus on the theorization of musical time, motion, and rhythmic patterns as proposed by polymath Abū Naşr al-Fārābī. After a deep dive in al-Fārābī's music theory, we survey rhythmic theories and diagrams by Ibn Sīnā (Avicenna) and al-Urmawī. While focusing on music theory, we also learn about music performance in the Abbasid caliphate, the "translation movement" and the integration of Greek music theory (with a focus on Aristoxenus) and philosophy, and discuss historiographical issues. Prerequisite: Basic music theoretical knowledge and/or knowledge of medieval Islamicate culture/philosophy is expected.

MUSI 546b, Histories of Music Notation Anna Zayaruznaya

Systems of music notation are intimately linked with the histories of musical composition and performance. This course combines a study of musical paleography (i.e., how music is written down) with consideration of the historical and intellectual currents that shaped, and were shaped by, systems of music writing. Among the systems surveyed are the neumes used to preserve early plainchant, the increasingly specific rhythmic notations that recorded Western polyphony from the thirteenth century onward, and the notational puzzles and games of the fourteenth and fifteenth centuries. Final papers may focus on medieval or later music notations.

MUSI 559b, Nineteenth-Century Opera and Representation Gundula Kreuzer Throughout the long nineteenth century, opera was the most expensive, lavish, and politically implicated multimedia spectacle, with both its production and the act of opera-going offering prime opportunities to negotiate individual and collective identities. By looking at all of opera's complex media—libretti, music, voice types, design, stage technology, architecture, etc. — this seminar addresses various operatic forms and techniques of representation related to such issues as gender, sexuality, class, race, nationalism, (dis)ability, the rise of the masses as political agent, and the operatic genre itself as a vehicle of colonialism. Following some introductory readings, each class focuses on one topic through the lens of one opera (or select scenes thereof), including works by Rossini, Weber, Meyerbeer, Verdi, Wagner, Puccini, Smyth, and Gershwin, as well as their representation on today's stages. We may contrast the trajectory of these historical works with developments in contemporary opera. A visit to the Metropolitan Opera or other performance is anticipated (if possible). Knowledge of Western musical notation is suggested.

MUSI 695b / AFAM 695b, The Study of African American Music Braxton Shelley This seminar explores the musical objects, critical debates, and scholarly methodologies that have shaped the study of African American music. How do artists, critics, and theorists differently define "Black music"? How do competing conceptions of Black musical traditions reflect and resist commercial and academic modes of categorization? In this course, we attend to the intersections and divergences that emerge from myriad attempts to define and discipline the musical products of black experience, converting Blues, Funk, Gospel, Hip-Hop, House, Jazz, Reggae, R&B, Soca, Soul, the Spiritual,
and many other idioms, into a single knowledge-object. We investigate the intellectual genealogies and scholarly disagreements that arise from the interdisciplinary scope of Black music studies, including: cultural history, cultural studies, ethnomusicology, literary studies, historical musicology, music theory, sociology, and theology. Required for students in the Joint Ph.D. Program in Music and African American Studies, this reading-intensive graduate course brings together texts that have defined the interdisciplinary study of Black music and new work that is remaking the field.

MUSI 697a, Proseminar: Ethnomusicology Ameera Nimjee

A survey of the major works, topics, issues, and techniques of ethnomusicological research as it has developed over the past century. We consider the position of the field within the broader contexts of society and the academy and provide a bibliographic foundation for further work in the field.

MUSI 698b, Proseminar: Music Theory Ian Quinn

A survey of the major works, topics, questions, and techniques of research in the field of music theory as it has developed over the past half-century. We consider the position of the field within the broader contexts of the academy and provide a bibliographic foundation for further work in the field.

MUSI 7144, Exploratory Readings in Music and Drugs Anna Zayaruznaya Since at least the fifteenth century, drug cultures and music cultures in the West have often been imbricated. Not only have the social aspects of drug cultures shaped the ways in which music is consumed, but also the altered perception induced by drugs has offered novel temporalities and subject-positions to composers and performers alike. Music-historical accounts of this topic are relatively rare, however, and few broader theories have been advanced to account for the ways in which pharmacological and musicological accounts can intersect. This seminar explores this relatively uncharted territory through a set of case studies with broad historical scope. Topics to be covered include, among others, Bach's *Coffee Cantata (Schweigt stille, plaudert nicht*, BWV 211, of the 1730s); Romantic composers' opium habits and depictions of intoxication (e.g., Hector Berlioz's *Symphonie fantastique* of 1830); Louis Armstrong's many statements about cannabis; and contemporary dance genres such as EDM, which are often consumed under the influence of drugs such as MDMA.

MUSI 812a or b, Directed Studies: Ethnomusicology Ian Quinn

MUSI 814a or b, Directed Studies: History of Music Ian Quinn By arrangement with faculty.

MUSI 852b / EMST 695b / HIST 958b, Temporalities: Early, Modern, and Otherwise

Maura Dykstra and Marlene Daut

What is the relationship between history and temporality? Perhaps a better question might be: what different relationships *have there been* between histories and temporalities, and how can interrogating those epistemic shifts generate new ways of "doing" history in the present? This interdisciplinary graduate seminar undertakes a critical genealogy of "history" itself, approaching the Enlightenment and the early-mid-twentieth century as two pivotal moments in the conceptual solidification of the relationship between time (singular) and capital-H history. Readings describing and utilizing foundational theories about time, periodization, and historicism, are juxtaposed against critiques and alternative imaginings in post/de-colonial studies, gender and sexuality studies, performance studies, and various traditions outside of

(or opposed to) the canon of modernity. The syllabus includes texts by early modern theorists of history, twentieth-century social theorists, and the critical theoretical engagements that assailed and critiqued them.

MUSI 914a or b, Directed Studies: Theory of Music Ian Quinn By arrangement with faculty.

MUSI 998a, Prospectus Workshop Ameera Nimjee

MUSI 999b, Dissertation Colloquium Giulia Accornero

Near Eastern Languages and Civilizations

Humanities Quadrangle, 203.432.2944 http://nelc.yale.edu M.A., M.Phil., Ph.D.

Chair Nadine Moeller

Director of Graduate Studies Kevin van Bladel

Professors John Darnell, Benjamin Foster, Eckart Frahm, Nadine Moeller, Shawkat Toorawa, Kevin van Bladel, Harvey Weiss

Senior Lecturers and Senior Lectors Sarab Al Ani, Muhammad Aziz, Gojko Barjamovic, Jonas Elbousty, Shiri Goren, Randa Muhammed, Dina Roginsky, Farkhondeh Shayesteh, Kathryn Slanski, Orit Yeret

Lecturers and Lectors Ozgen Felek, Agnete Lassen, Gregory Marouard, Jane Mikkelson, Vincent Morel, Klaus Wagensonner, M. Ezgi Yalcin

FIELDS OF STUDY

Fields include Arabic Humanities, Assyriology, the Classical Near East, and Egyptology.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants should state their specific field of study and intended specialization. Evidence of reading knowledge of both French and German is required of all Ph.D. students. Proficiency in one of these languages is normally a prerequisite for admission and is demonstrated by passing a departmental examination upon registration at Yale. Proficiency in the second language must be achieved before admission to the second year of study. Ph.D. students admitted with only one of the two required languages or who fail the departmental examination are expected to enroll in an appropriate course given by the French or German department at Yale (or the equivalent elsewhere, with the approval of the director of graduate studies [DGS]). Completion of such a course with a grade of A or B will be accepted as fulfilling the proficiency requirement in either language; exceptions, for instance, for native speakers of French or German, may be made by the department upon recommendation of the DGS. For students in the M.A. program, evidence of reading knowledge of either French or German is sufficient.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Coursework

The department normally requires that students take a minimum of twenty to twenty-three courses over three years. The minimum number depends on the area of specialization as follows: Arabic Humanities and Egyptology, twenty courses; Assyriology and Classical Near East, twenty-three courses. For all students, this normally means five semesters of full course load (four courses per semester) followed by a sixth semester of reduced course load in preparation for the qualifying examinations. Normal progress in course work is considered to be consistent achievement of grades of High Pass or better, and at least four term courses or two yearlong courses with Honors per year. Students entering the program with an M.A. may ask that up to three graduate courses they took before arrival at Yale be counted toward the course requirement. If the request is approved by their adviser and the DGS, they can meet the requirement within two and a half years.

Of the required courses for graduate study, at least three quarters should be taken within the department, usually within the student's primary field of study. Courses taken outside of the department should be clearly related to the student's primary field or constitute a coherent second field. For students who take no courses outside of the department, minimum competence in a second field within NELC is required, defined as follows: at least two terms of a Near Eastern language, to be evaluated either by examination or a course grade of High Pass or better, or at least two terms of nonlanguage courses outside the area of specialization.

Committees

While doing coursework, students are mentored by a faculty adviser from their field and by the DGS. Students writing dissertations may, if they so wish, be mentored by a committee headed by a primary adviser from NELC (not necessarily the faculty adviser from the course work years) and staffed with one, two, or more additional members, from either inside or outside the department, depending on the student's specific needs. Committees are to be approved by the DGS. Interested students are encouraged to seek out suitable and willing faculty to serve on their advisory committees.

Special Language and Course Requirements

Course work should be planned to meet two departmental general standards: core languages for the primary fields of study, and minimum competence in a secondary field. The core languages in each of the major fields of study are as follows: **Arabic Humanities** Arabic and one other Near Eastern language, typically Hebrew, Persian, or Turkish.

Assyriology Sumerian and Akkadian.

Classical Near East Arabic and at least two of the following: Armenian, Aramaic (Babylonian or Syriac), Coptic, Greek, Hebrew, Middle Persian, New Persian, or Sanskrit.

Egyptology Egyptian and at least four terms of Demotic or Coptic.

Minimum competence in a secondary field of study is defined as follows: at least two terms of a Near Eastern language to be evaluated either by examination or with a course grade of High Pass or better, or at least two terms of nonlanguage courses outside the area of specialization. A minimum grade of High Pass in these courses will be considered successful fulfillment of this requirement.

In Arabic Humanities, the minimum competence can be extended to an interdisciplinary course of study in a minor field. Minors may include six to eight term courses in such departments and programs as Comparative Literature, French, History, History of Science and Medicine, Italian Studies, Judaic Studies, Linguistics, Medieval Studies, Philosophy, Religious Studies, Spanish and Portuguese, or others as applicable. Students in all four fields of the department will be expected to declare their choice of a secondary language or area, or a minor field, by their third term of study.

Training in Teaching

NELC students normally acquire four terms of teaching experience, between their second and fourth years in residence. Teaching Fellow assignments will be made by the DGS in consultation with the relevant faculty and will, whenever possible, take student preferences into account.

Examinations and the Dissertation

The qualifying examination is normally taken at the end of the third year of study or no later than the beginning of the fourth year of study. Students meeting the course requirement after five semesters may take the qualifying examination at the end of the fall term of their third year. Qualifying examinations normally include three written and one oral examination, including language, literature, history, and other topics to be determined by the DGS in consultation with the student and the relevant faculty. Qualifying examinations may be based in part on reading lists of primary core texts and secondary literature compiled in advance by the student and the relevant faculty. Primary texts and secondary literature from course work may also be topics of the examination. For language examinations, unseen texts may also be included. In the case of the program in Arabic Humanities, for students electing to do a minor, the written portion will consist of two language examinations and one subject in the minor field, and the oral will consist of two subjects in Arabic studies and one in the minor field. Written examinations are set by the individual faculty members responsible for particular areas of study, but the oral portion may be conducted by the full staff of the department. The dissertation proposal is normally submitted one month after completing the qualifying examination.

In their final term of course work, students may, with the permission of the DGS and the relevant faculty, enroll in a directed readings course related to the general field of the prospective dissertation topic. Coursework should include preparation of a comprehensive, annotated bibliography for the prospective topic and exploration of selected aspects of the topic in a research paper. Students availing themselves of this option may present some of their work at the NELC Roundtable.

The dissertation prospectus may comprise up to thirty pages, excluding the bibliography. A two-page summary of the prospectus will normally be circulated among and voted upon by the faculty, though the full prospectus will be available for consideration.

Successful completion of the comprehensive examination and submission of an acceptable prospectus will qualify the student for admission to candidacy for the Ph.D. degree. After completion of the dissertation, the candidate may receive a final examination concerned primarily with the defense of the thesis.

ARCHAIA GRADUATE QUALIFICATION

Students can participate in the Yale Program for the Study of Ancient and Premodern Cultures and Societies (Archaia) and receive a graduate qualification by fulfilling the necessary requirements. For further information, see Archaia, under Non-Degree-Granting Programs, Councils, and Research Institutes.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

Terminal Master's Degree Program The Department of Near Eastern Languages and Civilizations occasionally admits students to pursue a terminal M.A. degree. No financial aid is available. Students enrolled in the M.A. program must complete a minimum of twelve term courses, with an average of High Pass and at least two grades of Honors.

Students in the Ph.D. program who leave the program prior to completion of the doctoral degree may be eligible to receive the terminal M.A. degree upon completion of a minimum of twelve courses, with an average of High Pass and at least two grades of Honors. Automatic petition for the M.A. degree is not available to students in Near Eastern Languages and Civilizations.

COURSES

AKKD 500a, Elementary Akkadian I Staff

Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 501b, Elementary Akkadian II Staff

Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 502a, Intermediate Akkadian Gojko Barjamovic

Close reading of selected Akkadian texts; introduction to Akkadian dialects, cuneiform epigraphy, and research techniques of Assyriology.

ARBC 500a, Elementary Modern Standard Arabic I Staff

A two-term course for students who have no previous background in Arabic. Students learn the Arabic alphabet, basic vocabulary and expression, and basic grammatical structures and concepts, and concentrate on developing listening and speaking skills. The course aims at developing the following skills: reading to extract the gist of written Modern Standard Arabic texts; speaking with increased ease, good pronunciation, sound grammatical forms, and correct usage; writing to respond to simple daily life issues; forming and recognizing grammatically correct Modern Standard Arabic.

ARBC 501b, Elementary Modern Standard Arabic II Staff

A two-term course for students who have no previous background in Arabic. Students learn the Arabic alphabet, basic vocabulary and expression, and basic grammatical structures and concepts, and concentrate on developing listening and speaking skills. The course aims at developing the following skills: reading to extract the gist of written Modern Standard Arabic texts; speaking with increased ease, good pronunciation, sound grammatical forms, and correct usage; writing to respond to simple daily life issues; forming and recognizing grammatically correct Modern Standard Arabic.

ARBC 502a, Intermediate Modern Standard Arabic I Staff

A two-term course for students with previous background in Arabic. It is designed to improve proficiency in aural and written comprehension as well as in speaking and writing skills. The course aims to develop the following skills: reading to extract the gist as well as key details of written Modern Standard Arabic texts on a variety of academic, social, cultural, economic, and political topics; speaking with greater fluency and enhanced engagement in conversations on a variety of topics; mastering writing, easily forming and recognizing grammatically correct Arabic sentences. Prerequisite: ARBC 501 or successful completion of a placement test.

ARBC 503b, Intermediate Modern Standard Arabic II Sarab Al Ani

A two-term course for students with previous background in Arabic. It is designed to improve proficiency in aural and written comprehension as well as in speaking and writing skills. The course aims to develop the following skills: reading to extract the gist as well as key details of written Modern Standard Arabic texts on a variety of academic, social, cultural, economic, and political topics; speaking with greater fluency and enhanced engagement in conversations on a variety of topics; mastering writing, easily forming and recognizing grammatically correct Arabic sentences. Prerequisite: ARBC 501 or successful completion of a placement test.

ARBC 504a, Advanced Modern Standard Arabic I Muhammad Aziz

Focus on improving the listening, writing, and speaking skills of students who already have a substantial background in the study of modern standard Arabic. Prerequisite: ARBC 503 or permission of the instructor.

ARBC 505b, Advanced Modern Standard Arabic II Muhammad Aziz

Focus on improving the listening, writing, and speaking skills of students who already have a substantial background in the study of modern standard Arabic. Prerequisite: ARBC 503 or permission of the instructor.

ARBC 509a, Beginning Classical Arabic I Staff

Introduction to classical Arabic, with emphasis on grammar to improve analytical reading skills. Readings include Qur'anic passages, literary material in both poetry and prose, biographical entries, and religious texts. Prerequisite: ARBC 501 or permission of the instructor. May be taken concurrently with ARBC 502 or ARBC 504.

ARBC 510b, Beginning Classical Arabic II Staff

Introduction to classical Arabic, with emphasis on analytical reading skills, grammar, and prose composition. Readings from the Qur'an, Islamic theology, and literature and history of the Middle East, as well as Jewish and Christian religious texts in Arabic.

ARBC 511a, Intermediate Classical Arabic I Staff

A course on Arabic grammar and morphology that builds on the skills acquired in ARBC 146/510, with emphasis on vocabulary, grammar, and reading skills and strategies. Readings drawn from a variety of genres, such as biography, history, hadith, and poetry. ARBC 146/510 or permission from instructor.

ARBC 512b, Intermediate Classical Arabic II Staff

A continuation of Intermediate Classical Arabic grammar and morphology that builds on the skills acquired in ARBC 156/511, with emphasis on vocabulary, grammar, and reading skills and strategies. Readings drawn from a variety of genres, such as biography, history, hadith, and poetry. ARBC 156/511 or permission from instructor.

ARBC 520a, Egyptian Arabic Randa Muhammed

ARBC 522a, Modern Standard Arabic for Heritage Learners I Sarab Al Ani This course is designed for students who have been exposed to Arabic – either at home or by living in an Arabic speaking country – but who have little or no formal training in the language. The main purpose of the course is to build on the language knowledge students bring to the classroom to improve their skills and performance in the three modes of communication (interpersonal, presentational, and interpretive) to fulfill various needs. Particular attention is paid to building, controlling, and mastering language structures. Effective study strategies are used in this course to strengthen writing skills in MSA. Various assignments and tasks are designed to improve the learner's understanding of several issues related to culture in various Arabic speaking countries. Prerequisite: Students must take the placement test or have permission of the instructor.

ARBC 527b, Hunger in Eden: Mohamed Choukri's Narratives Jonas Elbousty A survey of the work of Mohamed Choukri, one of the most prominent Moroccan, if not Arab, writers to have shaped the modern Arabic literary canon. His influence has been instrumental in forming a generation of writers and enthusiastic readers, who cherish his narratives. Students dive deeply into Choukri's narratives, analyzing them with an eye toward their cultural and political importance. The class looks to Choukri's life story to reveal the roots of his passion for writing and explores the culture of the time and places about which he writes. Through his narratives, students better understand the political environment within which they were composed and the importance of Choukri's work to today's reader regarding current debates over Arab identity. This class surveys the entirety of his work, contextualizing within the sphere of Arabic novelistic tradition. Prerequisite: ARBC 505 or permission of the instructor.

ARBC 532b, Modern Standard Arabic for Heritage Learners II Sarab Al Ani Continuation of ARBC 122, MSA for Heritage Learners I. This course is designed for students who have been exposed to Arabic – either at home or by living in an Arabicspeaking country – but who have little or no formal training in the language. The main purpose of the course is to build on the language knowledge students bring to the classroom to improve their skills and performance in the three modes of communication (Interpersonal, Presentational, and Interpretive) in MSA to fulfill various needs. Particular attention is paid to building, controlling, and mastering language structures. Effective study strategies are used in this course to strengthen writing skills. Various assignments and tasks are designed to improve the learner's understanding of several issues related to culture in various Arabic speaking countries. Prerequisite: ARBC 122, successful completion of placement test, or instructor permission.

ARBC 560a, Graduate Arabic Seminar: The Qur'an Kevin van Bladel Study and interpretation of classical Arabic texts for graduate students. The focus this term is on the Qur'an.

ARBC 561b, Graduate Arabic Seminar Shawkat Toorawa Study and interpretation of classical Arabic texts for graduate students.

ARBC 578a, Yemeni Literature and Culture Muhammad Aziz

This course introduces students to a variety of Yemeni novels, short stories, poetry, history, movies, songs, and culture. We delve deeply into the major Arabic literary styles, in their forms of poetry, prose, movies, and series, and gain a general sense of the transitional period between past and present in the modern era. Students are expected to read the material at home and prepare for class discussions. Students grasp some sense of Yemeni history as well as literature in general. Yemeni series and films are an essential part of the course. Evaluation is based on participation, a midterm paper, and a final project. Prerequisite: ARBC 503.

EGYP 500a, Introduction to Classical Hieroglyphic Egyptian I John Darnell A two-term introduction to the language of ancient pharaonic Egypt (Middle Egyptian) and its hieroglyphic writing system, with short historical, literary, and religious texts. Grammatical analysis with exercises in reading, translation, and composition.

EGYP 501b, Introduction to Classical Hieroglyphic Egyptian II John Darnell A two-term introduction to the language of ancient pharaonic Egypt (Middle Egyptian) and its hieroglyphic writing system, with short historical, literary, and religious texts. Grammatical analysis with exercises in reading, translation, and composition.

EGYP 512b / RLST 658b, Egyptian Monastic Literature in Coptic Stephen Davis Readings in the early Egyptian classics of Christian ascetism in Sahidic Coptic, including the Desert Fathers and Shenoute. Prerequisite: EGYP 510b or equivalent.

EGYP 514a / RLST 653a, Gnostic Texts in Coptic Ramona Teepe

The course reads selected portions of important texts from the Nag Hammadi collection, including the Apocryphon of John, the Gospel of Thomas, the Gospel of Truth, Thunder, the Treatise on Resurrection, the Tripartite Tractate, as well as other noncanonical texts preserved in Coptic, including the Gospel of Mary and the Gospel of Judas. Prerequisite: EGYP 510 or equivalent.

EGYP 533a, Intermediate Egyptian I: Literary Texts John Darnell

Close reading of Middle Egyptian literary texts; introduction to the hieratic (cursive) Egyptian script. Readings include the Middle Kingdom stories of "Sinuhe" and the "Eloquent Peasant" and excerpts from wisdom literature. Prerequisite: EGYP 501.

EGYP 541b, Intermediate Egyptian II: Historical Texts Staff

Close reading of Middle Egyptian historical texts in original hieroglyphic and hieratic script. Initial survey of ancient Egyptian historiography and grammatical forms peculiar to this genre of text. Prerequisite: EGYP 501.

EGYP 560a, Abydene Texts John Darnell

This course engages in close reading of a selection of the many texts deriving from and describing the ancient city of Abydos. The course provides an overview of material ranging in date from the Protodynastic through the Ramesside Periods, covering over two millennia of ancient Egyptian history. This class is intended for students who have completed at least an intermediate level course (L-3 or L-4). This course fulfills the L-5 requirement. Students who have not completed an intermediate level course (L-3 or L-4) need permission from the instructor.

EGYP 599a, Directed Readings: Egyptology Nadine Moeller

HEBR 500a, Elementary Modern Hebrew I Dina Roginsky

A two-term introduction to the language of contemporary Israel, both spoken and written. Fundamentals of grammar; extensive practice in speaking, reading, writing, and comprehension under the guidance of a native speaker. No previous knowledge required. Successful completion of the fall term required to enroll in the spring term.

HEBR 501b, Elementary Modern Hebrew II Orit Yeret

A two-term introduction to the language of contemporary Israel, both spoken and written. Fundamentals of grammar; extensive practice in speaking, reading, writing,

and comprehension under the guidance of a native speaker. No previous knowledge required. Successful completion of the fall term required to enroll in the spring term.

HEBR 502a, Intermediate Modern Hebrew I Orit Yeret

A two-term review and continuation of grammatical study leading to a deeper comprehension of style and usage. Focus on selected readings, writing, comprehension, and speaking skills. Prerequisite: HEBR 501 or equivalent.

HEBR 503b, Intermediate Modern Hebrew II Orit Yeret

A two-term review and continuation of grammatical study leading to a deeper comprehension of style and usage. Focus on selected readings, writing, comprehension, and speaking skills. Prerequisite: HEBR 502 or equivalent.

HEBR 505a, Contemporary Israeli Society in Film Shiri Goren

Examination of major themes in Israeli society through film, with emphasis on language study. Topics include migration, gender and sexuality, Jewish/Israeli identity, and private and collective memory. Readings in Hebrew and English provide a sociohistorical background and basis for class discussion. Conducted in Hebrew. Prerequisite: HEBR 502, placement test, or permission of the instructor.

HEBR 510a, Conversational Hebrew: Israeli Media Shiri Goren

An advanced Hebrew course for students interested in practicing and enhancing conversational skills. The course aims to improve the four language skills while stressing listening comprehension and various forms of discussions including practical situations, online interactions, and content analysis. Prerequisite: HEBR 502 or permission of the instructor.

HEBR 511a, Elementary Biblical Hebrew I Dina Roginsky

A two-term introduction to Biblical Hebrew. Intensive instruction in grammar and vocabulary, supplemented by readings from the Bible. No prior knowledge of Hebrew required.

HEBR 512b, Elementary Biblical Hebrew II Eric Reymond

A two-term review and continuation of instruction in grammar and vocabulary, supplemented by readings from the Bible. Prerequisite: HEBR 510 or equivalent.

HEBR 516b, Israeli Popular Music Dina Roginsky

Changes in the development of popular music in Israel explored as representations of changing Israeli society and culture. The interaction of music and cultural identity; the role of modern popular music in representing, shaping, challenging, and criticizing social conventions; songs of commemoration and heroism; popular representation of the Holocaust; Mizrahi and Arab music; feminism, sexuality, and gender; class and musical consumption; criticism, protest, and globalization. Prerequisite: HEBR 502 or equivalent.

HEBR 563b / JDST 695b, From Biblical to Modern Hebrew Dina Roginsky This course aims to support students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. The course concentrates on reading and aims at enabling students to use Modern Hebrew for research purposes. The texts chosen are tailored to students' particular areas of interest. Prerequisite: two years of Biblical or Modern Hebrew studies, or permission of the instructor. Conducted in English.

MESO 578a, Mesopotamian Lexical Lists Klaus Wagensonner

The cuneiform writing system emerged in southern Mesopotamia roughly in the last third of the fourth millennium BCE. The early engineers of writing used the script to keep track of incoming and outgoing commodities and for other administrative purposes. A quite substantial number of the early texts inscribed with this script, however, are scholarly: lists of items such as terms for occupations, animal species, materials, etc. Some of these lists were standardized and spread to other places in Mesopotamia and beyond, where they were faithfully copied throughout the third millennium BCE. Other lists were added to the corpus. Many of these lists eventually faded, but new lists emerged, which were appended and translated. The Mesopotamian lexical corpus spans from the earliest periods until the latest attestation of cuneiform in the first century CE. This course provides an overview of the most important developments in the lexical corpus, its use in the education of scribes, the concepts of knowledge organization, and its importance for modern philological work on the ancient languages of Mesopotamia. The course is designed as part lecture, part student presentations. The short presentations focus on certain aspects of lexical texts or highlight specific lexical compositions. Some familiarity with Sumerian and Akkadian is desirable. The lectures, however, can be followed by individuals without prior in-depth knowledge of these languages.

NELC 500a / ARCG 500a / CLSS 808a, Environmental Archaeology of West Asia, Egypt, and the Mediterranean Harvey Weiss

The new linkages of high-resolution paleoclimate and archaeological and epigraphic records revise earlier historiography for the major disjunctions, including societal genesis, collapse, habitat tracking, and technological and ideological innovations, from 4000 to 40 BCE across west Asia, Egypt, and the Aegean. The seminar synthesizes speleothem and lake, marine, and glacial core records for abrupt climate changes and coincident societal adaptations previously unexplained.

NELC 515b, The Bible in Its Ancient Near Eastern Setting (Seminar) Eckart Frahm History of the Assyrian, Babylonian, and Persian empires of the first millennium BCE, and how their rise and fall influenced the politics, religion, and literary traditions of biblical Israel. Topics include the role of prophecy and (divine) law, political and religious justifications of violence, the birth of monotheism, and the historical reliability of the Hebrew Bible.

NELC 517a, Beginnings of Business: A History of Early Trade Gojko Barjamovic When did trade begin? When did business go global? How has the organization of commerce changed through time? What are our fundamental financial instruments and how and in what order where they developed? Are there fundamental rules behind the way in which humans conduct business? What roles have states and institutions historically played in facilitating or restricting trade? What sources and approaches are available to study trade in pre-modern times? Can business innovations from the past help us think about business in the present? To explore all these questions, this course draws upon data and case studies drawn broadly from the ancient world but with focus on evidence from ancient Mesopotamia. With the benefit of a giant canvas of history we paint a detailed picture of how business developed through time. We look at examples where business was strictly regulated by state-controlled institutions as well as examples entrepreneurs would have to rely on informal enforcement mechanisms, such as kin-relationships and reputation in repeated interactions. We dive into the effects of shock on individuals and systems, from production shortages to pandemics. And we ask what happens when systems collapse or value becomes immeasurable (as people have claimed for the 2008 crash). We study family-controlled business groups as an alternative to integrated and professionally managed corporations. And we observe how entrepreneurs adapted to face the financial challenges of states and dawning globalization. Beginnings of Business immerses students in the history of trade and draws on guests from widely different fields and disciplines to showcase the variety of approaches with which scholars address questions of business history. Meetings are built around lectures but emphasize participation and discussion. We run business simulations and make visits to institutions and collections to provide as broad and engaging a learning experience for students as possible about the practice of trade since the dawn of history.

NELC 528a, From Gilgamesh to Persepolis: Introduction to Near Eastern Literatures Kathryn Slanski

This course is an introduction to Near Eastern civilization through its rich and diverse literary cultures. We read and discuss ancient works, such as the *Epic of Gilgamesh*, *Genesis*, and "The Song of Songs," medieval works, such as *A Thousand and One Nights*, selections from the *Qur'an*, and *Shah-nama: The Book of Kings*, and modern works of Israeli, Turkish, and Iranian novelists and Palestianian poets. Students complement classroom studies with visits to the Yale Babylonian Collection and the Beinecke Rare Book and Manuscript Library, as well as with film screenings and guest speakers. Students also learn fundamentals of Near Eastern writing systems, and consider questions of tradition, transmission, and translation. All readings are in translation.

NELC 531b, Magical and Medical Texts from Mesopotamia Eckart Frahm The course focuses on the study of magical and medical texts from Mesopotamia.

NELC 533a / ANTH 531a / CLSS 815a / EALL 773a / HIST 502a / HSAR 564a / JDST 653a / RLST 803a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

NELC 569a, Visible Language: The Origins of Writing in Mesopotamia and Ancient Egypt Klaus Wagensonner

Exploration of writing in the ancient Near East and the profound effects this new method of communication had on human society. Focus on Egypt and Mesopotamia, where advanced writing systems first developed and were used for millennia.

NELC 609b, Old Persian Staff

Study of the ancient Iranian language, Old Persian, in its historical and material context in the Achaemenian Empire, with intensive philological investigation of the inscriptions of the Achaemenid kings. Students learn to read the language in the original cuneiform script and cover almost the entire corpus of texts. They also study the place of Old Persian in Indo-European linguistics and within the Iranian languages as a family. Permission of instructor is required.

NELC 619a / CPLT 552a / MDVL 619a, The Medieval Court Shawkat Toorawa What are the features of the medieval court? To answer this, we look at courts in Western Europe, Byzantium, the Islamic world, and East Asia to learn about courtly culture, court poetry, and court society. Readings include van Berkel et al., *Crisis and Continuity in the Caliphate of al-Muqtadir*; Castiglione, *Book of the Courtier*; Duinden, *Vienna and Versailles*; Elias, *The Court Society*; Maguire, *Byzantine Court Culture*; Miner, *Introduction to Japanese Court Poetry*; al-Washshā, *al-Muwashshā*. Knowledge of French desirable.

NELC 632a / MDVL 802a, The Islamic Near East from Muhammad to the Mongol Invasion Kevin van Bladel

The shaping of society and polity from the rise of Islam to the Mongol conquest of Baghdad in 1258. The origins of Islamic society; conquests and social and political assimilation under the Umayyads and Abbasids; the changing nature of political legitimacy and sovereignty under the caliphate; provincial decentralization and new sources of social and religious power.

NELC 668a / RLST 667a, Arabic Bible and Biblical Interpretation Stephen Davis This graduate seminar focuses on the ways the Bible was transmitted and interpreted in the medieval Arabic-speaking world. *The topic for fall 2024 is the Book of Psalms, with a focus on the Psalms' use and interpretation in Jewish, Christian, and Muslim contexts.* Students who have completed the equivalent of three terms of Arabic instruction, including Classical Arabic, are eligible to enroll in the course with permission of the instructor.

NELC 689b, Edward Said as Public Intellectual Robyn Creswell

This seminar focuses on Edward Said's reflections on the role and responsibilities of the intellectual, paying particular attention to his writings on Palestine, the politics and culture of the Arab world, and the discourse of expertise. We also examine the reception of Said's ideas and example among Arab thinkers. Texts include *Orientalism, The Question of Palestine, After the Last Sky, Representations of the Intellectual*, and numerous essays.

NELC 700a, Abydos: Archaeology of a Political and Spiritual Provincial Capital Gregory Marouard

From the late Predynastic period, Abydos emerged as a major Egyptian site being probably the siege of a proto-state that will provide the very first Egyptian monarchs to rule over the entire Nile Valley. The symbolic role of Abydos as a dynastic capital and foundational for Egyptian kingship – a crucible of the State formation – will be preserved Over the time and rulers of all periods will add their marks to its architectural landscape. Intimately related to the cult of Osiris, a significant part of the semester also focuses on the unique sacred and spiritual scenery preserved at the site. This course proposes an extensive archaeological and diachronic survey of this strategic site, capital of the 8th Upper Egyptian Nome. After an overview of this strategy area and the history of early research at the site, first weeks will overlook on the cemeteries U and B at Umm el-Qaab and the North cemeteries, as final resting places and related ceremonial installations of almost all the Early Dynastic kings of Egypt, from late Naqada II period to the very end of the 2nd Dynasty, which mark the move of the main Royal necropolis in the Memphite area. Marked by the presence of an early Old Kingdom step pyramid, Abydos, as many other Egyptian provincial capitals, seems to regain some significance in the later part of the Old Kingdom as evidenced by settlement installations - town site at Kom el-Sultan – and several cemeteries such as the large Middle Cemetery marked by late OK provincial elite burials several mastabas of governors and high-rank members of the central government such as Weni. The construction of a large funerary chapel by Pepi I also underline the rising cult of Osiris, which will manifest itself in countless forms of royal and popular piety. Middle kingdom occupation will be the occasion to explore the local and long tradition of votive chapels and memorials overlooking the Great Temple of Osiris and to extensively discus the significant mortuary complex, cenotaph, cult temple, and related "Wah Sut" settlement, erected during the reign of Senwosret III. We then discuss the significance of the late 13th Dynasty and S.I.P. occupations in this area with the recently discovered "Abydos Dynasty", and the choice of Abydos for the founder of the 18th Dynasty, Ahmose, for his final resting place within a transitional kind of mortuary complex which include the last Royal pyramid complex and the first New Kingdom style Royal hypogeum. With the later NK phases, the significant of the site will marks the climax of the Osirian cult with the construction of the Seti I temple and the quite unique Osireion complex or the temple complex of Ramesses II.

NELC 709b, The Age of Akhenaton Nadine Moeller and John Darnell Study of the period of the Egyptian pharaoh Akhenaton (reigned 1353–1336 BCE), often termed the Amarna Revolution, from historical, literary, religious, artistic, and archaeological perspectives. Consideration of the wider Egyptian, ancient Near Eastern, African, and Mediterranean contexts. Examination of the international diplomacy, solar theology, and artistic developments of the period. Reading of primary source material in translation.

NELC 725b, New Kingdom Archaeology Nadine Moeller

The New Kingdom period of ancient Egypt (1550–1069 BC) is one of the most vibrant and culturally diverse time periods. Egypt had its first empire and became a major political and economic player within the ancient Near East. Egyptian culture and society was exposed to foreign influence but also evolved internally with its elaborate funerary architecture, royal and private, and saw the emergence of impressive royal cities. This course has the aim to investigate the archaeological data, architecture and corresponding material culture of New Kingdom Egypt (ca. 1550–1069 BCE). We discuss funerary and settlement evidence and the readings are selected according to their overall significance for current research. The aim is to provide a comprehensive overview of the available data and include recent discoveries such as Amenhotep III's "Golden City" on the Theban West Bank and the royal burials along the wadis of the Western Desert. Egypt's contact and influence in the Levant and Nubia are addressed as well, with the aim to achieve a more balanced perspective of these two regions and their populations interacting with Egyptian society.

NELC 743a / ARCG 645a, Archaeology of Ancient Egypt: An Introduction Gregory Marouard

This seminar examines in detail the archaeology of ancient Egypt following the chronological order of Egyptian history and covering almost 4,000 years, from the late Neolithic period to the end of the Greco-Roman period. The aim is not only to

give a comprehensive overview of major sites and discoveries but also to use as much as possible information from recent excavations, discuss problems and priorities concerning this field, and offer an introduction to new fieldwork methods and approaches used in Egypt as well as a short history of this discipline.

NELC 807b, Sasanian Seminar Kevin van Bladel

This is an intensive introduction to the primary sources for the study of the Sasanian Persian kingdom (third–seventh century CE) and the state of research on the topic.

NELC 809b / CLSS 829b / HIST 507b / LING 668b, Historical Sociolinguistics of the Ancient World Kevin van Bladel

Social history and linguistic history can illuminate each other. This seminar confers the methods and models needed to write new and meaningful social history on the basis of linguistic phenomena known through traditional philology. Students learn to diagnose general historical social conditions on the basis of linguistic phenomena occurring in ancient texts. Prerequisite: working knowledge of at least one ancient language.

NELC 843b, Classical Persian Epic Jane Mikkelson

This course acquaints students with some of the most famous epics of classical Persian literature. A remarkably capacious literary form, the Persian masnavī (long narrative poem) can be heroic, historical, religious, philosophical, didactic, or popular. As we attend minutely to matters of grammar, form, prosody, and style, we also keep in view relevant literary, cultural, historical, and intellectual contexts. An essential objective of the course is to introduce students to some of the ways in which the premodern Persian tradition thinks about itself. To that end, primary readings are supplemented with short extracts from works by medieval and early modern theorists, critics, philosophers, and literary historians. Achieving a fine-grained view of the tradition from within illuminates our discussions as we consider the distinctiveness of the epic genre and its ability to foster creative conjunctions across myth and history, philosophy and allegory, religion and entertainment, and oral and written literary cultures. Thinking critically about the scope, history, and exportability of terms like masnavi, epic, and romance leads us into broader conversations about how best to situate classical Persian literature within (or against) world literature - and what that might mean for comparative, entangled, and multifocal histories of the epic form. Prerequisite: intermediate-level reading competency in Persian.

NELC 844a, Classical Persian Lyric Jane Mikkelson

This course acquaints students with some of the most extraordinary lyric poets of classical Persian literature. We read famous medieval figures and early modern luminaries. As we attend minutely to matters of grammar, form, prosody, and style, we also keep in view relevant literary, cultural, historical, and intellectual contexts. An essential aim of the course is to introduce students to some of the ways in which the premodern Persian tradition thinks about itself. To that end, primary readings in poetry and literary prose are supplemented with short extracts from works by medieval and early modern critics, rhetoricians, theorists, and literary historians; these texts supply concepts and skills that are indispensable for reading, appreciating, and researching Persian literature. Achieving a fine-grained view of the tradition from within illuminates our discussions as we consider the distinctiveness of the lyric form; probe various entanglements between literature, philosophy, and religion; and situate the premodern Persian literary tradition against broader comparative horizons that stretch across the Islamicate world and beyond. Prerequisite: intermediate-level reading knowledge of Persian.

NELC 859a, Directed Readings in Near Eastern Languages and Civilizations Shawkat Toorawa

The texts and subjects studied vary based on the focus selected by the faculty to adjust to the the graduate students' research.

OTTM 561a, Ottoman Text Reading I Ozgen Felek

An introduction to Ottoman Turkish. Students develop skills that will enable them to read basic Ottoman Turkish texts and pursue independent work in Ottoman studies. We read and analyze excerpts from original Ottoman texts, such as chronicles, heroic narratives, advice books, physiognomy texts, travel accounts, and hagiographical stories. The principles of Turkish grammar, syntax, and textual criticism are covered as well.

OTTM 562b, Ottoman Text Reading II Ozgen Felek

A continuation of Ottoman reading series. Students will develop skills that will enable them to read basic Ottoman Turkish texts and pursue independent work in Ottoman studies. We read and analyze excerpts from original Ottoman texts, such as chronicles, heroic narratives, advice books, physiognomy texts, travel accounts, and hagiographical stories. The principles of Turkish grammar, syntax, and textual criticism are reviewed as well.

OTTM 567b, Islamic Manuscript Illumination: History, Theory, and Practice Ozgen Felek

This course is focused on the history, theory, and practice of Islamic manuscript illumination.

OTTM 692a, Nineteenth-Century Jerusalem in Ottoman Archives Ozgen Felek This course is focused on texts related to Jerusalem in the nineteenth-century Ottoman archives. Permission from instructor.

PERS 500a, Elementary Persian I Farkhondeh Shayesteh

A two-term introduction to modern Persian with emphasis on all four language skills: reading, writing, listening, and speaking. The objective is to allow students to develop the foundational knowledge necessary for further language study. Designed for nonnative speakers.

PERS 501b, Elementary Persian II Farkhondeh Shayesteh

A two-term introduction to modern Persian with emphasis on all four language skills: reading, writing, listening, and speaking. The objective is to allow students to develop the foundational knowledge necessary for further language study. Designed for nonnative speakers.

PERS 502a, Intermediate Persian I Farkhondeh Shayesteh

This two-term course is a continuation of PERS 501 with emphasis on expanding vocabulary and understanding of more complex grammatical forms and syntax. Designed for nonnative speakers. Prerequisite: PERS 501 or permission of the instructor.

PERS 503b, Intermediate Persian II Farkhondeh Shayesteh

This two-term course is a continuation of PERS 501 with emphasis on expanding vocabulary and understanding of more complex grammatical forms and syntax.

Designed for nonnative speakers. Prerequisite: PERS 501 or permission of the instructor.

PERS 561a, Persian Culture and Media Farkhondeh Shayesteh Advanced study of Persian grammar, vocabulary, and culture through the use of authentic Persian media. Examination of daily media reports on cultural, political, historical, and sporting events in Iran, Afghanistan, Tajikistan, and other Persianspeaking regions. Designed for nonnative speakers. Prerequisite: PERS 140 or permission of instructor.

SMTC 513a / RLST 838a, Elementary Syriac I Jimmy Daccache

Syriac was an Aramaic dialect that developed its own written tradition in the northern Levantine city of Edessa in classical antiquity. It became (and remains to this day) the liturgical language of Eastern Christianity in its various manifestations. This course provides students with a basic working knowledge of the language, namely, the three principal scripts (Estrangela, Serto, and "Nestorian"), verbal morphology, and the fundamental rules of syntax. Extracts of several Syriac texts are studied for purposes of application. At the end of the course, students are able to read, translate, and analyze simple texts.

SMTC 514b / RLST 839b, Elementary Syriac II Jimmy Daccache

Syriac was an Aramaic dialect that developed its own written tradition in the northern Levantine city of Edessa in classical antiquity. This course provides students with a basic working knowledge of the language, namely, the three principal scripts (Estrangela, Serto, and "Nestorian"), verbal morphology, and the fundamental rules of syntax. The course completes the introduction to the Syriac language. Extracts of several Syriac texts are studied for purposes of application. At the end of the course, students are able to read, translate, and analyze simple texts. Prerequisite: RLST 838/ SMTC 513.

SMTC 523a / RLST 848a, Intermediate Syriac I Chris Mezger

This two-term course is designed to enhance students' knowledge of the Syriac language by reading a selection of texts, sampling the major genres of classical Syriac literature. By the end of the year, students are familiar with non-vocalized texts and are capable of confronting specific grammatical or lexical problems. Prerequisite: RLST 839/SMTC 514 or knowledge of Syriac.

SMTC 524b / RLST 868b, Intermediate Syriac II Chris Mezger

The goal of this course is to enable students to gain proficiency in the Syriac language at a higher level. We continue readings in the major genres of classical Syriac literature, with special emphasis on texts from the ninth century onward. By the end of the term, students will have mastered complex grammatical structures. Prerequisite: RLST 848/ SMTC 523 or knowledge of Syriac.

SMTC 546a / RLST 834a, Northwest Semitic Inscriptions: Phoenician and Punic Epigraphy Jimmy Daccache

This course completes the introduction of Phoenician epigraphy. It is designed to study the Phoenician and Punic inscriptions found in the western Mediterranean basin. The chronological span stretches from the eighth century BCE to the Roman period. The study of inscriptions – examined from photographs and drawings – follows a chronological order: Phoenician inscriptions from the eighth and seventh centuries BCE (Italy, Iberian Peninsula); Punic and Late Punic inscriptions between the sixth century BCE and the first century CE (Italy, Iberian Peninsula, North Africa [Carthage, Maktar, etc.]). At the end of the term, students have a firm grasp of the Phoenician language and script and its evolution toward Punic and Late Punic. Prerequisite: RLST 832.

SMTC 553a / RLST 874a, Advanced Syriac I Jimmy Daccache

This course is designed for graduate students who are proficient in Syriac and is organized topically. Topics vary each term and are listed in the syllabus on Canvas.

SMTC 554b / RLST 875b, Advanced Syriac II Jimmy Daccache

This course is designed for graduate students who are proficient in Syriac and is organized topically. Topics vary each term and are listed in the syllabus on Canvas.

Nursing

400 West Campus Drive, 203.785.2389 https://nursing.yale.edu/academics/phd-program-nursing M.Phil., Ph.D.

Dean Azita Emami

Director of Graduate Studies

M. Tish Knobf (203.785.6455, tish.knobf@yale.edu)

Professors Xiaomei Cong, Azita Emami, M. Tish Knobf, LaRon Nelson, Tatiana Sadak, David Vlahov, Xuehong Zhang

Associate Professors Deena Costa, Soohyun Nam, Monica Ordway, Hermine Poghosyan, Raquel Ramos, Julie Womack

Assistant Professors Bridget Basile-Ibrahim, Shelli Feder, Zhao Ni

FIELDS OF STUDY

Common areas of inquiry include chronic conditions; self- and family management; symptom science; maternal and child health; sleep and sleep disorders; global health; health equity and health disparities; end-of-life and palliative care; environmental influences on health; and community-based interventions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Coursework

Completion of fifteen core courses and four cognates in the student's area of specialization (including one advanced analysis course) is required. Successful completion of the Dissertation Seminar (NURS 906 in the fall and NURS 907 in the spring) every term until the final dissertation defense is also required.

REQUIRED CORE COURSES

BIS 505	Biostatistics in Public Health II	1
BIS 633	Population and Public Health Informatics	1
CDE 534	Applied Analytic Methods in Epidemiology	1
or S&DS 563	Multivariate Statistical Methods for the Social Sciences	
EPH 505	Biostatistics in Public Health	1
NURS 901	Quantitative Methods for Health Research	1
NURS 902	Qualitative Methods for Health Research	1
NURS 903	Measurement of Biobehavioral Phenomena	1
NURS 904	Mixed Methods Research	1
NURS 905	Intervention Development and Introduction to Implementation Science	1
NURS 908	Synthesis of Knowledge and Skills for Nursing Science	1
NURS 912	Knowledge Development for Nursing Science	1

NURS 913	Chronic Conditions: Risk Factors, Prevention, and Management of Adverse Outcomes	1
NURS 915	Nurse Scientist and Grant Writing	1
NURS 929	Responsible Conduct of Research	1
NURS 985	Achieving Population Health Equity	1

Cognates may be taken in any area related to the student's dissertation research, including appropriate methodology and statistics courses. Some examples of the disciplines that doctoral students have chosen are public health, psychology, anthropology, divinity, and sociology.

The grading system includes Honors, High Pass, Pass, and Fail. Students must maintain a High Pass average and achieve a grade of Honors in at least two core courses to remain in good standing. After the first year, no more than one grade of Pass in a core course will be permitted. A grade of Pass or better is required for all cognates.

In addition to all other requirements, students must successfully complete NURS 929, Responsible Conduct of Research, prior to the end of their first year of study. This requirement must be met prior to registering for a second year of study.

The Yale School of Nursing does not offer the option of a combined degree.

Graduate Research Assistant and Teaching Fellow Experience

During the first two years of the program, students are Graduate Research Assistants with faculty mentors and participate in the mentor's ongoing research.

Teaching experience is also considered to be an integral part of graduate education. Therefore, two terms as a Teaching Fellow are required. Teaching Fellows assist with the teaching of master's-level courses, typically during their third year of doctoral study.

Examinations

Successful completion of three examinations is required.

- 1. The preliminary examination is taken in June after the first year of coursework has been completed. The preliminary examination is intended to allow the student to demonstrate mastery of doctoral coursework. Passing the preliminary examination is a prerequisite for continuing in the second year of doctoral study.
- 2. The qualifying examination typically takes place at the end of the second year of study, when required coursework is completed. If the qualifying examination is not completed by the end of the sixth term, the student will be placed on Academic Probation. If not completed by the end of the seventh term, the student will be dismissed from the program. The student prepares a comprehensive dissertation proposal containing a statement of the problem to be studied, conceptual framework, critical review of relevant literature, design, methods, and plan for analysis. The oral qualifying examination typically lasts one to one-and-a-half hours. The student gives a twenty-minute formal presentation of the proposed study and answers questions regarding the research and related topics. Successful

completion of the Qualifying Examination is required for candidacy for the doctoral degree.

3. The final oral examination is based on the dissertation. The dissertation is intended to demonstrate that the student is competent in the chosen area of study and has conducted independent research. The final oral examination typically lasts oneand-a-half to two hours. The student gives a twenty-minute formal presentation of the dissertation and answers questions. Successful completion of the final oral examination is required before the Ph.D. can be awarded.

MASTER'S DEGREE

M.Phil. This degree will be granted to Ph.D. students who successfully complete two years of coursework, but do not progress to the dissertation stage. To be awarded the M.Phil. degree, students need to complete all core courses, four cognates (may include independent study with faculty), and two years of Graduate Research Assistant experience, and must pass the Preliminary Examination. This degree is normally granted only to students who are withdrawing from the Ph.D. program.

For information on the terminal master's degree offered by the Yale School of Nursing (Master of Science in Nursing), please visit the school's website, https:// nursing.yale.edu.

REQUIRED NURSING COURSES

All Ph.D. students are required to take the following courses. For a complete list of Nursing courses, see the School of Nursing bulletin, online at https://bulletin.yale.edu; and Yale Course Search at https://courses.yale.edu.

NURS 901a, Quantitative Methods for Health Research Julie Womack and Soohyun Nam

This course introduces students to quantitative research methods and how to evaluate various scientific designs for investigating problems of importance to nursing and health. Emphasis is placed on scientific rigor, validity, and the critical appraisal of research. Experimental, quasi-experimental, and observational designs are presented and evaluated for internal, external, construct, and statistical validity. The interrelationships of the research question and study aims with study design and method are thoroughly explored. The course prepares students for designing a quantitative study. Required of first-year Ph.D. students in nursing. Three hours per week for fourteen weeks.

NURS 903a, Measurement of Biobehavioral Phenomena Xiaomei Cong This course is designed to review measurement theory, reliability, and validity of measurement methods and discuss the accuracy and precision of biological and behavioral measures for clinical research. Measures are evaluated through the lens of diverse communities and populations, with the goals of promoting health equity. Required of all second-year Ph.D. students in nursing. Open to advanced graduate students in other schools of the University. Three hours per week for fourteen weeks.

NURS 904a, Mixed Methods Research Shelli Feder

The purpose of this course is to provide an overview of mixed methods research. This overview consists of the history, philosophical foundations, purpose, data collection,

analysis, and evaluation of the common mixed methods designs. Required of all Ph.D. students in nursing. Three hours per week for seven weeks.

NURS 906a, Dissertation Seminar I M. Tish Knobf

This required doctoral course provides the student with advanced study and direction in research leading to development of the dissertation proposal and completion of the dissertation. Students are guided in the application of the fundamentals of scientific writing and criticism. All Ph.D. students in nursing are required to take this seminar every term. Three hours every other week for fourteen weeks.

NURS 908a, Synthesis of Knowledge and Skills for Nursing Science M. Tish Knobf This course is designed to develop beginning competencies necessary to engage in a career as a nurse scientist. It includes the basic principles and processes of scientific writing, literature searches, synthesis of research evidence, and presentation skills.

NURS 912a, Knowledge Development for Nursing Science Deena Costa This course introduces the historical perspective of the philosophy of science and the relationship to nursing science. Students review nursing's disciplinary perspective and examine the philosophical, theoretical, and conceptual linkages for knowledge development for nursing science. The course is required of all first-year students in the Ph.D. program and open to others by permission of the instructor. Three hours per week for fourteen weeks.

Pathology and Molecular Medicine

140 Brady Memorial Laboratory https://medicine.yale.edu/pathology/training/graduateprogram M.S., M.Phil., Ph.D.

Chair Chen Liu

Director of Graduate Studies Themis Kyriakides

Professors Nita Ahuja (Surgery), Ranjit Bindra (Therapeutic Radiology), Marcus Bosenberg (Dermatology), Richard Bucala (Internal Medicine), Sandy Chang (Laboratory Medicine), Keith Choate (Dermatology), Vishwa Deep Dixit, Rong Fan (Biomedical Engineering), Carlos Fernandez-Hernando (Comparative Medicine), Gary Friedlaender (Orthopedics and Rehabilitation), Patrick Gallagher (Pediatrics), Erica Herzog (Internal Medicine), Robert Homer, Steven Kleinstein, Yuval Kluger, Christine Ko (Dermatology), Diane Krause (Laboratory Medicine), Themis Kyriakides, Francis Lee (Orthopaedics and Rehabilitation), Chen Liu, Vincent Marchesi, Gilbert Moeckel, Ruth Montgomery (Rheumatology), Jon Morrow, Jordan Pober (Immunobiology), Katerina Politi, David Rimm, David Stern, Yajaira Suarez (Comparative Medicine), Qin Yan

Associate Professors Demetrios Braddock, Karin Finberg, Joanna Gibson, Stephanie Halene (*Hematology*), Anita Huttner, Ryan Jensen (*Therapeutic Radiology*), Samuel Katz, Peggy Myung (*Dermatology*), Don Nguyen, Manoj Pillai (*Hematology*), Kurt Schalper, Yibing Qyang (*Internal Medicine*), Silvia Vilarinho (*Internal Medicine*), Dean Yimlamai (*Pediatrics*)

Assistant Professors Arnaud Augert, Mathieu Bakhoum (*Ophthalmology and Visual Sciences*), Gianfilippo Coppola, William Damsky (*Dermatology*), Marcello DiStasio, Romina Fiorotto (*Internal Medicine*), Salil Garg (*Lab Medicine*), Pallavi Gopal, Brian Hafler (*Neurology*), Albert Higgins-Chen (*Psychiatry*), Won Jae Huh, Jeffrey Ishizuka (*Medical Oncology*), Nelson LaMarche, Stephania Libreros, Yang Liu, Caleigh Mandel-Brehm, Sathish Ramakrishnan, Jenny Huanjiao Zhou

FIELDS OF STUDY

Fields include molecular medicine with an emphasis on disease mechanisms and therapies, including cancer; biology, biochemistry, genetics, and pathology of molecules, cells, tissues, and organ systems, including plasma membrane dynamics, mitochondrial dysfunction, signal transduction, and response to stimuli of connective tissue; assembly of viruses and their interactions with animal cells; somatic cell genetics and birth defects; biology of endothelial cells; and computational and high-throughput approaches to understanding disease pathology.

To enter the Ph.D. program, students apply to an interest-based track, usually the Translational Molecular Medicine, Pharmacology, and Physiology track (TMMPP), within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs. After successful completion of year one, BBS students will choose a department to join.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Course Requirements Pathology and Molecular Medicine students are required to complete the following core requirements: pass PATH 640, Developing and Writing a Scientific Research Proposal; PATH 650, Biology of Cancer; PATH 679 and PATH 680, Seminar in Molecular Medicine, Pharmacology and Physiology (if not already taken in first year) and PATH 690, Molecular Mechanisms of Disease. In addition, students must take two graduate-level electives, which can include courses in biochemistry, genetics, immunology, cell biology, and pathology, to be chosen in consultation with the director of graduate studies (DGS), based on the student's background and interest. All requirements of the graduate school must be met including the school's two Honors Grade requirement by the end of the fourth term of full-time study. Students must also maintain an overall High Pass average. Student progress toward these goals is reviewed at the end of the second term. Students must successfully complete PATH 660, Responsible Conduct of Research. In their fourth year of study, all students must successfully complete B&BS 503, RCR Refresher for Senior BBS Students.

Teaching Requirements In accordance with the BBS program, Ph.D. students are expected to participate in two terms (or the equivalent) as a Teaching Fellow. Teaching assignments in fulfillment of the requirement must be approved in advance by the DGS. Pathology students do not teach in year one and two unless special circumstance and approved by the DGS.

Qualifying Examination The qualifying examination of the Pathology and Molecular Medicine graduate program comprises: (1) enrollment in the BBS/Pathology course PATH 640, Developing and Writing a Scientific Research Proposal in the fall term of year two and preparation of a proposal on the topic of the student's research; students will receive assistance from a faculty member who will later be part of the qualifying committee; (2) two literature reading periods in the spring term of year two that are specifically related to the grant proposal; and (3) an oral exam in which the student is examined by the qualifying exam committee on the research proposal, the reading periods, and general knowledge of experimental pathology. This exam is usually taken in the second term of the second year and is described below.

The qualifying examination committee, consisting of three faculty members, will be chosen to examine the student. At least two of the committee members must have appointment in the Department of Pathology (one primary required). The thesis adviser is not on the exam committee. The membership of the committee must be approved by the DGS. The student will read with two committee members. The faculty member who assisted the student during the proposal writing period will serve as the third person on the committee. At the oral exam, one member of the committee will be selected as the chairperson responsible for documenting the results of the exam for submission to the DGS. Members of the exam committee should have expertise in areas chosen for reading.

Prospectus and Admission to Candidacy Upon successful completion of the qualifying examination, the student will constitute a dissertation committee including at minimum three members in addition to the dissertation/thesis adviser. At least two of the committee members must be Pathology department faculty. The membership of the committee must be approved by the DGS. The student will prepare a written thesis

prospectus, consisting of a summary of background information in the field of interest, the specific questions to be answered, a rationale for choosing those questions, and a research plan for addressing those questions. Upon completing the course requirement with at least two terms of Honors, passing the qualifying examination, and submitting a thesis prospectus, students will be admitted to candidacy. This should take place by the end of the third year. Students must then submit a written thesis describing the research and present a thesis research seminar.

M.D.-PH.D. STUDENTS

M.D.-Ph.D. students must satisfy all the requirements listed above for the Ph.D. with the following modifications: Two laboratory rotations are required. Serving as a teaching fellow for one term is required. Five courses are required for the Ph.D., including PATH 640, Developing and Writing a Scientific Research Proposal; PATH 650, Biology of Cancer; PATH 679 and PATH 680, Seminar in Molecular Medicine, Pharmacology and Physiology; and PATH 690, Molecular Mechanisms of Disease. With DGS approval, an equivalent for PATH 660 is allowed.

See Graduate School Degree Requirements under Policies and Regulations.

MASTER'S DEGREES

See Graduate School Degree Requirements under Policies and Regulations.

M. Phil. See Degree Requirements under Policies and Regulations. The M. Phil. is awarded only to students who are continuing for the Ph.D. Students are not admitted for this degree. Students will be automatically petitioned by the university for a M.Phil. after successful completion of the requirements at the end of the third year. No additional action is required on the part of the student.

M.S. Students are not admitted for this degree. On a case-by-case basis and subject to faculty vote, students who are not continuing for the Ph.D. may be considered for an M.S. degree if they have successfully completed the course requirements for the Ph.D. degree listed above and received a grade of Honors in at least two courses to meet the graduate school's requirements. Students who meet this criterion are eligible to petition for the M.S degree.

Additional information can be found on the Pathology and Molecular Medicine graduate-student website, https://medicine.yale.edu/pathology/training/ graduateprogram.

PATH 620a / C&MP 506a / PHAR 506a / PTB 620a, Lab Rotations Staff Students work in laboratories of faculty of their choice. The schedule for each rotation is announced at the beginning of the fall term.

PATH 630b / ENAS 535b, Biomaterial-Tissue Interactions Themis Kyriakides Study of the interactions between tissues and biomaterials, with an emphasis on the importance of molecular- and cellular-level events in dictating the performance and longevity of clinically relevant devices. Attention to specific areas such as biomaterials for tissue engineering and the importance of stem/progenitor cells, as well as biomaterial-mediated gene and drug delivery.

PATH 640a / B&BS 640a, Developing and Writing a Scientific Research Proposal Katerina Politi

The course covers the intricacies of scientific writing and guides students in the development of a scientific research proposal on the topic of their research. All elements of an NIH fellowship application are covered, and eligible students submit their applications for funding. Enrollment limited to twelve. Required of second-year graduate students in Pathology and Molecular Medicine. Registration allowed by prior authorization from course directors only.

PATH 650b, Biology of Cancer David Stern

A comprehensive survey of cancer research from the cellular to the clinical level. The relation of cancer to intracellular and intercellular regulation of cell proliferation is emphasized, as are animal models for cancer research. Background in molecular genetics and cell biology is assumed. Open to advanced undergraduates with permission of the organizers.

PATH 66ob / C&MP 65ob / PHAR 58ob / PTB 65ob, The Responsible Conduct of Research Staff

Organized to foster discussion, the course is taught by faculty in the Pharmacology, Pathology, and Physiology departments and two or three senior graduate students. Each session is based on case studies from primary literature, reviews, and two texts: Francis Macrina's *Scientific Integrity* and Kathy Barker's *At the Bench*. Each week, students are required to submit a reaction paper discussing the reading assignment. Students take turns leading the class discussion; a final short paper on a hot topic in bioethics is required.

PATH 679a and PATH 680b / C&MP 629a and C&MP 630b / PHAR 501a and PHAR 502b / PTB 629a and PTB 630b, Seminar in Molecular Medicine, Pharmacology, and Physiology Staff

Readings and discussion on a diverse range of current topics in molecular medicine, pharmacology, and physiology. The class emphasizes analysis of primary research literature and development of presentation and writing skills. Contemporary articles are assigned on a related topic every week, and a student leads discussions with input from faculty who are experts in the topic area. The overall goal is to cover a specific topic of medical relevance (e.g., cancer, neurodegeneration) from the perspective of three primary disciplines (i.e., physiology: normal function; pathology: abnormal function; and pharmacology: intervention). Required of and open only to Ph.D. and M.D./Ph.D. students in the Molecular Medicine, Pharmacology, and Physiology track.

PATH 681a, Advanced Topics in Cancer Biology Kurt Schalper

This advanced course focuses on readings and discussion on three or four major topics in cancer biology, such as targeted therapy, tumor immunology, tumor metabolism, and genomic evolution of cancer. For each topic, the class starts with an interactive lecture, followed by critical analysis of primary research literature. Recent research articles are assigned, and a student leads discussions with input from faculty who are experts in the topic area. Prerequisite: PATH 650 or permission of the instructor. Open to all Ph.D., M.D./Ph.D., and M.P.H. students and to advanced undergraduates at the discretion of the instructor. **PATH 690a / PTB 690a, Molecular Mechanisms of Disease** Demetrios Braddock This course covers aspects of the fundamental molecular and cellular mechanisms underlying various human diseases. Many of the disorders discussed represent major forms of infectious, degenerative, vascular, neoplastic, and inflammatory disease. Additionally, certain rarer diseases that illustrate good models for investigation and/ or application of basic biologic principles are covered in the course. The objective is to highlight advances in experimental and molecular medicine as they relate to understanding the pathogenesis of disease and the formulation of therapies.

Pharmacology

Sterling Hall of Medicine B316, 203.785.7469 http://medicine.yale.edu/pharm M.S., M.Phil., Ph.D.

Chair

Mark Lemmon (SHM B 203/WC ABC-301B, mark.lemmon@yale.edu)

Directors of Graduate Studies

David Calderwood (SHM B 395C, 203.737.2311, david.calderwood@yale.edu) Kathryn Ferguson (WC ABC-305C/SHM B 226C, kathryn.ferguson@yale.edu)

Professors Karen Anderson, Anton Bennett, David Calderwood, Yung-Chi Cheng, Joseph Contessa (*Therapeutic Radiology*), Craig Crews (*Mollecular, Cellular, and Developmental Biology*), Barbara Ehrlich, Jonathan Ellman, Seth Herzon (*Chemistry*), Leonard Kaczmarek, Irit Lax, Mark Lemmon, Elias Lolis, Kathleen Martin (*Cardiovascular Medicine*), Angus Nairn (*Psychiatry*), Joseph Schlessinger, Dianqing Wu

Associate Professors Titus Boggon, Jason Cai (*Radiology and Biomedical Imaging*), Kathryn Ferguson, Daryl Klein, Yansheng Liu, Ya Ha, Faye Rogers (*Therapeutic Radiology*), Benjamin Turk

Assistant Professors Claudio Alarcón, Assaf Alon, Moitrayee Bhattacharyya, Joel Butterwick, Sangwon Lee, Ken Loh (*Comparative Medicine*), Wei Mi

FIELDS OF STUDY

Major emphases in the Pharmacology Graduate Program are in the areas of molecular pharmacology, mechanisms of drug action, signal transduction, structural biology, infectious diseases, neuropharmacology, and chemotherapy.

To enter the Ph.D. program, students should apply to the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/ bbs, and select one of the interest-based tracks. Most students interested in a Ph.D. in pharmacology select the Translational Molecular Medicine, Pharmacology, and Physiology (TMMPP) or the Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BQBS) tracks.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The field of pharmacology encompasses many disciplines. Flexibility in the Pharmacology Graduate Program permits students to concentrate in the areas of their particular interest. Students are required to take at least five courses. Students must take both terms of the graduate seminar course (PHAR 501 and PHAR 502) or equivalent courses from another program. The other three required courses are selected based on the interest of each student, but must include at least one of the following core courses: PHAR 504, PHAR 528, PHAR 529, MB&B 720, MB&B 752, or other DGS-approved BBS courses. Students are also required to do three laboratory rotations in their first year (PHAR 506). The graduate school requires a grade of Honors for a minimum of two courses. Honors for rotations cannot be used toward this requirement and only one Honors grade from PHAR 501/PHAR 502 can count toward this requirement. Students must meet this Honors requirement prior to being admitted to candidacy and must maintain an overall High Pass average. A grade of Honors or High Pass is required for the selected core courses. Student progress toward these goals is reviewed at the end of the second and subsequent terms.

Prior to registering for a second year of study, students must successfully complete PHAR 580, The Responsible Conduct of Research, or the equivalent from another department. In addition, B&BS 503, RCR Refresher for Senior BBS Students, must be completed by the end of the fourth year. PHAR 580 and B&BS 503 do not count towards the five required courses.

Students are required to pass the qualifying examination by the end of their fourth term. In preparation for this, Pharmacology Graduate Program students must take PHAR 540, Developing and Writing a Scientific Research Proposal, in the spring term of their second year (this does not count toward the five-course requirement). Before the end of the third year, a thesis prospectus must be submitted and accepted for admission to candidacy. Once a student's original doctoral dissertation research is largely complete, they give an oral presentation to the Pharmacology faculty (pre-defense) for approval. Within six months of passing the pre-defense, the student must submit a preliminary written thesis to the thesis committee and an outside reader. A public Ph.D. dissertation seminar will then be scheduled, followed by a closed examination by the student's thesis committee and the outside examiner. Once the draft of the written thesis is approved by the thesis committee, it is submitted to the Graduate School. One first-author manuscript is required from the thesis research. The Pharmacology Graduate Program faculty recognizes that some types of thesis-related work can take a long time. If deemed necessary, with agreement across the faculty that the student has made substantial progress in a project of this sort, the faculty can exempt a student from the one first-author paper requirement.

An important aspect of graduate training in pharmacology is the acquisition of teaching skills through participation in teaching courses related to the student's scientific interests. These opportunities can be drawn from a diverse menu of lecture, laboratory, and seminar courses given at the undergraduate, graduate, and medical school levels. Ph.D. students are required to participate in two terms (or the equivalent) of teaching. Students are not expected to teach during their first year.

M.D.-PH.D. STUDENTS

M.D.-Ph.D. students must satisfy all of the above requirements for the Ph.D. with the following modifications: (1) only two of three laboratory rotations are required; (2) some medical-school courses (except pharmacology) can qualify as graduate-school courses as long as the M.D.-Ph.D. student registers for them in OCS (Online Course Selection); and (3) only one term of teaching is required. Current graduate-school courses cannot be used to fulfill any medical-school course requirements.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Students who withdraw from the Ph.D. program may be eligible to receive the M.S. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.S., students must successfully complete the first three terms of the Ph.D. program. This includes one year of lab rotations and course requirements.

Program materials are available upon request to the Director of Graduate Studies, Department of Pharmacology, Yale University, PO Box 208066, New Haven CT 06520-8066.

COURSES

PHAR 501a and PHAR 502b / C&MP 629a and C&MP 630b / PATH 679a and PATH 680b / PTB 629a and PTB 630b, Seminar in Molecular Medicine, Pharmacology, and Physiology Staff

Readings and discussion on a diverse range of current topics in molecular medicine, pharmacology, and physiology. The class emphasizes analysis of primary research literature and development of presentation and writing skills. Contemporary articles are assigned on a related topic every week, and a student leads discussions with input from faculty who are experts in the topic area. The overall goal is to cover a specific topic of medical relevance (e.g., cancer, neurodegeneration) from the perspective of three primary disciplines (i.e., physiology: normal function; pathology: abnormal function; and pharmacology: intervention). Required of and open only to Ph.D. and M.D./Ph.D. students in the Molecular Medicine, Pharmacology, and Physiology track.

PHAR 504a / PTB 504a, Molecular Mechanisms of Drug Actions Elias Lolis This course provides fundamental background in core principles of pharmacology, molecular mechanisms of drug action, and important research areas in contemporary pharmacology. Material covered includes quantitative topics in pharmacology such as drug-receptor theory, multiple equilibria and kinetics, pharmacokinetics, therapeutic drug monitoring, and drug metabolism. Specific content on the mechanisms of drug action includes autonomics; ion channel blockers; endocrine agents (hormones); cardiovascular drugs (ACE inhibitors, organic nitrates, β -blockers, acetylsalicylic acid); antimicrobials (anti-bacterials, fungals, and virals); anti-cancer, anti-inflammatory, anti-asthma, and anti-allergy drugs; and immunosuppressants. Students learn how to model drug-receptor interaction parameters and how to analyze steady-state enzyme kinetics and inhibition data. Senior students serving as teaching assistants lead discussion groups covering problem sets, review topics or assigned manuscripts. The course includes a self-study component consisting of video modules produced in collaboration with Yale faculty and Merck that explore the preclinical and clinical phases of drug development.

PHAR 506a / C&MP 506a / PATH 620a / PTB 620a, Lab Rotations Staff Students work in laboratories of faculty of their choice. The schedule for each rotation is announced at the beginning of the fall term.

PHAR 528b, Principles of Signal Transduction Anton Bennett The regulation of intracellular signaling is of fundamental importance to the understanding of cell function and regulation. This course introduces the broad principles of intracellular signal transduction. More detailed lectures on specific intracellular signaling pathways are given in which students learn both the basic and most recent and cutting-edge concepts of intracellular signaling. Topics include regulation of signaling by protein phosphorylation, small G proteins, G-proteincoupled receptors, hormones, phospholipids, adhesion, and gasses.

PHAR 529b / MB&B 529b, Structural Biology and Drug Discovery Titus Boggon and Ya Ha

A comprehensive introduction to the concepts and practical uses of structural biology and structural biology-related techniques in drug discovery. The first half of the course focuses on techniques used to discover and optimize small and macromolecule drugs. Students are introduced to topics such as small molecule lead discovery, X-ray crystallography, cryo-electron microscopy, and biophysical techniques. The first half of the course also includes a practical component where students conduct hands-on structural biology experiments and learn about biophysical techniques in a laboratory setting. The second half of the course focuses on drug discovery, particularly for protein kinases. It includes a field trip to the Yale Center for Drug Discovery, where the students are introduced to the in-house Yale screening facilities for small molecule drug discovery. Two half-credit courses – PHAR 530 and PHAR 531 – are also offered for the two halves of PHAR 529.

PHAR 530b, Targeted Use of Structural Biology in Drug Discovery Titus Boggon and Ya Ha

This 0.5-credit course, the second half of PHAR 529, begins in February. The goal of the course is to show students how concepts of structural biology are applied to areas of great importance in pharmacology such as protein kinases, proteases, cell surface receptors, integrins and other membrane-bound enzymes, and transporters and channels, and how these concepts facilitate drug development. ¹/₂ Course cr

PHAR 531b, Concepts of Structural Pharmacology Titus Boggon and Ya Ha This 0.5-credit course, the first half of PHAR 529, introduces students to the concepts of structural biology and provides the background for how these concepts are applied to areas of great importance in pharmacology and how they facilitate drug development. ½ Course cr

PHAR 537a, Systems Pharmacology and Integrated Therapeutics Kathryn Ferguson This course provides an in-depth, "hands-on" experience in drug design, drug discovery, high-throughput screening, state-of-the-art proteomics, and target validation.

PHAR 538a, Pharmacokinetics and Pharmacodynamics in Neuropharmacology Jason Cai

This course is designed to give a historic account of drug discovery and development for brain diseases, introduce methods to understand the pharmacological mechanisms of drugs working on neurological systems, and inspire young generations to join the endeavor of drug discovery and development for brain diseases. It is designed for advanced graduate students, postdocs, and residents with basic knowledge in chemistry, pharmacology, and neuroscience. The lecturers and guest lecturers are leading experts in the field of PET and MR imaging, and industry leaders in pharmaceutical science. This course also introduces the applications of advanced imaging technologies (PET, MRI) in the study of pharmacokinetics and pharmacodynamics of CNS drugs in humans and its implications to our understanding of neurodegenerative and neuropsychiatric disorders. Each class constitutes a fortyfive-minute didactic lecture and a thirty-minute interactive discussion section. The classroom activities are expected to prepare students for their future endeavor in the field of neuropharmacology. Open to students second-year and up.

PHAR 540b, Qualifying Exam Prep Class for Pharmacology Mark Lemmon, Titus Boggon, and Moitrayee Bhattacharyya

The goal of this class is to teach students to conceive, write, and defend a grant proposal. The timing of this half-term course is aligned with the pharmacology qualifying exam in the spring term, for which a written research proposal is required. This course takes students through the steps of proposal writing, guiding them in defining a problem of their own and training them in the mechanics of writing. Additional support is given as needed to students with more limited writing experience. By taking the "guesswork" out of the writing process, students can focus on the development of their research proposal without the added anxiety associated with an unfamiliar process. Students learn about the structure and components of fellowship and grant proposals. They engage in "mock study sections", providing written critiques and participating in discussion of sample proposals assigned by the instructors. Students give oral presentations of their specific aims followed by classroom discussion. At the end of the course, students will have made substantial progress toward completing the written portion of their qualifying exam and gained a set of competencies central to this program. Open to graduate students only. Priority is given to pharmacology students.

PHAR 550a / C&MP 550a / ENAS 550a / MCDB 550a / PTB 550a, Physiological

Systems W. Mark Saltzman and Stuart Campbell

The course develops a foundation in human physiology by examining the homeostasis of vital parameters within the body, and the biophysical properties of cells, tissues, and organs. Basic concepts in cell and membrane physiology are synthesized through exploring the function of skeletal, smooth, and cardiac muscle. The physical basis of blood flow, mechanisms of vascular exchange, cardiac performance, and regulation of overall circulatory function are discussed. Respiratory physiology explores the mechanics of ventilation, gas diffusion, and acid-base balance. Renal physiology examines the formation and composition of urine and the regulation of electrolyte, fluid, and acid-base balance. Organs of the digestive system are discussed from the perspective of substrate metabolism and energy balance. Hormonal regulation is applied to metabolic control and to calcium, water, and electrolyte balance. The biology of nerve cells is addressed with emphasis on synaptic transmission and simple neuronal circuits within the central nervous system. The special senses are considered in the framework of sensory transduction. Weekly discussion sections provide a forum for in-depth exploration of topics. Graduate students evaluate research findings through literature review and weekly meetings with the instructor.

PHAR 580b / C&MP 650b / PATH 660b / PTB 650b, The Responsible Conduct of Research Staff

Organized to foster discussion, the course is taught by faculty in the Pharmacology, Pathology, and Physiology departments and two or three senior graduate students. Each session is based on case studies from primary literature, reviews, and two texts: Francis Macrina's *Scientific Integrity* and Kathy Barker's *At the Bench*. Each week, students are required to submit a reaction paper discussing the reading assignment. Students take turns leading the class discussion; a final short paper on a hot topic in bioethics is required.

Philosophy

Connecticut Hall, 203.432.1665 http://philosophy.yale.edu M.A., Ph.D.

Chair Paul Franks

Director of Graduate Studies Sun-Joo Shin (sun-joo.shin@yale.edu)

Professors Stephen Darwall, Michael Della Rocca, Keith DeRose, Paul Franks, Tamar Gendler, Daniel Greco, Verity Harte, Brad Inwood, Shelly Kagan, Joshua Knobe, Laurie Paul, Thomas Pogge, Scott Shapiro, Sun-Joo Shin, Steven Smith, Jason Stanley, Zoltán Szabó, Kenneth Winkler, Gideon Yaffe

Associate Professors Robin Dembroff, John Pittard

Assistant Professors Claudia Dumitru, Lily Hu, Jacob McNulty

FIELDS OF STUDY

The department offers a wide range of courses in various traditions of philosophy, with strengths and a well-established reputation in the history of philosophy, ethics, philosophy of law, epistemology, philosophy of language, and philosophy of religion as well as other central topics.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

- In the first two years all students must complete a total of twelve term courses. Graduate courses are grouped: (1) metaphysics, theory of knowledge, philosophy of mind, philosophy of language, philosophy of science; (2) ethics, aesthetics, philosophy of religion, political philosophy, philosophy of law, and theory of value; (3) history of philosophy. No more than six of the twelve and no fewer than two courses may be taken in each group. At least one of the twelve courses taken must be in formal methods (unless the formal methods requirement is satisfied in some other way), and this course does not count toward the required minimum of two within any of the three categories.
- 2. Two qualifying papers must be submitted, one in the history of philosophy, the other in another distribution area. These papers must be more substantial and professional than an ordinary term paper.
- 3. Approval of the dissertation prospectus is expected before the end of the sixth term. Upon completion of all predissertation requirements, including the prospectus, students are admitted to candidacy for the Ph.D. Admission to candidacy must take place by the end of the third year of study.
- 4. Students in Philosophy typically teach in the third, fourth, and sixth years.
- 5. In addition to the twelve required philosophy courses, before the dissertation defense students must take at least one class that is not listed in philosophy on a subject that is relevant to their research.
- 6. The dissertation is expected to be submitted in the end of the fifth to sixth year.

CLASSICS AND PHILOSOPHY COMBINED PH.D. PROGRAM

The Classics and Philosophy Program is a combined program, offered by the Departments of Classics and Philosophy at Yale, for students wishing to pursue graduate study in ancient philosophy. Suitably qualified students may apply for entry to the program either through the Classics department for the Classics track or through the Philosophy department for the Philosophy track.

Applicants for the Classics track of the combined program must satisfy the general requirements for admission to the Classics graduate program, in addition to the requirements of the Classics track of the combined program. Details of the Classics track of the program are available online at https://classics.yale.edu/research/ancient-philosophy/classics-and-philosophy-joint-program.

Applicants for the Philosophy track of the combined program must satisfy the general requirements for admission to the Philosophy graduate program, in addition to the requirements of the Philosophy track of the combined program. Details of the Philosophy track of the program are available online at http://philosophy.yale.edu/graduate-program/classics-and-philosophy-program.

The combined program is overseen by an interdepartmental committee currently consisting of Verity Harte and Brad Inwood together with the director of graduate studies (DGS) for Classics and the DGS for Philosophy.

PHILOSOPHY AND PSYCHOLOGY COMBINED PH.D. PROGRAM

The Philosophy and Psychology Program is a combined program, offered by the Departments of Philosophy and Psychology at Yale. Students enrolled in the program complete a series of courses in each discipline as well as an interdisciplinary dissertation that falls at the intersection of the two. On completing these requirements, students are awarded a Ph.D. either in Philosophy and Psychology, or in Psychology and Philosophy.

Students can be admitted into the combined program either through the Psychology department or through the Philosophy department. Students must be accepted into one of these departments (the "home department") through the standard admissions process, and both departments must then agree to accept the student into the combined program.

Students can be accepted into the combined program either (a) at the time they initially apply for admission to their home department, or (b) after having already competed some course work within the home department. In either case, students must be accepted into the combined program by each department.

Students in the combined program complete two-thirds of the course requirements of each of the two disciplines, then write a qualifying paper and a dissertation that are fully interdisciplinary. For more details about the program requirements, see http:// philosophy.yale.edu/graduate-program/philosophy-and-psychology-combined-phd-program.

MASTER'S DEGREE

M.A. Students who successfully complete the course requirements of their program with an average grade of High Pass will be awarded the M.A. degree.

Please see the Philosophy website for information on the program: http://philosophy.yale.edu.

COURSES

PHIL 500a, Sartre and De Beauvoir Stephen Darwall and Jacob McNulty This course examines writings from two of the most important French philosophers of the twentieth century, Jean-Paul Sartre and Simone de Beauvoir. We begin with a popular statement of the existentialist outlook, "existentialism is a humanism." We then consider the methodological underpinnings of this new philosophical approach by examining Sartre's response Husserlian phenomenology and the notion of intentionality that lies at its center. The bulk of the course is devoted to a reading of Sartre's masterwork, Being and Nothingness. Themes we consider include realism and idealism; the difference between the "for itself" and "in-itself"; bad faith; "the look" and intersubjectivity; love; embodiment; sadism and masochism; freedom, responsibility, choice; the notion of a fundamental project; and the desire to be God. In the remainder of the course, we consider Beauvoir's moral philosophy, as set forth in an early essay and in her masterwork The Ethics of Ambiguity (traditionally, this work has been overshadowed by her Second Sex). Here, we devote attention to the idea of an existentialist ethics and the demanding ideals of freedom and authenticity that are at its center. We also consider Beauvoir's perspectives on patriarchy, racism, colonialism, and war. Throughout the course, we give ourselves the option of consulting secondary readings by Anglophone philosophers writing in the existentialist tradition, e.g. Moran, Dover and Gingrich, and others. However, the emphasis is on the primary texts. Prerequisite: at least one prior course in philosophy, preferably in ethics and political philosophy or history of philosophy.

PHIL 503a, Early Modern Theories of the Passions Claudia Dumitru This course focuses on seventeenth-century discussions of the passions, also referred to as "affects," "perturbations," or "emotions." We explore questions such as: What is the nature and function of the passions? How do they differ from sensations, opinions, judgments? What is the connection between passions and the will? Do non-human animals have passions? Can the passions be diminished or eliminated? What is the relation between reason and the passions? We also examine more closely a few passions that were taken to have important implications for scientific inquiry, religion, or politics such as: wonder, love, and glory. Main authors discussed include René Descartes, Elisabeth of Bohemia, Nicolas Malebranche, Thomas Hobbes, Baruch Spinoza, Mary Astell, and Damaris Masham. Prerequisites: Two courses in philosophy, of which one must be in the history of philosophy.

PHIL 507a, Hegel Jacob McNulty

Hegel is among the most important and influential figures in the history of Western philosophy. This course aims to provide a broad overview of his thought. We begin with selections from Hegel's *Phenomenology of Spirit*, intended as an introduction to his system. We also consider his mature system itself, starting with his main work of theoretical philosophy, *The Science of Logic* and extending to his main work of practical (moral and political) philosophy, the *Philosophy of Right*. Time permitting,

we consider other appendages of the system as well, like the philosophy of history, aesthetics, and philosophy of religion. Topics to be addressed across these areas include idealism, monism, historicism, the "sociality of reason," self-consciousness, negation and negativity, mutual recognition, Spirit, Hegel's critique of Kant's theoretical and practical philosophies, the fate of metaphysics, and, finally, the relationships between art, religion, and philosophy. Prerequisite: at least one prior course in philosophy, preferably on the history of philosophy (for example, Kant).

PHIL 540a, The Social and Political Philosophy of W.E.B. Du Bois Robert Gooding-Williams

In this seminar we examine three of Du Bois's books – *The Souls of Black Folk* (1903), *Darkwater* (1920), and *Black Reconstruction* (1935) – with some attention to a fourth, *Dusk of Dawn* (1940). We also give attention to some of Du Bois's essays. Through close readings of these writings, we consider Du Bois's evolving conceptualization of the "Negro Problem" in the perspective of his philosophy of the human sciences, his political thought, and his aesthetics.

PHIL 551a / CLSS 751a, Ancient Philosophy of Language Verity Harte and Zoltan Szabo

A seminar on central texts on topics in philosophy of language in the Greco-Roman philosophical tradition. The seminar does not attempt a full survey of the tradition on these topics but select texts and topics of special interest, including exploring points of comparison and contrast with contemporary discussions in philosophy of language. Topics to be covered include: linguistic categories, the nature of grammar, origins of language, naming, and meaning. Prerequisites: one prior course in the history of ancient Greco-Roman philosophy and at least one additional prior course in philosophy.

PHIL 567a, Mathematical Logic I Sun-Joo Shin

An introduction to the metatheory of first-order logic, up to and including the completeness theorem for the first-order calculus. An introduction to the basic concepts of set theory is included.

PHIL 570a, Epistemology Keith DeRose

Introduction to current topics in the theory of knowledge. The analysis of knowledge, justified belief, rationality, certainty, and evidence.

PHIL 573a, Weakness of Will Michael Della Rocca

An examination of the apparent phenomenon of weakness of will or akratic action whereby one knowingly (in some sense of "knowingly") acts contrary to one's better (in some sense of "better") judgment. Attention to the metaphysical underpinnings of akratic action that seem to make such action possible. Discussion of the connection between weak-willed action and other forms of apparent irrationality and exploration of the implications of akrasia for moral philosophy. Attention both to historical and recent and contemporary including Plato, Aristotle, Augustine, Spinoza, Leibniz, Anscombe, Davidson, Korsgaard, Bratman, Holton, Buss, Schapiro, and others. Prerequisite: at least two courses in philosophy.

PHIL 590a, Sidgwick's Methods of Ethics Shelly Kagan

Henry Sidgwick's *The Methods of Ethics* is one of the greatest works of moral philosophy of the nineteenth century. A systematic and extremely careful study of three basic approaches to ethics – egoism, utilitarianism, and intuitionism (roughly, commonsense
deontological morality) – the *Methods* is a masterpiece that is widely praised (at least, by philosophers!) but much less frequently read, since it is a long and demanding book. We devote the semester to studying it. Prerequisite: A previous class in moral philosophy.

PHIL 625b, Topics in Epistemology Keith DeRose and Timothy Williamson A survey of some recent work in epistemology, with an emphasis on connections between formal approaches to epistemology and traditional epistemological questions. We explore the power and limitations of Bayesian approaches to epistemology; the relationship between credence on the one hand, and belief and knowledge on the other; higher-order knowledge and probability; and other topics.

PHIL 627b, Computability and Logic Sun-Joo Shin

A technical exposition of Gödel's first and second incompleteness theorems and of some of their main consequences in proof theory and model theory, such as Löb's theorem, Tarski's undefinability of truth, provability logic, and nonstandard models of arithmetic.

PHIL 637b, Philosophy of Mathematics Sun-Joo Shin

We take up a time-honored debate between Platonism and anti-Platonism, along with different views of mathematical truth, that is, logicism, formalism, and intuitionism. We read classical papers on the subject. Why do we need the philosophy of mathematics? This question could be answered toward the end of the term.

PHIL 642a, Language and Power Staff

An investigation into the way language shapes our social world, drawing on readings from feminist theory, critical race theory, formal semantics and pragmatics, political psychology, and European history.

PHIL 650b, The Problem of Evil Keith DeRose

The evils of our world can seem to present strong reasons for disbelieving in the existence of God. This course examines the main forms that this problem for theism takes, and some of the proposed ways of solving, or at least mitigating, the problem.

PHIL 652b, History of Early Modern Ethics Stephen Darwall

The seventeenth and eighteenth centuries were an unusually fertile period in philosophical ethics. Among other things, thinkers of the period attempted to work out and investigate a distinctive ethical conception, the idea of morality and its distinctive demands or obligations. We investigate major and some lesser-known figures, including Hobbes, Francis Hutcheson, Hume, Bishop Joseph Butler, Rousseau, Kant, Adam Smith, and Bentham. The main topics include the nature of moral obligation and moral motivation, whether morality can be based on reason or sentiment, and the relation between the right and the good.

PHIL 655b, Normative Ethics Shelly Kagan

A systematic examination of normative ethics, the part of moral philosophy that attempts to articulate and defend the basic principles of morality. The bulk of the course surveys and explores some of the main normative factors relevant in determining the moral status of a given act or policy (features that help make a given act right or wrong). Brief consideration of some of the main views about the foundations of normative ethics (the ultimate basis or ground for the various moral principles).

PHIL 677a / WGSS 677a, Feminist Philosophy: Theories of Sex, Gender, and Sexual Orientation Robin Dembroff

This course surveys several feminist frameworks for thinking about sex, gender, and sexual orientation. We consider questions such as: Is there a tenable distinction between sex and gender? Between gender and sexual orientation? What does it mean to say that gender is a social construction, or that sexual orientation is innate? What is the place of politics in gender and sexual identities? How do these identities – and especially resistant or transgressive identities – impact the creation and revision of social categories?

PHIL 685b, Wittgenstein Paul Franks

Study and discussion of Wittgenstein's *Tractatus Logico-Philosophicus*, *Philosophical Investigations*, and *On Certainty*, with some attention to their background in writings by Frege, Russell, and Moore. Consideration of Wittgenstein's influence on more recent philosophers, among them Iris Murdoch, Elizabeth Anscombe, Saul Kripke, and Cora Diamond. Prerequisite: permission of the instructor.

PHIL 705a, First-Year Seminar Laurie Paul and Robin Dembroff

Required of and limited to first-year students in the Philosophy Ph.D. program. Topic varies from year to year. Preparation for graduate work. Reading, writing, and presentation skills.

PHIL 706b, Work in Progress I Brad Inwood

In consultation with the instructor, each student presents a significant work in progress, e.g., a revised version of an advanced seminar paper or a dissertation chapter. Upon completion of the writing, the student presents the work in a mock colloquium format, including a formal question-and-answer period.

PHIL 729b / LATN 732b, Seneca: Letters on Ethics Brad Inwood

Lucius Annaeus Seneca was one of the most distinguished writers of Latin prose and also an important Stoic philosopher. This course focuses on readings in his most important and best known works, the *Epistulae Morales*. Most of the letters we read deal with themes of broad general interest, but some include the more challenging philosophical topics in Stoic ethics that form the culmination of the work. We aim to read the letters included in *Seneca: Selected Letters*, ed. Catharine Edwards (2019), which has an excellent literary and philological commentary; a few additional letters are read with the more philosophical commentary found in the instructor's *Seneca: Selected Philosophical Letters* (2007).

PHIL 740b, The Philosophy of Cognitive Science and Artificial Intelligence Laurie Paul and Tyler Wilson

This course looks at a number of questions in the philosophy of cognitive science and AI. Questions like: What is the structure of the mind? Can what we think influence what we see? And, are people rational or irrational? We investigate these by trying to build up a picture of the mind, looking at the space of possible minds described by AI, the major division of the mind into perception and cognition, and contemporary philosophical issues raised by recent developments in AI. Prerequisite: previous courses in philosophy.

PHIL 750a or b, Tutorial Sun-Joo Shin By arrangement with faculty.

PHIL 754a, Recent Work in Analytic Philosophy of Religion Keith DeRose and John Pittard

An advanced seminar engaging state-of-the-art work in analytic philosophy of religion, with attention given to both traditional questions and areas of emerging interest. Possible topics include theodicy, alternatives to traditional theism and naturalism, fine-tuning arguments, creation ethics, skeptical worries facing various religious and nonreligious outlooks, and norms pertaining to religious hope and commitment.

PHIL 782a, Hume Kenneth Winkler

Study and discussion of Hume's three-volume *Treatise of Human Nature*, concentrating on selected themes in his logic of the understanding (Book I), his theory of the passions and the will (Book II), and his account of morals (Book III). Likely topics include the theory of ideas, space and time, causal reasoning, skepticism and naturalism, personal identity, passion and action, liberty and necessity, the foundation of morals, and justice as an artificial virtue. Some consideration of Hume's sources and influence.

PHIL 850a or b, Prospectus Tutorial Sun-Joo Shin

Prospectus tutorial for Philosophy Ph.D. students.

Physics

35 Sloane Physics Laboratory, 203.432.3650 http://physics.yale.edu M.Phil., Ph.D.

Chair Karsten Heeger

Director of Graduate Studies Daisuke Nagai (daisuke.nagai@yale.edu)

Professors Charles Ahn (Applied Physics), Yoram Alhassid, Thomas Appelquist, Charles Bailyn (Astronomy), O. Keith Baker, Charles Baltay (Emeritus), Sean Barrett, Joerg Bewersdorf (Cell Biology), Helen Caines, Hui Cao (Applied Physics), Richard Casten (Emeritus), Flavio Cavanna (Adjunct), Paolo Coppi (Astronomy), Sarah Demers, Thierry Emonet (Molecular, Cellular, and Developmental Biology), Paul Fleury (Emeritus), Marla Geha (Astronomy), Steven Girvin, Larry Gladney, Leonid Glazman, Walter Goldberger, Jack Harris, John Harris (Emeritus), Karsten Heeger, Victor Henrich (Emeritus), Jonathon Howard (Molecular Biophysics and Biochemistry), Francesco Iachello (Emeritus), Sohrab Ismaill-Beigi (Applied Physics), Steve Lamoreaux, Konrad Lehnert, Andre Levchenko (Biomedical Engineering), Reina Maruyama, Simon Mochrie, Vincent Moncrief, Daisuke Nagai, Priyamvada Natarajan (Astronomy), Andrew Neitzke (Mathematics), Corey O'Hern (Mechanical Engineering and Materials Science), Vidvus Ozolins (Applied Physics), Ornella Palamara (Adjunct), Peter Parker (Emeritus), Daniel Prober (Applied Physics), Nicholas Read, Robert Schoelkopf (Applied Physics), John Schotland (Mathematics), Jurgen Schukraft (Adjunct), Ramamurti Shankar, Witold Skiba, A. Douglas Stone (Applied Physics), Hong Tang (Engineering), Paul Tipton, Thomas Ullrich (Adjunct), C. Megan Urry, Frank van den Bosch (Astronomy), Pieter van Dokkum (Astronomy), John Wettlaufer (Earth and Planetary Sciences), Robert Wheeler (Emeritus), Werner Wolf (Emeritus), Michael Zeller (Emeritus)

Associate Professors Damon Clark (*Molecular, Cellular, and Developmental Biology*), David C. Moore, Michael Murrell (*Biomedical Engineering*), Nikhil Padmanabhan, David Poland, Peter Rakich (*Applied Physics*), Alison Sweeney

Assistant Professors Charles Brown, Meng Cheng, Eduardo da Silva Neto, Laura Havener, Yu He (*Applied Physics*), Christopher Lynn, Benjamin Machta, Owen Miller (*Applied Physics*), Chiara Mingarelli, Ian Moult, Nir Navon, Laura Newburgh, Shruti Puri (*Applied Physics*), Diana Qiu (*Mechanical Engineering and Materials Science*)

Lecturers Sidney Cahn, Mehdi Ghiassi-Nejad, Caitlin Hansen, Stephen Irons, Steven Konezny, Rona Ramos, Adriane Steinacker

FIELDS OF STUDY

Fields include Astrophysics and Cosmology; Atomic, Molecular and Optical Physics; Biological Physics; Condensed Matter; Gravitational Physics; Nuclear Physics; Particle Physics; Quantum Physics; and other areas in collaboration with the School of Engineering & Applied Science and the departments of Applied Physics; Astronomy; Chemistry; Earth and Planetary Sciences; Molecular Biophysics and Biochemistry; and Molecular, Cellular, and Developmental Biology.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in Physics with a concentration of Biological Physics may also apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and https://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

To complete the course requirements, students are expected to take a set of seven full-term courses: six foundational courses and one elective. The six core courses (PHYS 500, Advanced Classical Mechanics; PHYS 502, Electromagnetic Theory I; PHYS 506, Mathematical Methods of Physics; PHYS 508, Quantum Mechanics I; PHYS 510, Quantum Mechanics II; and PHYS 512, Statistical Physics I) serve to complete the student's undergraduate core training in classical and quantum physics. For the seventh course, students select from the list of graduate elective courses offered by the Physics or Applied Physics departments, or courses offered by other departments with the approval of the director of graduate studies (DGS). In addition, all students are required to engage in a research project by taking PHYS 990, Special Investigations, by the end of their second year of study. First-year students are also required, in addition to their core courses, to take PHYS 515, Topics in Modern Physics Research, in the fall, and PHYS 590, Responsible Conduct in Research for Physical Scientists, in the spring. Certain equivalent course work or successful completion of a pass-out examination may allow for the substitution or waiver of core courses for individual students.

All students must participate in a two-part qualifying event by the end of their second year of study. Part one is a qualifying event in research (RQE) consisting of an oral presentation on research completed during their first couple of years, in conjunction with PHYS 990, Special Investigation. Students will present their research and be evaluated on their presentation by the DGS and their research adviser. Part two is a written qualifying event (WQE) consisting of four separate written components on classical mechanics, electromagnetic theory, statistical mechanics, and quantum mechanics, to be taken after the student has taken or passed out of the relevant courses. Students will receive feedback after each portion of the qualifying event. The RQE and WQE are not graded, but rather serve as learning milestones. Students may take the qualifying events in any order. Both events must be completed by the end of the student's second year.

Before the end of a student's third year of study, they must submit their thesis prospectus, as presented to and approved by their core thesis committee. Students who have completed their required course credits with satisfactory grades (two Honors and an overall High Pass average), taken the qualifying events, and submitted an acceptable thesis prospectus are recommended for advancement to candidacy and to receive their M.Phil en route. Students entering the program with a master's degree in physics or a related field may waive equivalent graduate-level core courses, with approval from the DGS, without the requirement of replacing course credits. These student can advance to candidacy, after completing all other requirements, without receiving an M.Phil from the department.

There is no foreign language requirement in the physics program, but students whose first language is not English must receive, at a minimum, 25 or above on the TOEFL speak test in order to be assigned as a teaching fellow. Admitted students who fall below this threshold will be required to take ESL classes prior to being able to teach. The teaching experience is regarded as an integral part of the graduate training program. During their studies, students are expected to serve four terms as teaching fellows, usually in the first two years. Students who require additional support from the Graduate School must teach additional terms, if needed, after they have fulfilled this teaching requirement.

Formal association with a dissertation adviser normally begins after their second year, after the qualifying event has been passed and required course work has been completed. An adviser from a department other than Physics can be chosen in consultation with the DGS, provided the dissertation topic is deemed suitable for a physics Ph.D.

MASTER'S DEGREES

M.Phil. Students who have successfully advanced to candidacy qualify for the M.Phil. degree.

M.S. Students who withdraw from the Ph.D. program may be eligible to receive the M.S. degree, if they have met the course requirements and have not submitted a thesis prospectus. For the M.S., students must successfully complete all six core courses listed above, in addition to completing either PHYS 990, Special Investigations, or an advanced elective (all with a satisfactory record). Certain equivalent course work or successful completion of a pass-out examination may allow individual students to substitute an elective course for a required one.

Additional program information can be found on the Physics website under Academics – Graduate Studies.

COURSES

PHYS 500a, Advanced Classical Mechanics Yoram Alhassid

Newtonian dynamics, Lagrangian dynamics, and Hamiltonian dynamics. Rigid bodies and Euler equations. Oscillations and eigenvalue equations. Classical chaos. Introduction to dynamics of continuous systems.

PHYS 502b, Electromagnetic Theory I Walter Goldberger

Classical electromagnetic theory including boundary-value problems and applications of Maxwell equations. Macroscopic description of electric and magnetic materials. Wave propagation.

PHYS 506a, Mathematical Methods of Physics Chiara Mingarelli

Survey of mathematical techniques useful in physics. Includes vector and tensor analysis, group theory, complex analysis (residue calculus, method of steepest descent), differential equations and Green's functions, and selected advanced topics.

PHYS 508a, Quantum Mechanics I Thomas Appelquist

The principles of quantum mechanics with application to simple systems. Canonical formalism, solutions of Schrödinger's equation, angular momentum, and spin.

PHYS 510b, Quantum Mechanics II Meng Cheng

Approximation methods, scattering theory, and the role of symmetries. Relativistic wave equations. Second quantized treatment of identical particles. Elementary introduction to quantized fields.

PHYS 512b, Statistical Physics I Yoram Alhassid

Review of thermodynamics, the fundamental principles of classical and quantum statistical mechanics, canonical and grand canonical ensembles, identical particles, Bose and Fermi statistics, phase transitions and critical phenomena, enormalization group, irreversible processes, fluctuations.

PHYS 515a, Topics in Modern Physics Research Karsten Heeger

A comprehensive introduction to the various fields of physics research carried out in the department and a formal introduction to scientific reading, writing, and presenting.

PHYS 517b / ENAS 517b / MB&B 517b / MCDB 517b, Methods and Logic in Interdisciplinary Research Corey O'Hern and Emma Carley

This full PEB class is intended to introduce students to integrated approaches to research. Each week, the first of two sessions is student-led, while the second session is led by faculty with complementary expertise and discusses papers that use different approaches to the same topic (for example, physical and biological or experiment and theory).

PHYS 523a / CB&B 523a / ENAS 541a / MB&B 523a, Biological Physics Yimin Luo This course has three aims: (1) to introduce students to the physics of biological systems, (2) to introduce students to the basics of scientific computing, and (3) to familiarize students with characterization methods and analysis tools. We focus on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, entropic forces, membranes, and cell motion using computational tools and methods. We provide intensive tutorials for Matlab including basic syntax, arrays, functions, plotting, and importing and exporting data.

PHYS 524a, Introduction to Nuclear Physics Laura Havener

An introduction to a wide variety of topics in nuclear physics and related experimental techniques including weak interactions, neutrino physics, neutrinoless double beta decay, and relativistic heavy-ion collisions. The aim is to give a broad perspective on the subject and to develop the key ideas in simple ways, with more weight on physics ideas than on mathematical formalism. The course assumes no prior knowledge of nuclear physics and only elementary quantum mechanics. It is accessible to advanced undergraduates.

PHYS 526b, Introduction to Elementary Particle Physics Laura Havener An overview of particle physics, including an introduction to the standard model, experimental techniques, symmetries, conservation laws, the quark-parton model, and open questions in particle physics.

PHYS 529b, Systems Modeling in Biology Christopher Lynn An introduction to the techniques of integrating knowledge from mathematics, physics, and engineering into the analysis of complex living systems. Use of these techniques to address key questions about the design principles of biological systems. Discussion of experiments and corresponding mathematical models. Reading of research papers from the literature. Students build their own models using MATLAB. QR, SC

PHYS 538a, Introduction to Relativistic Astrophysics and General Relativity Walter Goldberger

Basic concepts of differential geometry (manifolds, metrics, connections, geodesics, curvature); Einstein's equations and their application to such areas as cosmology, gravitational waves, black holes.

PHYS 548a / APHY 548a / ENAS 850a, Solid State Physics I Vidvuds Ozolins A two-term sequence (with APHY 549) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

PHYS 549b / APHY 549b / ENAS 851b, Solid State Physics II Yu He A two-term sequence (with APHY 548) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

PHYS 561a / MB&B 561a / MCDB 561a, Modeling Biological Systems I Thierry

Emonet and Kathryn Miller-Jensen

Biological systems make sophisticated decisions at many levels. This course explores the molecular and computational underpinnings of how these decisions are made, with a focus on modeling static and dynamic processes in example biological systems. This course is aimed at biology students and teaches the analytic and computational methods needed to model genetic networks and protein signaling pathways. Students present and discuss original papers in class. They learn to model using MatLab in a series of in-class hackathons that illustrate the biological examples discussed in the lectures. Biological systems and processes that are modeled include: (1) gene expression, including the kinetics of RNA and protein synthesis and degradation; (2) activators and repressors; (3) the lysogeny/lysis switch of lambda phage; (4) network motifs and how they shape response dynamics; (5) cell signaling, MAP kinase networks and cell fate decisions; and (6) noise in gene expression. Prerequisites: MATH 115 or 116, BIOL 101–104, or with permission of instructors. This course also benefits students who have taken more advanced biology courses (e.g. MCDB 200, MCDB 310, MB&B 300/301).

PHYS 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b, Modeling Biological Systems II Thierry Emonet

This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor.

PHYS 590b / APHY 590b, Responsible Conduct in Research for Physical Scientists Karsten Heeger

A review and discussion of best practices of conduct in research including scientific integrity and misconduct; mentorship; data management; and diversity, equity, and inclusion in science.

PHYS 601a / APHY 660a, Quantum Information and Computation Staff

This course focuses on the theory of quantum information and computation. We cover the following tentative list of topics: overview of postulates of quantum mechanics and measurements, quantum circuits, physical implementation of quantum operations, introduction to computational complexity, quantum algorithms (DJ, Shor's, Grover's, and others as time permits), decoherence and noisy quantum channels, quantum errorcorrection and fault-tolerance, stabilizer formalism, error-correcting codes (Shor, Steane, surface-code, and others as time permits), quantum key distribution, quantum Shannon theory, entropy and data compression.

PHYS 603a, Euclidean-Signature Semi-Classical Analysis for Quantum Mechanics and Quantum Field Theory Vincent Moncrief

The textbook WKB (or semi-classical) approach to solving quantum eigenvalue problems has been significantly improved and generalized in scope in recent years. New techniques offer advantages, not only over the very circumscribed, classical WKB (Wentzel, Kramers, Brillouin) methods (which are mostly limited to elementary, one dimensional quantum mechanical problems), but also over conventional perturbation theory. The corresponding "Euclidean-Signature Semi-Classical Program" is undergoing rapid, continuing development and has significant applications, not only to higher dimensional quantum mechanical problems but also to interacting quantum field theories. Unlike conventional perturbation theory this approach does not require the decomposition of a quantum Hamiltonian operator into a solvable (e.g., free field) component and its "perturbation" and, in the case of gauge theories, can maintain full, non-abelian gauge invariance at every order of a calculation. Prerequisite: PHYS 440 or 441. A basic understanding of textbook perturbation theory and WKB techniques is strongly advised. The methods developed in this course build on and revise both of these fundamental techniques of quantum approximation theory.

PHYS 609a, Relativistic Field Theory I Ian Moult

The fundamental principles of quantum field theory. Interacting theories and the Feynman graph expansion. Quantum electrodynamics including lowest order processes, one-loop corrections, and the elements of renormalization theory.

PHYS 610b / APHY 610b, Quantum Many-Body Theory Leonid Glazman Identical particles and second quantization. Electron tunneling and spectral function. General linear response theory. Approximate methods of quantum many-body theory. Dielectric response, screening of long-range interactions, electric conductance, collective modes, and photon absorption spectra. Fermi liquid; Cooper and Stoner instabilities; notions of superconductivity and magnetism. BCS theory, Josephson effect, and Majorana fermions in condensed matter; superconducting qubits. Bose-Einstein condensation; Bogoliubov quasiparticles and solitons.

PHYS 624b, Group Theory Witold Skiba

Lie algebras, Lie groups, and some of their applications. Representation theory. Explicit construction of finite-dimensional irreducible representations. Invariant operators

and their eigenvalues. Tensor operators and enveloping algebras. Boson and fermion realizations. Differential realizations. Quantum dynamical applications.

PHYS 628b / APHY 628b, Statistical Physics II Nicholas Read

An advanced course in statistical mechanics. Topics may include mean field theory of and fluctuations at continuous phase transitions; critical phenomena, scaling, and introduction to the renormalization group ideas; topological phase transitions; dynamic correlation functions and linear response theory; quantum phase transitions; superfluid and superconducting phase transitions; cooperative phenomena in low-dimensional systems.

PHYS 630b, Relativistic Field Theory II Ian Moult

An introduction to non-Abelian gauge field theories, spontaneous symmetry breakdown, and unified theories of weak and electromagnetic interactions. Renormalization group methods, quantum chromodynamics, and nonperturbative approaches to quantum field theory.

PHYS 650a / APHY 650a, Theory of Solids I Leonid Glazman

A graduate-level introduction with focus on advanced and specialized topics. Knowledge of advanced quantum mechanics (Sakurai level) and solid state physics (Kittel and Ashcroft-Mermin level) is assumed. The course teaches advanced solid state physics techniques and concepts.

PHYS 670a, Special Topics in Biophysics Christopher Lynn

The aim of the course is to introduce students to the approaches, methods, major results, and open questions in modern biological physics. Topics include non-equilibrium statistical physics, with applications to kinetic proof-reading and understanding molecular motors, information theory with applications to cellular signaling and phase transitions as they occur in living systems. The course is designed for graduate students in physics or a closely related field, otherwise, permission of the instructor is required.

PHYS 675a / APHY 675a, Principles of Optics with Applications Hui Cao Introduction to the principles of optics and electromagnetic wave phenomena with applications to microscopy, optical fibers, laser spectroscopy, nanophotonics, plasmonics, and metamaterials. Topics include propagation of light, reflection and refraction, guiding light, polarization, interference, diffraction, scattering, Fourier optics, and optical coherence.

PHYS 678b, Computing for Scientific Research David Moore

This hands-on lab course introduces students to essential computational and data analysis methods, tools, and techniques and their applications to solve problems in physics. The course introduces some of the most important and useful skills, concepts, methods, tools, and relevant knowledge to get started in scientific research broadly defined, including theoretical, computational, and experimental research. Students learn basic programming in Python, data analysis, statistical tools, modeling, simulations, machine learning, high-performance computing, and their applications to problems in physics and beyond.

PHYS 816a / APHY 816a, Techniques of Microwave Measurement and RF Design Robert Schoelkopf

An advanced course covering the concepts and techniques of radio-frequency design and their application in making microwave measurements. The course begins with a review of lumped element and transmission line circuits, network analysis, and design of passive elements, including filters and impedance transformers. We continue with a treatment of passive and active components such as couplers, circulators, amplifiers, and modulators. Finally, we employ this understanding for the design of microwave measurement systems and techniques for modulation and signal recovery, to analyze the performance of heterodyne/homodyne receivers and radiometers.

PHYS 990a or b, Special Investigations Staff

Directed research by arrangement with individual faculty members and approved by the DGS. Students are expected to propose and complete a term-long research project. The culmination of the project is a presentation that fulfills the departmental requirement for the research qualifying event.

PHYS 991a / ENAS 991a / MB&B 591a / MCDB 591a, Integrated Workshop Yimin Luo

This required course for students in the PEB graduate program involves a series of modules, co-taught by faculty, in which students from different academic backgrounds and research skills collaborate on projects at the interface of physics, engineering, and biology. The modules cover a broad range of PEB research areas and skills. The course starts with an introduction to MATLAB, which is used throughout the course for analysis, simulations, and modeling.

Political Science

Rosenkranz Hall, 203.432.5241 http://politicalscience.yale.edu M.A., M.Phil., Ph.D.

Chair Gregory Huber

Director of Graduate Studies Hélène Landemore

Professors Bruce Ackerman, Akhil Amar (*Law*), Jennifer Gandhi, Bryan Garsten, Alan Gerber, Jacob Hacker, Gregory Huber, Hélène Landemore, Isabela Mares, Adam Meirowitz, Gerard Padró i Miquel, Kenneth Scheve, Jasjeet Sekhon, Ian Shapiro, Stephen Skowronek, Steven Smith, Milan Svolik, Peter Swenson, John Wargo (*School of the Environment*), Steven Wilkinson, Elisabeth Wood

Associate Professors P.M. Aronow, Katharine Baldwin, Ana De La O Torres, Alexandre Debs

Assistant Professors Alexander Coppock, Kevin DeLuca, Allison Harris, Melody Huang, Joshua Kalla, Sarah Khan, Christina Kinane, Shiro Kuriwaki, Egor Lazarev, Soyoung Lee, Charles McClean, Daniel Mattingly, Giulia Oskian, Didac Queralt, Noam Reich, Lucia Rubinelli, Emily Sellars, Ian Turner

FIELDS OF STUDY

Fields include American politics, comparative politics, international relations, political economy, political theory, quantitative empirical methods, qualitative and archival methods, and formal theory.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to pass sixteen term courses by the end of their fourth term in the program, to receive a grade of Honors in at least two political science courses, and to maintain an overall High Pass or above average (for purposes of calculating this average, Honors=3, High Pass=2, Pass=1, and Fail=0). The High Pass average must also be met for graduate courses listed in the Political Science department. To remain in good standing throughout their time in the Ph.D. program, students are expected to actively participate in classes and workshops, produce high-quality written work, and demonstrate regular progress toward completion of the dissertation. The department regularly offers about sixty term courses for graduate students each year. Courses are conducted as seminars and typically have small enrollments. Four of the courses required for the degree may be in departments other than Political Science (two of these can be advanced language courses with the approval of the director of graduate studies [DGS]).

Each student must demonstrate elementary reading competence in one foreign language. Such competence is usually demonstrated by taking, or having completed, two years of undergraduate course work or by examination. Alternatively, the language requirement can be satisfied by successfully completing two terms of formal theory or two terms of statistical methods at the graduate level (beyond the introductory course in statistical methods offered in the department).

Courses are offered in five substantive fields - political theory, international relations, comparative politics, American politics, and political economy-and three methods fields: quantitative empirical methods, qualitative and archival methods, and formal theory. Courses taken must include one each in at least three of the department's substantive fields. Courses cannot be counted in more than one field. Each student must demonstrate competence in three fields (two of which must be substantive fields) before the start of the fifth term. Competence can be demonstrated either by passing the comprehensive examination in the field or by course work, provided that each student takes at least two comprehensive exams. The fields of formal theory and quantitative empirical methods offer certification only through examination. For fields to be certified by course work, students are required to satisfactorily complete three courses in the field, where courses in the field are determined by the faculty and the DGS, including one in which a research paper is written and presented. The paper must be submitted to review by the instructor of the course for which the paper was written. The department offers exams twice a year, in late August and in early January. Students are expected to pass their comprehensive examinations by August of their second year. Each examination is based on a reading list compiled by the faculty within the field and updated each year. Each list offers an introduction and framework for study in the field and preparation for the examination. A committee of faculty within the field grades the exams as Distinguished, Satisfactory, or Unsatisfactory.

Students who successfully complete the Ph.D. in Political Science will often join the faculties of colleges and universities. For that reason, learning what is involved in teaching and gaining teaching experience are also essential components of graduate education. The department normally expects students to devote themselves exclusively to course work and comprehensive examinations in their first two years in the Ph.D. program. Students in Political Science typically teach in their third and fourth years.

During each year in residence, graduate students are expected to participate actively and regularly in one or more of the many research workshops run by the department. Students beyond their fourth term are required to enroll in at least one of the workshops for credit, and all workshops are graded on a Satisfactory/Unsatisfactory basis. (At the discretion of the DGS, this requirement may be waived for a term for students whose situations make participation temporarily unfeasible.) All students are expected to present a research paper of their own at one of these workshops before the end of their fourth year. Workshop participation does not count toward the requirement of sixteen term courses.

Prior to Registration for the Second Year

 Students must have taken and passed at least seven courses, including the required Introduction to the Study of Politics (PLSC 510), and maintained an overall High Pass average. At least five of these courses must be graduate courses in Political Science. While only seven courses are required, students are normally expected to complete eight courses in the first year to be on track to complete sixteen courses by the end of the second year.

- 2. Students are strongly encouraged to complete at least one field certification prior to the beginning of their second year.
- Students are strongly encouraged to attend one of the subfield weekly workshops. (Note that these workshops do not count toward the required number of completed courses.)

Prior to Registration for the Third Year

- 1. Students must have taken at least sixteen term courses and have received a grade of at least Pass in each of them, including the two-term required Research and Writing course (PLSC 540, PLSC 541) for second-year students. Research and Writing is devoted to the preparation of a manuscript based on original research on a topic of the student's choice and will count as two of the sixteen credits needed to advance to candidacy.
- 2. Students must have received a grade of Honors in at least two Political Science courses and maintained an overall High Pass average.
- 3. Students must have completed certification in three fields by the end of their second year. (For purposes of fulfilling this requirement, students registered for the August exams are assumed to have passed those exams when determining eligibility for enrollment in the third year.) At the discretion of the DGS, students who fail an exam may be granted a one-term extension (to January of the third year) for obtaining certification.
- 4. Students are strongly encouraged to attend one of the required subfield weekly workshops. (Note that these workshops do not count toward the required number of completed courses.)

Admission to Candidacy Students must be admitted to candidacy prior to registration for the fourth year of study. Students are recommended to the graduate school for admission to candidacy by the Department of Political Science after having completed departmental requirements listed above and the graduate school's prospectus requirement. As part of admission to candidacy, a student must have a prospectus approved by a dissertation director and two other members of the faculty. This must occur no later than May 1 of the student's third year of study.

Submitting the Dissertation A student's dissertation research is guided by a committee of no fewer than three faculty members, at least two of whom must be members of the Yale Department of Political Science. One of the committee members is designated as chair. When a dissertation is completed, the student will select two members to write written reports on the final dissertation, at least one of whom must be a member of the Yale Department of Political Science. The DGS will also appoint one additional member of the department to write an additional evaluation.

COMBINED PH.D. PROGRAMS

Political Science and African American Studies

The graduate school offers a combined degree in Political Science and African American Studies. For details, see African American Studies in this bulletin.

Political Science and Statistics & Data Science

The Department of Political Science also offers, in conjunction with the Department of Statistics and Data Science, a combined Ph.D. degree in Political Science and Statistics and Data Science. The requirements are designed to emphasize the interdisciplinary nature of the combined-degree program. Unless otherwise noted, students are required to complete all program requirements in each department's regular Ph.D. program.

Coursework Students must take at least sixteen graduate-level courses.

Students must complete at least eight courses in the Political Science department before the start of the seventh term, including PLSC 510 (taken in the first term) and three courses in quantitative methods: PLSC 500, PLSC 503, and PLSC 508 (or a suitable equivalent, as approved by the Political Science DGS). In addition to these four courses, students must also take at least two courses each in two other fields (American politics, comparative politics, international relations, political theory, and political economy). Two of these eight courses may be courses outside the department that appropriately build the student's substantive interests. Students may optionally take the two-course Research and Writing sequence in year two or three, but this sequence does not count toward the eight-course requirement.

Students must also complete at least eight courses in the Statistics and Data Science department before the start of the seventh term, with the specific course schedule subject to approval by the Statistics and Data Science DGS. A typical course plan would likely include S&DS 541 (taken in the first term), S&DS 542 and S&DS 661 (taken in the second term), S&DS 612 and S&DS 625 (taken in the third term), S&DS 551 (taken in the fourth term), and S&DS 626 (taken in the fifth term).

In the event course requirements as written cannot be met due to restrictions on course offerings, etc., the DGSs of each program, in consultation with one another, may mutually agree on course substitutions consistent with the intellectual goals of this program.

Qualifying Examination There are separate comprehensive exam requirements in each department. In Political Science, students must certify in three fields, and one of these fields must be quantitative methods, which is certified by examination. The other two fields can be drawn from American politics, comparative politics, international relations, political theory, and political economy. For rules about certification in these fields, please see the Political Science department's solo Ph.D. requirements. Students must complete all of these certifications prior to the start of the sixth term, and it is expected that students will complete their first two certifications the summer after their second term. Students satisfy the Political Science language requirement by certifying in quantitative methods.

In Statistics and Data Science, students will complete the Probability Theory Comprehensive Exam at the end of the first term, the Statistical Theory Comprehensive Exam at the end of the second term, and both the Practical Exam and the Oral Exam at the end of the fifth term. Please see the Statistics and Data Science department's solo Ph.D. requirements (https://statistics.yale.edu/academics/graduate-programs/phdprogram/qualifying-exams). **Teaching** The teaching requirement of students admitted in the combined program will be split between the two departments (i.e., the student will be serving as a teaching fellow [TF] for an equal number of courses in both departments).

Prospectus and Dissertation Requirements For the dissertation, not later than the fifth term, a student shall select a primary adviser from one department, a co-adviser from the other department, and a third faculty member from either department who serves as a reader along with the advisers. The dissertation prospectus is due not later than the middle of the sixth term (mid-March for students whose sixth term is a spring term). Subsequently, and not later than the end of classes in the sixth term (usually the end of April for students whose sixth term is a spring term), there is to be an oral presentation of the prospectus by the prospective candidate, followed by a meeting of a faculty committee consisting of the advisers and at least one DGS for prospectus approval. Admission to candidacy for the combined Ph.D. requires DGS signature of prospectus approval from both departments following adviser approval in both departments. In Political Science, this requires all three committee members to attest that the prospectus is approved. (Certification for the third field in Political Science may take place after prospectus approval.) Combined dissertations will take a form suitable for both disciplines. We anticipate that many students will write dissertations composed of three papers.

Advising Beginning in the first term of the Ph.D. program, a student shall select an adviser from each department, with one adviser designated as the primary adviser. We strongly suggest the student meet jointly with both advisers to discuss navigating the combined Ph.D. program.

Transfer Admissions Process Students admitted to either Political Science or Statistics and Data Science may apply to transfer to the combined Ph.D. program with the approval of the DGS in both programs. Transfer applications are expected to take place no later than the third term in the Ph.D. program.

Exit from the Combined Program A student admitted into the combined program may elect to exit the combined program and instead pursue a regular Ph.D. in either of the two departments. This election must take place before the start of the sixth term.

JOINT DEGREE

Students may also pursue a joint degree with Yale Law School.

MASTER'S DEGREES

M.Phil. The academic requirements for the M.Phil. degree are the same as for the Ph.D. degree except for the completion of the prospectus and dissertation.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete a full year of course work in the program (at least eight term courses) with an average of High Pass. The courses must include at least six listed in the Political Science Department and one each in at least three of the department's substantive fields. Language requirements are the same as for the Ph.D. degree.

Students enrolled in the Ph.D. program in political science may qualify for the M.A. in history, rather than an M.A. in political science, upon completion of a minimum of six graduate term courses in history at Yale, of which two must have earned Honors grades and the other four courses must average High Pass overall. A student must include in the six courses completed at least two research seminars in the History Department.

Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

COURSES

PLSC 500a, Foundations of Statistical Inference Melody Huang

This course provides an intensive introduction to statistical theory for quantitative empirical inquiry in the social sciences. Topics include foundations of probability theory, statistical inference from random samples, estimation theory, linear regression, maximum likelihood estimation, and a brief introduction to identification.

PLSC 505b / SOCY 508b, Qualitative Field Research Egor Lazarev

In this seminar we discuss and practice qualitative field research methods. The course covers the basic techniques for collecting, interpreting, and analyzing ethnographic data, with an emphasis on the core ethnographic techniques of participant observation and in-depth interviewing. All participants carry out a local research project. Open to undergraduates with permission of the instructor.

PLSC 509a, Philosophy of Science for the Study of Politics Ian Shapiro An examination of the philosophy of science from the perspective of the study of politics. Particular attention to the ways in which assumptions about science influence models of political behavior, the methods adopted to study that behavior, and the relations between science and democracy. Readings include works by both classic and contemporary authors.

PLSC 510a, Introduction to the Study of Politics Jennifer Gandhi

The course introduces students to some of the major controversies in political science. We focus on the five substantive themes that make up the Yale Initiative: Order, Conflict, and Violence; Representation and Popular Rule; Crafting and Operating Institutions; Identities, Affiliations, and Allegiances; and Distributive Politics. We divide our time between discussing readings on these subjects and conversations with different members of the faculty who specialize in them. There is also some attention to methodological controversies within the discipline. Requirements: an annotated bibliography of one of the substantive themes and a take-home final exam.

PLSC 512b, The Design and Analysis of Randomized Field Experiments in Political Science Alexander Coppock

Randomized field experiments are deployed across the social sciences to answer wellposed theoretical questions and to generate new information from which to build fresh theories of social interaction and behavior. Experiments are attractive because they enable the researcher to (mostly) ground statistical and causal inferences in features of the research design rather than assumptions about the world. This course covers the design and analysis of both introductory and advanced experimental designs, using the textbook by Gerber and Green (2012) as the main guide. Strong emphasis is placed on developing practical skills for real research scenarios. Given resources, how should subjects be assigned to conditions? How many treatment arms should be included? How do we plan to analyze the resulting data? The course has a relatively heavy workload: weekly problem sets in R that will prepare students for 95 percent of experimental research tasks they will encounter in the field. Prerequisite: any introductory statistics course that covers regression at any level of detail.

PLSC 518a, Introduction to Game Theory Adam Meirowitz

This course offers a rigorous introduction to noncooperative game theory. The course covers normal and extensive form games of perfect information and normal and extensive form games of imperfect information. We end with a brief introduction to mechanism design. Through lectures and problem sets students gain familiarity with creating and analyzing models of political phenomena. Applications are drawn from a broad set of topics in political science and students are pushed to think about how game theoretic analysis connects with empirical work in political science. A capstone project pushes students to create and analyze a novel model of politics in their own research area. Students are assumed to have mathematical knowledge at the level of the Political Science Math Camp.

PLSC 519b, Introduction to Formal Political Economy Ian Turner

This course surveys key applications of game theory and related methods to the study of politics and political economy. Topics include electoral competition, political accountability, special interest politics, delegation, political agency, legislative bargaining, collective action, and regime chance. Prerequisite: PLSC 518 or an equivalent course in game theory.

PLSC 522a / SOCY 503a, Archival Methods and Historical Approaches in the Social Sciences Jonny Steinberg

The aim of the course is to equip students to navigate different sorts of archives, to interpret archival material, and to survey debates in the social sciences about using historical material and theory to build arguments.

PLSC 524a, YData: Data Science for Political Campaigns Joshua Kalla Political campaigns have become increasingly data driven. Data science is used to inform where campaigns compete, which messages they use, how they deliver them, and among which voters. In this course, we explore how data science is being used to design winning campaigns. Students gain an understanding of what data is available to campaigns, how campaigns use this data to identify supporters, and the use of experiments in campaigns. The course provides students with an introduction to political campaigns, an introduction to data science tools necessary for studying politics, and opportunities to practice the data science skills presented in S&DS 523. Can be taken concurrently with, or after successful completion of, S&DS 523.

PLSC 530a or b / S&DS 530a or b, Data Exploration and Analysis Staff Survey of statistical methods: plots, transformations, regression, analysis of variance, clustering, principal components, contingency tables, and time series analysis. The R computing language and web data sources are used.

PLSC 533a, Formal Models of International Relations Alex Debs

This course offers a survey of game-theoretic models of international relations. Students learn how to evaluate and present existing models and how to develop their own research projects. Topics covered include nuclear deterrence theory, war duration, the democratic peace, militarization and war, mediation, and mutual optimism. Prerequisites: PLSC 518 and PLSC 519 or the equivalent. PLSC 540a and PLSC 541b, Research and Writing Helene Landemore-Jelaca and Daniel Mattingly

This is a required course for all second-year students. It meets for the first six weeks of the fall term and the first six weeks of the spring term. The fall meetings are devoted to discussion of research design as well as individual student projects. The spring meetings are devoted to discussion of drafts of student papers. The work of the spring-term seminar includes criticism of the organization, arguments, data evaluation, and writing in each student's paper by the instructors and the other students. Using this criticism, and under the supervision of the instructors, each student conducts additional research, if necessary, rewrites the paper as required, and prepares a final paper representing the best work of which the student is capable. Students must submit a one-page outline of the proposed project for the first fall-term meeting and a complete draft of the paper at the first meeting in the spring.

PLSC 546b, Prospectus Writing Workshop Alex Debs

A non-credit workshop for third-year Ph.D. students in the Political Science department, in which they develop, revise, and present their prospectus. o Course cr

PLSC 629a / HIST 656a, Histories of Political Thought Isaac Nakhimovsky The intersection between political theory and intellectual history, examined from a historiographical rather than an exclusively methodological perspective. The course aims to develop a comparative framework for discussing the kinds of preoccupations and commitments that have animated various important contributions to the history of political thought since the nineteenth century.

PLSC 667a, Domestic Politics in International Relations Soyoung Lee This class explores the interplay between domestic politics and international relations. We examine questions such as how does domestic politics affect the foreign policy choices of leaders and states? Who are the key domestic actors and what do the actors want? How do domestic actors form their preferences? Do domestic political institutions matter, and if so, how? Topics include rallying and diversionary conflict, war and the fate of leaders, domestic interest groups and sectoral politics, elite messaging and propaganda, democratic peace, and the rise of populism and nationalism. Students also have a chance to develop their own research skills by writing and presenting a research paper outline. Assignments also include writing practice referee reports and response papers. This class is aimed at political science Ph.D. students interested in international relations.

PLSC 691b, Identity and Conflict Lab Nicholas Sambanis

The Identity and Conflict Lab (ICL), led by Professor Nicholas Sambanis, is launching a new graduate-level course focusing on the politics of intergroup conflict broadly conceived. The lab's research is motivated by major problems of our time, such as civil war, ethnic violence, racial prejudice, and religious intolerance. The lab sponsors research on all these areas, with a particular focus on identity politics: how social identities shape individual behavior, how conflict affects identities, and what interventions are effective in reducing conflict. The ICL course reviews the state of the debate on key topics in which the ICL has active research and identifies new research questions that lab affiliates can address by collecting new data and applying cutting edge analysis in a collaborative setting. The lab involves affiliated faculty at Yale and other universities, post-doctoral fellows, and students. The lab promotes an interdisciplinary, multimethod approach to the study of conflict. Students affiliated with the lab must attend workshops and meetings biweekly and are expected to complete reading assignments, comment on lab affiliates' work in progress, and present their own work to the lab on suitable topics decided in consultation with the lab director. Students taking this course have opportunities to join ongoing lab projects depending on their interests and skills. For more information, please send inquiries to nicholas.sambanis@yale.edu. Open to graduate students only. ½ Course cr

PLSC 734a / SOCY 560a, Comparative Research Workshop Jonathan Wyrtzen This weekly workshop is dedicated to group discussion of work-in-progress by visiting scholars, Yale graduate students, and in-house faculty from Sociology and affiliated disciplines. Papers are distributed a week ahead of time and also posted on the website of the Center for Comparative Research (http://ccr.yale.edu). Students who are enrolled for credit are expected to present a paper-in-progress.

PLSC 756a, The European Union David Cameron

Origins and development of the European Community and Union over the past fifty years; ways in which the often-conflicting ambitions of its member states have shaped the EU; relations between member states and the EU's supranational institutions and politics; and economic, political, and geopolitical challenges.

PLSC 777**b**, **Comparative Politics I: Research Design** Katharine Baldwin This course is part of a two-term course series designed to introduce students to the study of comparative politics. This half of the sequence focuses on issues related to research design and methodology in comparative politics. Although there are a handful of weeks devoted entirely to methodological debates, most of our weekly discussions are focused around one book as an exemplar of a particularly interesting or important research design. The course is helpful for students who plan to take the comparative politics field exam.

PLSC 778a, Comparative Politics II Isabela Mares

This survey course provides a general introduction to the field of comparative politics, with an emphasis on the most important theories and research themes. Topics include the foundations of political regimes, state formation, identity and nationalism, party development, electoral reforms, programmatic and clientelistic linkages, and social policy development. At the same time, the course seeks to strengthen students' analytical skills in evaluating comparative research and prepare students to take the examination in comparative politics.

PLSC 779a / ANTH 541a / ENV 836a / HIST 965a / SOCY 617a, Agrarian Societies: Culture, Society, History, and Development Jonathan Wyrtzen and Elisabeth Wood

An interdisciplinary examination of agrarian societies, contemporary and historical, Western and non-Western. Major analytical perspectives from anthropology, economics, history, political science, and environmental studies are used to develop a meaning-centered and historically grounded account of the transformations of rural society. Team-taught.

PLSC 800a, Introduction to American Politics Jacob Hacker

This course is an introduction to American politics for students pursuing graduate work in political science. It surveys current research in a range of areas, with a focus on theory and substance rather than method. Topics include the U.S. constitutional structure; American political development; interest groups and parties as political actors; race, ethnicity, gender, and politics; federalism and state and local politics; the welfare state and policy feedback; elections and citizen behavior; inequality and influence; and policymaking with a separation of powers system. The semester concludes with an examination of the contemporary American political economy. Students are expected to read and discuss each week's assignment and, for each of five weeks, to write a three- to five-page analytic paper that deals with a subject addressed or suggested by the reading.

PLSC 810a, Political Preferences and American Political Behavior Joshua Kalla

Introduction to research methods and topics in American political behavior. Focus on decision-making from the perspective of ordinary citizens. Topics include utility theory, heuristics and biases, political participation, retrospective voting, the consequences of political ignorance, the effects of campaigns, and the ability of voters to hold politicians accountable for their actions.

PLSC 839a, Congress in the Light of History David Mayhew

A critical investigation of the United States Congress, the primary democratic institution in the American political system. Focus on individual members of Congress, institutional features, and the role of Congress within the larger separation-of-powers system.

PLSC 841a / EP&E 336a / PLSC 258a, Democracy and Bureaucracy Ian Turner Exploration of what government agencies do and why; focus on issues of accountability and the role of bureaucracy in representative democracy. Understanding how bureaucracy works internally and how it is affected by interactions with other political actors and institutions.

PLSC 930a and PLSC 931b, American Politics Workshop Jacob Hacker and Ian Turner

The course meets throughout the year in conjunction with the ISPS American Politics Workshop. It serves as a forum for graduate students in American politics to discuss current research in the field as presented by outside speakers and current graduate students. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 932a and PLSC 933b, Comparative Politics Workshop Daniel Mattingly and Charles McClean

A forum for the presentation of ongoing research by Yale graduate students, Yale faculty, and invited external speakers in a rigorous and critical environment. The workshop's methodological and substantive range is broad, covering the entire range of comparative politics. There are no formal presentations. Papers are read in advance by participants; a graduate student critically discusses the week's paper, the presenter responds, and discussion ensues. Detailed information can be found at https:// campuspress.yale.edu/cpworkshop. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 934a and PLSC 935b, Political Theory Workshop Staff

An interdisciplinary forum that focuses on theoretical and philosophical approaches to the study of politics. The workshop seeks to engage with (and expose students to) a broad range of current scholarship in political theory and political philosophy, including work in the history of political thought; theoretical investigations of contemporary political phenomena; philosophical analyses of key political concepts; conceptual issues in ethics, law, and public policy; and contributions to normative political theory. The workshop features ongoing research by Yale faculty members, visiting scholars, invited guests, and advanced graduate students. Papers are distributed and read in advance, and discussions are opened by a graduate student commentator. Detailed information can be found at http://politicaltheory.yale.edu. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/ Unsatisfactory only.

PLSC 938a and PLSC 939b, Leitner Political Economy Seminar Series Gerard Padro

This seminar series engages research on the interaction between economics and politics as well as research that employs the methods of political economists to study a wide range of social phenomena. The workshop serves as a forum for graduate students and faculty to present their own work and to discuss current research in the field as presented by outside speakers, faculty, and students. Detailed information can be found at http://leitner.yale.edu/seminars. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 940a and PLSC 941b, International Relations Workshop Staff

This workshop engages work in the fields of international security, international political economy, and international institutions. The forum attracts outside speakers, Yale faculty, and graduate students. It provides a venue to develop ideas, polish work in progress, or showcase completed projects. Typically, the speaker would prepare a 35- to 40-minute presentation, followed by a question-and-answer session. More information can be found at http://irworkshop.yale.edu. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 942a and PLSC 943b, Political Violence and Its Legacies Workshop Elisabeth Wood

The MacMillan Political Violence and Its Legacies (PVL) workshop is an interdisciplinary forum for work in progress by Yale faculty and graduate students, as well as scholars from other universities. PVL is designed to foster a wide-ranging conversation at Yale and beyond about political violence and its effects that transcends narrow disciplinary and methodological divisions. The workshop's interdisciplinary nature attracts faculty and graduate students from Anthropology, African American Studies, American Studies, History, Sociology, and Political Science, among others. There are no formal presentations. Papers are distributed one week prior to the workshop and are read in advance by attendees. A discussant introduces the manuscript and raises questions for the subsequent discussion period. To help facilitate a lively and productive discussion, we ban laptops and cellphones for the workshop's duration. If you are affiliated with Yale University and would like to join the mailing list, please send an e-mail to julia.bleckner@yale.edu with "PVL Subscribe" in the subject line.

PLSC 990a or b, Directed Reading Staff By arrangement with individual faculty.

Psychology

Kirtland Hall, 203.432.4500 http://psychology.yale.edu M.S., M.Phil., Ph.D.

Chair

Jutta Joormann (203.432.4545, jutta.joormann@yale.edu)

Director of Graduate Studies

Melissa Ferguson (203.432.4518, melissa.ferguson@yale.edu)

Professors Woo-kyoung Ahn, John Bargh, Paul Bloom (*Emeritus*), Thomas Brown (*Emeritus*), Tyrone Cannon, Marvin Chun, Margaret Clark, John Dovidio (*Emeritus*), Melissa Ferguson, Edmund Gordon (*Emeritus*), Marcia Johnson (*Emerita*), Jutta Joormann, Alan Kazdin (*Emeritus*), Frank Keil, Joshua Knobe (*Philosophy*), Marianne LaFrance (*Emerita*), Gregory McCarthy, Jennifer Richeson, Peter Salovey, Laurie Santos, Brian Scholl, Nicholas Turk-Browne, Tom Tyler (*Law School*), Karen Wynn (*Emerita*)

Associate Professors Arielle Baskin-Sommers, Steve Chang, Yarrow Dunham, Avram Holmes

Assistant Professors Dylan Gee, Maria Gendron, Julian Jara-Ettinger, Julia Leonard, Samuel McDougle, Robert Rutledge, Ilker Yildirim

Lecturers Richard Aslin (Senior Lecturer), Stephanie Lazzaro, Kristi Lockhart (Emerita), Mary O'Brien, Faith Prelli

Affiliated Faculty Alan Anticevic (*Psychiatry*), Amy Arnsten (*Neuroscience*), Christopher Benjamin (*Neurology*), Philip Corlett (*Psychiatry*), Maggie Davis (*Psychiatry*), Ravi Dhar (*School of Management*), Irina Esterlis (*Psychiatry*), Tamar Gendler (*Philosophy*), Phillip Atiba Goff (*African American Studies*), Elizabeth Goldfarb (*Psychiatry*), Carlos Grilo (*Psychiatry*), Ilan Harpaz-Rotem (Psychiatry), Jeannette R. Ickovics (*Public Health*), Robert Kerns (*Veterans Administration Medical Center*), Hedy Kober (*Psychiatry*), Michael Kraus (*School of Management*), John Krystal (*Psychiatry*), Daeyeol Lee (*Neurobiology*), Becca Levy (*Public Health*), Ifat Levy (*Neuroscience*), David Lewkowicz (*Child Study Center*), Linda Mayes (*Child Study Center*), Carolyn Mazure (*Psychiatry*), James McPartland (*Child Study Center*), Nathan Novemsky (*School of Management*), Laurie Paul (*Philosophy*), Christopher Pittenger (*Psychiatry*), Al Powers (*Psychiatry*), Helena Rutherford (*Child Study Center*), Wendy Silverman (*Child Study Center*), Dana Small (*Psychiatry*), Jane Taylor (*Psychiatry*), Tom Tyler (*Law School*), Fred Volkmar (*Child Study Center*), Gideon Yaffe (*Law School*)

FIELDS OF STUDY

Fields include clinical psychology; cognitive psychology; developmental psychology; neuroscience; and social/personality psychology.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

In order to allow students to be trained in accordance with their own interests and career goals, the general requirements of the department are kept to a minimum. The formal requirements are:

- 1. Students must take PSYC 500, PSYC 501, PSYC 518, and then any 500-level course with adviser approval. The basic-level core course requirement must be completed by the end of the second year. Students must attain an Honors grade in at least two term courses by the end of the second year of study.
- 2. Students are required to assist in teaching four courses by the end of their fourth year.
- 3. Completion of a First-Year Research Paper (PSYC 920) due by May 1 of the second term.
- 4. Completion of a predissertation research project (PSYC 930 and DISR 999), to be initiated not later than the second term and completed not later than May 10 of the second year. Certification of this research project as well as performance in course work and other evidence of scholarly work at a level commensurate with doctoral study, as judged by the faculty, are necessary for continuation beyond the second year.
- 5. Submission of a dissertation prospectus, and a theme essay that demonstrates the candidate's comprehensive knowledge and understanding of the area of concentration. Certification of the theme essay completes the qualifying examination.
- 6. Approval of the dissertation by an advisory committee and the passing of an oral examination on the dissertation and its general scientific implications. The theme essay and the dissertation prospectus are completed during the third year. Students are then formally admitted to Ph.D. candidacy. There are no language requirements.

The faculty considers teaching to be an essential element of the professional preparation of graduate students in Psychology. For this reason participation in the Teaching Fellow Program is a degree requirement for all doctoral students. They are expected to serve as teaching fellows (level 20) for four terms over the course of the second through fourth years in the program. Opportunities for teaching are matched as closely as possible with students' academic interests.

CLINICAL GRADUATE STUDENT INTERNSHIPS

Registered students undertaking their required clinical internships (usually in their sixth year) are typically not eligible for graduate school stipend funding, since these are paid internships. However, clinical internship stipends for sixth-year students that fall below the current year's Psychology stipend will be topped up to the current year's Psychology stipend. Students will be considered to have fulfilled the final requirement for the degree after successfully completing their internship (typically in July) and will be awarded degrees the following December. They will not be registered in the graduate school during the fall term in which their degrees are conferred.

COMBINED PH.D. PROGRAMS

Psychology offers a combined Ph.D. degree program with African American Studies. For the combined program with African American Studies, students must apply to the African American Studies department, with Psychology indicated as the secondary department.

Psychology also offers a combined Ph.D. degree program with Philosophy. Students interested in this combined degree can apply to the Philosophy department or the Psychology department. Students must be accepted into one of these departments (the "home department") through the standard admissions process, and both departments must then agree to accept the student into the combined program. If a student applies to the Philosophy department for the combined degree program, that student should also contact one or more Psychology faculty members with compatible interests so that a suitable adviser in Psychology can be identified prior to an admissions decision. Students enrolled in the combined program complete a series of courses in each discipline as well as an interdisciplinary dissertation that falls at the intersection of the two. On completing these requirements, students are awarded a Ph.D. either in Philosophy and Psychology, or in Psychology and Philosophy.

Questions about the combined degree programs may be directed to the directors of graduate studies in the participating departments prior to application.

MASTER'S DEGREES

M.Phil. The academic requirements for the M.Phil. degree are the same as for the Ph.D. degree except for the submission of a prospectus, and the completion and defense of a dissertation, which define the Ph.D.

M.S. (en route to the Ph.D.) The M.S. degree is awarded upon satisfactory completion of a first-year research project, a predissertation research project, and the four required core courses. A satisfactory grade must be achieved in the predissertation research project.

The Department of Psychology does not admit students for a terminal master's degree. If, however, a student admitted to the Ph.D. program leaves the program prior to completion of the doctoral degree, the student may be eligible to receive a master's degree upon completion of the academic requirements as stated above.

Program materials are available online at http://psychology.yale.edu.

COURSES

PSYC 500a, Foundations of Psychology I: Cognitive Psychology and Neuroscience

Julian Jara-Ettinger An introduction to graduate-level cognitive psychology and the biological bases of human behavior for first-year graduate students in psychology. Topics include decision making, learning, memory, perception, and attention. Topics also include neuroanatomy, neuronal signaling, and neuronal encoding. This course serves as the foundation for further study in more advanced graduate courses on specific topics. This course is required for all Psychology PhD students.

PSYC 518a, Multivariate Statistics Samuel Paskewitz

This is a practical course in statistics that covers classical null-hypothesis significance testing (e.g., binomial and chi-squared tests), regression analyses (multiple regressions, generalized linear models, and mixed-effects models), modern statistical methods (bootstraps and cross-validation), basics of Bayesian data analysis (hierarchical Bayesian models, Bayes factors), and basics of machine learning for data analysis (principal component analysis and classifiers). This course focuses on how to intuitively understand what different tests do, how to run them using R, and how to interpret the results. The course favors intuitions over mathematical rigor, but it's impossible to teach statistics without some math.

PSYC 539a, Advanced Psychopathology Jutta Joormann

The aim of this course is to have students master information on theory and assessment for major forms of psychopathology using cognitive-behavioral approaches. The focus is on learning how behavior can be conceptualized in cognitive-behavioral terms and to review recent models and empirical findings regarding clinical disorders. Students play an active role in this process by participating in class discussions and making presentations on etiological models and empirical findings for various clinical problems.

PSYC 553a / MGMT 753a, Behavioral Decision-Making I: Choice Ravi Dhar and Nathan Novemsky

The purpose of this seminar is to provide Ph.D.-level coverage of the psychology of decision making, focusing on choice. Although the normative issue of how choices should be made is relevant, the descriptive issue of how choices *are* made is the main focus of the course. In addition to examining prior choice research, the goal of this seminar is to improve your ability to identify interesting research questions and develop effective experiments for testing them. Students generally enroll from a variety of disciplines, including cognitive and social psychology, behavioral economics, finance, marketing, political science, medicine, and public health.

PSYC 576b, Social and Cultural Factors in Mental Health and Illness Jeannette Ickovics

This course provides an introduction to mental health and illness with a focus on the complex interplay between risk and protective factors and social and cultural influences on mental health status. We examine the role of social and cultural factors in the etiology, course, and treatment of substance misuse; depressive, anxiety, and psychotic disorders; and some of the severe behavioral disorders of childhood. The social consequences of mental illness such as stigma, isolation, and barriers to care are explored, and their impact on access to care and recovery considered. The effectiveness of the current system of services and the role of public health and public health professionals in mental health promotion are discussed.

PSYC 664a, Health and Aging Becca Levy

This course explores the ways psychosocial and biological factors influence aging health. Topics include interventions to improve mental and physical health; effects of ageism on health; racial and gender health disparities in later life; and how health policy can best adapt to the growing aging population. Students have the opportunity to engage in discussions and to develop a research proposal on a topic of interest.

PSYC 702a, Current Work in Cognition Woo-Kyoung Ahn

A weekly seminar in which students, staff, and guests report on their research in cognition and information processing.

PSYC 704a, Current Work in Behavior, Genetics, and Neuroscience Kia Nobre Examination of the current status of research and scientific knowledge bearing on issues of behavior, genetics, and neuroscience. Weekly speakers present research, which is examined methodologically; recent significant journal articles or technical books are also reviewed.

PSYC 708a, Current Work in Developmental Psychology Nicolò Cesana-Arlotti A luncheon meeting of the faculty and graduate students in developmental psychology for reports of current research and discussion on topics of general interest.

PSYC 710a, Current Work in Social Psychology and Personality Melissa Ferguson Faculty and students in personality/social psychology meet during lunchtime to hear about and discuss the work of a local or visiting speaker.

PSYC 720a, Current Work in Clinical Psychology Staff

Basic and applied current research in clinical psychology that focuses on the cognitive, affective, social, biological, and developmental aspects of psychopathology and its treatment is presented by faculty, visiting scientists, and graduate students. This research is examined in terms of theory, methodology, and ethical and professional implications. Students cannot simultaneously enroll in PSYC 718 or 719.

PSYC 724a, Research Topics in Cognition, Emotion, and Psychopathology Jutta Joormann

This weekly seminar focuses on the role of cognition and emotion in psychopathology. We discuss recent research on basic mechanisms that underlie risk for psychopathology such as cognitive biases, cognitive control, and biological aspects of psychological disorders. The seminar also focuses on the interaction of cognition and emotion, on the construct of emotion regulation, and on implications for psychopathology.

PSYC 727a, Research Topics in Clinical Neuroscience Tyrone Cannon Current research into the biological bases of schizophrenia and bipolar disorder, including topics related to etiology, treatment, and prevention.

PSYC 728a / AFAM 778a, Research Topics in Racial Justice in Public Safety Phillip Atiba Solomon

In this seminar, graduate students and postdoctoral fellows have a chance to present their research, and undergraduate research assistants learn about how to conduct interdisciplinary quantitative social science research on racial justice in public safety. The course consists of weekly presentations by members and occasional discussions of readings that are handed out in advance. The course is designed to be entirely *synchronous*. Presenters may request a video recording if they can benefit from seeing themselves present (e.g., for a practice talk). This course is intended for graduate students, postdocs, and undergraduates interested in conducting original quantitative social science research about race and public safety. Permission of the instructor is required.

PSYC 731a, Research Topics in Cognition and Development Frank Keil A weekly seminar discussing research topics concerning cognition and development. Primary focus on high-level cognition, including such issues as the nature of intuitive or folk theories, conceptual change, relations between word meaning and conceptual structure, understandings of divisions of cognitive labor, and reasoning about causal patterns.

PSYC 732a, Research Topics in Cognitive and Computational Human Neuroscience Marvin Chun

Examines recent research in human cognitive neuroscience. Topics include attention, visual perception, working memory, long-term memory, and cognitive control.

PSYC 733a, Research Topics in Social Cognitive Development Yarrow Dunham Investigation of various topics in developmental social cognition. Particular focus on the development of representations of self and other, social groups, and attitudes and stereotypes.

PSYC 735a, Research Topics in Thinking and Reasoning Woo-Kyoung Ahn In this lab students explore how people learn and represent concepts. Weekly discussions include proposed and ongoing research projects. Some topics include computational models of concept acquisition, levels of concepts, natural kinds and artifacts, and applications of some of the issues.

PSYC 737a, Research Topics in Clinical and Affective Neuroscience Avram Holmes Seminar focusing on ongoing research projects in clinical, cognitive, and translation neuroscience. Prerequisite: permission of the instructor.

PSYC 739a, Research Topics in Autism and Related Disorders Fred Volkmar Focus on research approaches in the study of autism and related conditions including both psychological and neurobiological processes. The seminar emphasizes the importance of understanding mechanisms in the developmental psychopathology of autism and related conditions.

PSYC 741a, Research Topics in Emotion and Relationships Margaret Clark Members of this laboratory read, discuss, and critique current theoretical and empirical articles on relationships and on emotion (especially those relevant to the functions emotions serve within relationships). In addition, ongoing research on these topics is discussed along with designs for future research.

PSYC 742a, Research Topics in Computation and Cognition Julian Jara-Ettinger Seminar-style discussion of recently published and unpublished researched in cognitive development and computational models of cognition.

PSYC 744a, Research Topics in Philosophical Psychology Joshua Knobe The lab group focuses on topics in the philosophical aspects of psychology.

PSYC 745a, Research Topics in Disinhibitory Psychopathology Arielle Baskin-Sommers

This laboratory course focuses on the study of cognitive and affective mechanisms contributing to disinhibition. We discuss various forms of disinhibition from trait (e.g., impulsivity, low constraint, externalizing) to disorder (e.g., antisocial personality disorder, psychopathy, substance use disorders), diverse methods (e.g., psychophysiology, self-report, neuroimaging, interventions), and multiple levels of analyses (e.g., neural, environmental, social). Members of this laboratory read and critique current articles, discuss ongoing research, and plan future studies.

PSYC 752a, Research Topics in Social Neuroscience Steve Chang

This weekly seminar discusses recent advances in neuroscience of social behavior. We discuss recent progress in research projects by the lab members as well as go over recently published papers in depth. Primary topics include neural basis of social decision-making, social preference formation, and social information processing. Our lab studies these topics by combining neurophysiological and neuroendocrinological techniques in nonhuman animals.

PSYC 753a, Research Topics in Legal Psychology Tom Tyler

This seminar is built around student research projects. Students propose, conduct, and analyze empirical research relevant to law and psychology. Grades are based upon final papers. Permission of the instructor required.

PSYC 754a, Research Topics in Clinical Affective Neuroscience and Development Dylan Gee

This weekly seminar focuses on current research related to the developmental neurobiology of child and adolescent psychopathology. Topics include typical and atypical neurodevelopmental trajectories, the development of fear learning and emotion regulation, effects of early life stress and trauma, environmental and genetic influences associated with risk and resilience, and interventions for anxiety and stress-related disorders in youth.

PSYC 755a, Research Topics in Intergroup Relations Jennifer Richeson Students in this laboratory course are introduced to and participate in socialpsychological research examining interactions and broader relations between members of socioculturally advantaged and disadvantaged groups. For instance, we examine the phenomena and processes associated with one's beliefs about members of social groups (stereotypes), attitudes and evaluative responses toward group members (prejudice), and behaviors toward members of a social group based on their group membership (discrimination). We also study how these issues shape the experiences of social groups members, especially when they are members of low-status and/or minority groups. We primarily focus on large societal groups that differ on cultural dimensions of identity, with a focus on race, ethnicity, and gender. Notably, we apply the theoretical and empirical work to current events and relevant policy issues.

PSYC 758a, Research Topics in Cognitive Neuroscience Nick Turk-Browne Seminar-style discussion of recent research in cognitive neuroscience, covering both recent studies from the literature and ongoing research at Yale.

PSYC 759a, Research Topics in Affective Science and Culture Maria Gendron A seminar-style discussion of recent research and theory in affective science and culture. The lab group focuses on the social and cultural shaping of emotions. We also discuss the biological constraints on variation and consistency in emotion as revealed by physiological research on emotion (in both the central and peripheral nervous system). Some discussion of current and planned research in the lab group also takes place.

PSYC 760a, Research Topics in Cognitive and Neural Computation Ilker Yildirim Lab meetings of the Cognitive & Neural Computation Laboratory at Yale.

PSYC 761a, Research Topics in Computational Decision and Affective Neuroscience Robb Rutledge

Seminar focusing on ongoing research projects in computational approaches to clinical, cognitive, and affective neuroscience.

PSYC 762a, Research Topics in Skill Learning Samuel McDougle This weekly seminar covers various themes in human learning, with an emphasis on

motor learning, motor memory, reinforcement learning, and decision-making. We discuss recently published and ongoing research on these topics, with special attention to behavioral studies, computational models of learning, and neural correlates.

PSYC 763a, Research Topics in Implicit Social Cognition Melissa Ferguson Weekly seminar on contemporary research projects in implicit social cognition, with a special focus on the topics of changing minds, prejudice, and self-control. Permission of the instructor required.

PSYC 764a, Research Topics in Children's Learning and Motivation Julia Leonard This weekly seminar covers cutting-edge research in cognitive science, developmental psychology, and neuroscience on young children's learning and motivation. We discuss how theoretically and empirically grounded science can be applied to the real world. Permission of the instructor required.

PSYC 765a, Research Topics in Philosophy and Cognitive Science Laurie Paul A weekly meeting to discuss relevant philosophical and psychological topics. Permission of the instructor required.

PSYC 766a, Research Topics in Perception and Cognition Brian Scholl Seminar-style discussion of recent research in perception and cognition, covering both recent studies from the literature and the ongoing research in the Yale Perception and Cognition Laboratory.

PSYC 771a, Research Topics in Nonconscious Processes John Bargh The lab group focuses on nonconscious influences of motivation, attitudes, social power, and social representations (e.g., stereotypes) as they impact on interpersonal behavior, as well as the development and maintenance of close relationships.

PSYC 775a, Research Topics in Animal Cognition Laurie Santos Investigation of various topics in animal cognition, including what nonhuman primates know about tools and foods; how nonhuman primates represent objects and number; whether nonhuman primates possess a theory of mind. Prerequisite: permission of the instructor.

PSYC 783a, Reserach Topics in Logical Cognition and the Infant Mind Nicolò Cesana-Arlotti

This weekly seminar discusses research topics concerning logical cognition and the infant mind. The seminar focus on the emergence of logical computations in different domains of human cognition and the origins of logical and abstract thought in the mind of infants and non-human cognition.

PSYC 784a, Research Topics in Proactive Cognition Kia Nobre

This weekly seminar discusses research topics concerning the psychological and brain mechanisms for controlling the flexible and proactive control of adaptive human behavior. None

PSYC 785a, Research Topics in Emotion, Health, and Psychophysiology Wendy Berry Mendes

This weekly seminar discusses research topics at the intersection of social psychology, affective science, biological psychology, and health. The seminar examines how the mind and body interact, emphasizing research in stress and health, emotions and psychophysiology, racial health disparities, and physiologic synchrony in dyads and groups.

PSYC 801a, Clinical Internship (Child) Staff

Advanced training in clinical psychology with children. Adapted to meet individual needs with location at a suitable APA-approved internship setting.

PSYC 802a, Clinical Internship (Adult) Staff

Advanced training in clinical psychology with adults. Adapted to meet individual needs with location at a suitable APA-approved internship setting.

PSYC 805a, Affective and Developmental Bases of Behavior Dylan Gee

This course aims to provide a broad survey of the affective and developmental bases of behavior, drawing on key topics in affective science and developmental psychology. Readings include reviews and empirical articles that highlight core issues relevant to the topics, from early theoretical perspectives to recent advances in the field. Topics broadly fall into several domains, including evolutionary, cultural, and developmental perspectives on emotion; neurocognitive and affective development; early experiences, attachment, and sensitive periods; emotional reactivity and regulation; and the role of emotion in illness and well-being.

PSYC 811a, Mood and Anxiety Disorders Practicum Mary O'Brien

This is a course for graduate students in clinical psychology. Group supervision of therapy provided at the Yale Psychology Department Clinic.

PSYC 817a, Other Clinical Practica Mary O'Brien

For credit under this course number, clinical students register for practicum experiences other than those listed elsewhere in clinical psychology, so that transcripts reflect accurately the various practicum experiences completed.

PSYC 920a, First-Year Research Staff

By arrangement with faculty.

PSYC 923a, Individual Study: Theme Essay Staff By arrangement with faculty.

PSYC 930a, Predissertation Research Staff By arrangement with faculty.

Public Health

60 College Street, 203.785.6383 http://publichealth.yale.edu M.S., M.Phil., Ph.D.

Dean Megan Ranney

Director of Graduate Studies Christian Tschudi (203.785.6383)

Professors Serap Aksoy, Heather Allore (Internal Medicine), Frederick Altice (Internal Medicine), Paul Anastas, Michelle Bell (School of the Environment), Cynthia Brandt (Emergency Medicine), Richard Bucala (Internal Medicine), Susan Busch, Michael Cappello, Kei-Hoi Cheung (Emergency Medicine), Elizabeth Claus, Theodore Cohen, Leslie Curry, Louise Dembry (Internal Medicine), Mayur Desai, Vincent DeVita (Internal Medicine), James Dziura (Emergency Medicine), Denise Esserman, David Fiellin (Internal Medicine), Erol Fikrig (Internal Medicine), Howard Forman (Radiology and Biomedical Imaging), Alison Galvani, Alan Gerber (Political Science), Thomas Gill (Internal Medicine), Peter Glazer (Therapeutic Radiology), Cary Gross (Internal Medicine), Robert Heimer, Jason Hockenberry, Jeannette Ickovics, Melinda Irwin, Akiko Iwasaki (Immunobiology), Amy Justice (Internal Medicine), Edward Kaplan (School of Management), Trace Kershaw, Jaehong Kim (Chemical and Environmental Engineering), Marissa King (School of Management), Albert Ko, Suchitra Krishnan-Sarin (Psychiatry), Harlan Krumholz (Internal Medicine), Ann Kurth (Nursing), Becca Levy, Judith Lichtman, Shuangge (Steven) Ma, Xiaomei Ma, I. George Miller (*Pediatrics*), Ruth Montgomery (Rheumatology), Bhramar Mukherjee, Linda Niccolai, Marcella Nunez-Smith (Internal Medicine), John Pachankis, Elijah Paintsil (Pediatrics), A. David Paltiel, Catherine Panter-Brick (Anthropology), Sunil Parikh, Rafael Pérez-Escamilla, Robert Pietrzak (Psychiatry), Edieal Pinker (School of Management), Jeffrey Powell (Ecology and Evolutionary Biology), Megan Ranney, Carrie Redlich (Occupational Medicine), Robert Rosenheck (Psychiatry), Joseph Ross (Internal Medicine), Mark Russi (Internal Medicine), Peter Salovey (Psychology), Mark Schlesinger, Fiona Scott-Morton (School of Management), Eugene Shapiro (Pediatrics), Andre Sofair (Internal Medicine), Donna Spiegelman, Jacob Tebes (Psychiatry), Jeanette Tetrault (General Medicine), Jeffrey Townsend, Christian Tschudi, Prathibha Varkey (General Medicine), Vasilis Vasiliou, Sten Vermund, Joseph Vinetz (Internal Medicine), David Vlahov (Nursing), Emily Wang (General Medicine), Marney White, David Yanez (Anesthesiology), Kimberly Yonkers (Psychiatry), Heping Zhang, Hongyu Zhao, Julie Zimmerman (Chemical and Environmental Engineering)

Associate Professors Rene Almeling (Sociology), Hamad Altalib (Neurology), Peter Aronow (Political Science), Amy Bei, Deepa Camenga (Emergency Medicine), Kai Chen, Xi Chen, Zack Cooper, Forrest Crawford, J. Lucian Davis, Andrew Dewan, Michaela Dinan, Nicole Deziel, Jennifer Edelman (General Medicine), Laura Forastiere, Abigail Friedman, Gregg Gonsalves, Nathan Grubaugh, Nicola Hawley, Josephine Hoh, Caroline Johnson, Manisha Juthanki-Mehta (Infectious Diseases), Danya Keene, Kaveh Khoshnood, Zeyan Liew, Sarah Lowe, Edward Melnick (Emergency Medicine), Jamie Meyer (Infectious Diseases), Joan Monin, Chima Ndumele, Ijeoma Opara, Robert Pietrzak (*Psychiatry*), Virginia Pitzer, Krystal Pollitt, Yusof Ransome, Eric Schneider (*Surgery*), Jason Schwartz, Veronika Shabanova (*Pediatrics*), Jodi Sherman (*Anesthesiology*), Erica Spatz (*Internal Medicine*), Katie Wang, Shi-Yi Wang, Jacob Wallace, Zuoheng (Anita) Wang, Joshua Warren, Melissa Weimer (*General Medicine*), Daniel Weinberger, Inci Yildirim (*Infectious Diseases*), Yize Zhao

Assistant Professors Colin Carlson, Drew Cameron, Daniel Carrión, Chelsey Carter, Jen-hwa Chu (Internal Medicine), Rachel Dreyer (Emergency Medicine), Leah Ferrucci, Julie Gaither (Pediatrics), Leying Guan, Ashley Hagaman, Kevin Hall (Cardiology), George Hauser (Laboratory Medicine), Kathryn Hawk (Emergency Medicine), Evelyn Hsieh (Internal Medicine), Yuan Huang, Samah Fodeh-Jarad (Emergency Medicine), Skyler Jackson, Olivia Kachingwe, Lee Kennedy-Shaffer, Tassos Kyriakides, Michael Leapman (Urology), Morgan Levine (Pathology), Fan (Frank) Li, Qiao Liu, Terika McCall, Robert McDougal, Ryan McNeil (General Medicine), Carol Oladele (Internal Medicine), Carlos Oliveira (Pediatrics), Victoria Perez, Kendra Plourde, Brita Roy (General Medicine), Wade Schultz (Laboratory Medicine), Sheela Shenoi (Internal Medicine), Jamie Tam, Chantal Vogels, Brian Wahl, Karen Wang (General Medicine), Shannon Whirledge (Obstetrics, Gynecology, and Reproductive Sciences), Reza Yaesoubi, Xiting Yan (Internal Medicine), Emma Zang (Sociology), Xin Zhou

FIELDS OF STUDY

Programs of study are offered in the areas of biostatistics, chronic disease epidemiology, environmental health sciences, epidemiology of infectious diseases, epidemiology of microbial diseases, health informatics, health policy and management, and social and behavioral sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Generally the first two years of the Ph.D. program are devoted primarily to coursework and rotations for students in some areas. All doctoral students are required to successfully complete a minimum of ten graduate-level courses and must satisfy the individual departmental requirements, detailed below. Courses such as Dissertation Research, Preparing for Qualifying Exams, Research Ethics and Responsibility, and Seminar do not count toward the course requirements. However, students must register for these courses in order for them to appear on the transcript.

All first-year Ph.D. students must enroll in and complete training in Research Ethics and Responsibility (EPH 600). This course introduces and prepares students for responsible conduct in research, including data acquisition and management, mentor/ trainee responsibilities, publication practices and authorship standards, scientific misconduct, and conflict of interest. Research Ethics and Responsibility is offered annually and is graded Satisfactory/Unsatisfactory.

The Graduate School uses grades of Honors, High Pass, Pass, or Fail. Students are required to earn a grade of Honors in at least two full-term courses and must achieve a High Pass average. (This applies to courses taken after matriculation in the Graduate School and during the nine-month academic year.)

Teaching and research experiences are regarded as an integral aspect of the graduate training program. All students are required to serve as teaching fellows for two terms at the TF level 10 or 20, typically during years two and three. During the first term of

teaching, students must attend a training session conducted by the Poorvu Center for Teaching and Learning. First-year students are encouraged to focus their efforts on coursework and are not permitted to serve as teaching fellows. A Ph.D. student who has fulfilled the teaching requirement is not permitted to serve as a teaching fellow without special permission from their adviser and the DGS. In the rare instances this exception is approved, the student will only be allowed to serve at the TF-10 level.

At the end of years one and two, advisers will be asked to complete a progress report for each student evaluating the student's academic progress and describing the student's readiness for teaching and/or conducting research. This is then discussed with the student and reviewed by the DGS. Students who have not progressed adequately will be asked to meet with the DGS to address the situation.

The qualifying exam is typically taken by the end of the second full academic year. With the assistance of the faculty adviser, generally after qualifying exams, each student requests appropriate faculty members to join a dissertation advisory committee (DAC). The DAC reviews and approves the prospectus as developed by the student and submits it to the DGS and the Graduate Studies Executive Committee (GSEC) for approval. The dissertation prospectus must be approved by the end of the third year.

To be admitted to candidacy, students must: (1) satisfactorily complete the course requirements for their department as outlined below, achieve grades of Honors in at least two full-term courses, and achieve an overall High Pass average; (2) obtain an average grade of High Pass on the qualifying exam; and (3) have the dissertation prospectus approved by the GSEC. Students who have been admitted to candidacy are required by the Graduate School to complete an annual Dissertation Progress Report.

Each DAC is required to meet as a group at least twice each year, and more frequently if necessary. The student schedules meetings of the DAC. The chair/adviser of the DAC produces a summary evaluation of progress and plans for the next six months. The student and the DGS receive a copy of the final document. The DAC reviews the progress of the dissertation research and decides when the dissertation is ready to be submitted to the readers. This decision is based on a closed defense of the dissertation, which involves a formal oral presentation by the student to the DAC. (At the adviser's discretion, other invited faculty may be present.) Upon completion of the closed defense, the chair/adviser of the DAC submits the recommendation to the DGS along with the names of three appropriate readers.

Doctoral dissertations originating in Public Health must also be presented in a public seminar. This presentation is scheduled after the submission of the dissertation to the readers and preferably prior to the receipt and consideration of the readers' reports. At least one member of the DAC supervising the dissertation and at least one member of the GSEC are required to attend the presentation.

Required Coursework

BIOSTATISTICS

Ph.D. students in biostatistics (BIS) have the choice of two pathways: the *Biostatistics Standard Pathway* and the *Biostatistics Implementation and Prevention Science Methods Pathway*. Students in the Biostatistics Standard Pathway are required to take a minimum of sixteen courses and students in the Implementation and Prevention

Science Methods Pathway are required to take a minimum of fifteen courses (not including BIS 525, BIS 526, BIS 699, and EPH 600). Course substitutions must be identified and approved by the student's adviser and the DGS. Students funded by specific fellowships may be subject to additional requirements and should discuss this with their adviser.

Core Requirements for Both Pathways

BIS 525	Seminar in Biostatistics and Journal Club ¹	0
BIS 526	Seminar in Biostatistics and Journal Club ¹	0
BIS 610	Applied Area Readings for Qualifying Exams	1
BIS 623	Advanced Regression Models	1
or S&DS 612	Linear Models	
BIS 628	Longitudinal and Multilevel Data Analysis	1
BIS 643	Theory of Survival Analysis	1
BIS 691	Theory of Generalized Linear Models	1
BIS 699	Summer Internship in Biostatistical Research ¹	0
EPH 508	Foundations of Epidemiology and Public Health ²	1
EPH 600	Research Ethics and Responsibility ¹	0
EPH 608	Frontiers of Public Health ²	1
S&DS 610	Statistical Inference ³	1

¹ These courses do not count toward the total number of courses required (fifteen for Implementation and Prevention Science Methods Pathway students and sixteen for Standard Pathway students)

² Students entering the program with an M.P.H. degree may be exempt. Students granted an exemption must take an alternate to replace EPH 608.

³ This course is offered through the Graduate School of Arts and Sciences

Students in the *Standard Pathway* (in consultation with their academic adviser and approved by the DGS) also choose a minimum of eight additional electives that will best prepare them for their dissertation research.

Implementation and Prevention Science Methods Pathway: Additional Required Courses

BIS 537	Statistical Methods for Causal Inference	1
BIS 629	Advanced Methods for Implementation and Prevention Science	1
BIS 631	Advanced Topics in Causal Inference Methods	1
EMD 533	Implementation Science	1
Implementation	and Prevention Science Methods Pathway: Suggested Electives	
BIS 536	Measurement Error and Missing Data	1
BIS 567	Bayesian Statistics	1
BIS 646	Nonparametric Statistical Methods and Their Applications	1

BIS 662	Computational Statistics	1
CDE 516	Principles of Epidemiology II	1
CDE 534	Applied Analytic Methods in Epidemiology	1
EMD 538	Quantitative Methods for Infectious Disease Epidemiology	1
HPM 570	Cost-Effectiveness Analysis and Decision-Making ¹	1
HPM 575	Evaluation of Global Health Policies and Programs	1
HPM 586	Microeconomics for Health Policy and Health Management	1
HPM 587	Advanced Health Economics	1
MGT 611	Policy Modeling ¹	4
SBS 541	Community Health Program Evaluation	1
SBS 574	Developing a Health Promotion and Disease Prevention Intervention	1
SBS 580	Qualitative Research Methods in Public Health ¹	1
S&DS 541	Probability Theory ^{1,2}	1
S&DS 565	Introductory Machine Learning ²	1
or S&DS 665	Intermediate Machine Learning	
S&DS 600	Advanced Probability ²	1

¹ These courses are strongly recommended.

² These courses are offered through the Graduate School of Arts and Sciences

CHRONIC DISEASE EPIDEMIOLOGY

Ph.D. students in chronic disease epidemiology (CDE) must complete a minimum of seventeen courses (not including EPH 600) from the following courses or their equivalents. Course substitutions must be identified and approved by the student's adviser and the DGS.

CDE 516	Principles of Epidemiology II	1
CDE 534	Applied Analytic Methods in Epidemiology	1
CDE 610	Applied Area Readings for Qualifying Exams	1
CDE 566	Causal Inference Methods in Public Health Research	1
CDE 617	Developing a Research Proposal ¹	1
or EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	
CDE 650	Introduction to Evidence-Based Medicine and Health Care	1
EHS/CDE 502	Physiology for Public Health	1
EPH 508	Foundations of Epidemiology and Public Health ³	1
EPH 600	Research Ethics and Responsibility ²	0
EPH 608	Frontiers of Public Health ³	1

¹ CDE 617 (or EMD 625) is not required of students funded by the Yale AIDS Prevention Training Program. Those students must take an additional elective in order to meet the seventeen-course requirement.

² This course does not count toward the minimum of seventeen courses.
³ Students entering the program with an M.P.H. degree may be exempt. Students granted an exemption must take an alternate course to replace EPH 608.

Alternate courses can be taken to fulfill the requirement of three 600-level course units in Biostatistics. Students must consult with their academic adviser and obtain approval of alternate courses. For example: S&DS 563, Multivariate Statistical Methods for the Social Sciences, may serve as an option for one of these three courses.

Students will also choose five additional electives that will best prepare them for their dissertation research.

ENVIRONMENTAL HEALTH SCIENCES

Ph.D. students in environmental health sciences (EHS) must take a minimum of thirteen courses (not including EHS 525, EHS 526, and EPH 600). However, more courses may be required by a student's adviser. Course substitutions must be identified and approved by the student's adviser and the DGS.

Required Courses

CDE 617	Developing a Research Proposal	1
or EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	
EHS 503	Public Health Toxicology	1
EHS 508	Environmental and Occupational Exposure Science	1
EHS 525	Seminar and Journal Club in Environmental Health ¹	0
EHS 526	Seminar and Journal Club in Environmental Health ¹	0
EHS 560	Methods in Climate Epidemiology	1
or EHS 566	Causal Inference Methods in Public Health Research	
0		
EHS 619	Research Rotation	1
EHS 619 EHS 620	Research Rotation Research Rotation	1
EHS 619 EHS 620 EPH 505	Research Rotation Research Rotation Biostatistics in Public Health	1
EHS 619 EHS 620 EPH 505 EPH 508	Research Rotation Research Rotation Biostatistics in Public Health Foundations of Epidemiology and Public Health ²	1 1 1
EHS 619 EHS 620 EPH 505 EPH 508 EPH 600	Research Rotation Research Rotation Biostatistics in Public Health Foundations of Epidemiology and Public Health ² Research Ethics and Responsibility ¹	1 1 1 1 0
EHS 619 EHS 620 EPH 505 EPH 508 EPH 600 EPH 608	Research Rotation Research Rotation Biostatistics in Public Health Foundations of Epidemiology and Public Health ² Research Ethics and Responsibility ¹ Frontiers of Public Health ²	1 1 1 1 0 1

¹ These courses do not count toward the minimum of thirteen courses.

² Students entering the doctoral program with an M.P.H. degree may be exempt. Students granted an exemption must take an alternate course to replace EPH 608.

Suggested Electives

A minimum of four is required.

BIS 505	Biostatistics in Public Health II	1
BIS 623	Advanced Regression Models	1
BIS 628	Longitudinal and Multilevel Data Analysis	1
CDE 516	Principles of Epidemiology II	1
CDE/EHS 520	Case-Based Learning for Genetic and Environmental	1
	Diseases	

CDE 534	Applied Analytic Methods in Epidemiology	1
EHS/CDE 502	Physiology for Public Health	1
EHS 511	Principles of Risk Assessment	1
EHS 530	Our Air, Our Health	1
EHS/EMD 537	Water, Sanitation, and Global Health	1
EHS 547	Climate Change and Public Health	1
EHS/CDE 563	Biomarkers of Exposure, Effect, and Susceptibility in the Epidemiology of Noncommunicable Disease	1
EHS 567	Fundamentals of Green Chemistry and Green Engineering	1
EHS 568	Introduction to GIS for Public Health	1
EHS 569	Advanced GIS Workshop	1
EHS 581	Public Health Emergencies: Disaster Planning and Response	1
ENV 755	Modeling Geographic Space ¹	3
ENV 756	Modeling Geographic Objects ¹	3

¹ These courses are offered in the School of the Environment.

EPIDEMIOLOGY OF MICROBIAL DISEASES

Ph.D. students in epidemiology of microbial diseases (EMD) must complete a minimum of ten courses (not including EPH 600). Course substitutions must be identified and approved by the student's adviser and the DGS.

Courses in biostatistics, epidemiology, and microbiology are strongly recommended. The specific courses recommended depend on the background of individual students and their stated research interests. An individual program that includes courses, seminars, and research rotations is developed by the student and the student's academic adviser. All students are required to complete three distinct research rotations. These are done in the fall and spring terms and in the summer between the first and second years. These research rotations (EMD 670, EMD 671, and EMD 672) are graded and account for three of the required ten courses.

Required Courses

EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	1
or CDE 617	Developing a Research Proposal	
EMD 670	Advanced Research Laboratories	1
EMD 671	Advanced Research Laboratories	1
EMD 672	Advanced Research Laboratories	1
EPH 508	Foundations of Epidemiology and Public Health ¹	1
or CDE 516	Principles of Epidemiology II	
EPH 600	Research Ethics and Responsibility ²	0
EPH 608	Frontiers of Public Health ¹	1

¹ Students entering the program with an M.P.H. or relevant graduate degree may be exempt. Students granted an exemption must take an alternate course to replace EPH 608.

² This course does not count toward the minimum of ten courses.

The following courses are suggested as appropriate for Ph.D. students in EMD. However, in consultation with the student's adviser, other courses in the School of Public Health or in other departments may also be appropriate.

BIS 537	Statistical Methods for Causal Inference	1
BIS 567	Bayesian Statistics	1
CDE/EHS 566	Causal Inference Methods in Public Health Research	1
EHS 568	Introduction to GIS for Public Health	1
EMD 531	Genomic Epidemiology of Infectious Diseases	1
EMD 533	Implementation Science	1
EMD 538	Quantitative Methods for Infectious Disease Epidemiology	1
EMD 539	Introduction to the Analysis and Interpretation of Public Health Surveillance Data	1
EMD 546	Vaccines and Vaccine-Preventable Diseases	1
EMD 550	Epidemiology and Control of Vector Borne Diseases	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	1
EMD 567	Tackling the Big Three: Malaria, TB, and HIV in Resource- Limited Settings	1
EMD 582	Political Epidemiology	1
HPM 570	Cost-Effectiveness Analysis and Decision-Making	1
S&DS 530	Data Exploration and Analysis ¹	1
S&DS 538	Probability and Statistics ¹	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences ¹	1

¹ These courses are offered in through the Graduate School of Arts and Sciences

HEALTH POLICY AND MANAGEMENT

Ph.D. students in health policy and management (HPM) are required to develop expertise in one of three areas of specialization: *Economics*; *Organizational Theory and Management*; or *Political and Policy Analysis*.

Students are required to complete the following coursework (or the equivalent in the topic areas covered in these courses). This course listing represents a suggested general program of study, but the specifics of course requirements are adapted to the particular interests and professional aspirations of each student. The standard number of courses taken is sixteen (excluding EPH 600, HPM 617, and HPM 618), with the option of obtaining credits for previous courses. With the approval of the academic adviser and the DGS, alternative courses that better suit the needs of the student may satisfy the coursework requirement. The departmental representative to the GSEC, in conjunction with the student's adviser, is responsible for determining if core course requirements have been satisfied by previous coursework or alternative courses. If so, the student should apply for a course waiver through the Graduate School. HPM students can only waive up to three of the sixteen courses.

Core Requirements (All Students)¹

EPH 508	Foundations of Epidemiology and Public Health ²	1
EPH 600	Research Ethics and Responsibility ³	0
EPH 608	Frontiers of Public Health ²	1
HPM 610	Applied Area Readings	1
HPM 617	Colloquium in Health Services Research ³	0
HPM 618	Colloquium in Health Services Research ³	0
HPM 600	Independent Study or Directed Readings 1	1

¹ Students must enroll in two distinct Independent Study courses (HPM 600)

² Students entering the program with an M.P.H. degree may be exempt. Students granted an exemption must take an alternate course to replace EPH 608.

³ These courses do not count toward the standard number of sixteen courses.

Methods and Statistics: Suggested Courses

A minimum of four is required.

BIS 623	Advanced Regression Models	1
BIS 628	Longitudinal and Multilevel Data Analysis	1
ECON 556	Topics in Empirical Economics and Public Policy ¹	1
ECON 558	Econometrics ¹	1
HPM 583	Methods in Health Services Research	1
MGMT 737	Applied Empirical Methods ¹	1
PLSC 500	Foundations of Statistical Inference ¹	1
PLSC 503	Theory and Practice of Quantitative Methods ¹	1
SBS 580	Qualitative Research Methods in Public Health	1
SOCY 580	Introduction to Methods in Quantitative Sociology ¹	1
SOCY 581	Intermediate Methods in Quantitative Sociology ¹	1
SOCY 582	Statistics III: Advanced Quantitative Analysis for Social Scientists ¹	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences ¹	1
S&DS 565	Introductory Machine Learning 1	1

¹ These courses are offered through the Graduate School of Arts and Sciences

Health Policy and Management: Suggested Courses

A minimum of two, all with Ph.D. readings, is required.

EPH 510	Health Policy and Health Care Systems	1
HPM 514	Health Politics, Governance, and Policy	1
HPM 570	Cost-Effectiveness Analysis and Decision-Making	1
HPM 573	Advanced Topics in Modeling Health Care Decisions	1
HPM 587	Advanced Health Economics	1

Area of Specialization Course Requirements

A minimum of four courses, all with Ph.D. readings, is required in the student's area of specialization.

Economics: Required Courses

ECON 545	Microeconomics ²	1
ECON 558	Econometrics ^{1,2}	1

¹ ECON 558 may count as a methods/statistics course or as a specialization course, but not both.

² These courses are offered through the Graduate School of Arts and Sciences

Students are also required to take a year-long sequence in econometrics, selected in consultation with the student's adviser (this will count towards the required Methods and Statistics courses). In addition, students take *two* field courses in a concentration area in which they plan to develop expertise. Sets of courses across topics can be selected to meet research interests.

Economics: Concentration Areas and Courses

Other courses may be substituted in consultation with the student's adviser.

Behavioral Economics

Foundations of Behavioral Economics ¹	1
Behavioral Decision Making I: Choice 1	
Denavioral Decision-making 1. Choice	1
Dn	
Industrial Organization I ¹	1
Industrial Organization II ¹	1
Labor Economics ¹	1
Labor Economics ¹	1
Topics in Empirical Economics and Public Policy ¹	1
Public Finance I ¹	1
Public Finance II ¹	1
	Behavioral Decision-Making I: Choice ¹ m Industrial Organization I ¹ Industrial Organization II ¹ Labor Economics ¹ Labor Economics ¹ Topics in Empirical Economics and Public Policy ¹ Public Finance I ¹ Public Finance II ¹

Organizational Theory and Management

Four courses are required, selected in consultation with the student's adviser.

Political and Policy Analysis: Suggested Courses

Four courses are required, selected in consultation with the student's adviser.

PLSC 800	Introduction to American Politics ¹	1
PLSC 801	Political Preferences and American Political Behavior ¹	1
PLSC 803	American Politics III: Institutions ¹	1

Students will also choose one additional elective that will best prepare them for their dissertation research.

¹ These courses are offered through the Graduate School of Arts and Sciences

SOCIAL AND BEHAVIORAL SCIENCES

Ph.D. students in social and behavioral sciences (SBS) or the Maternal Child Health Promotion Pathway must complete a minimum of fifteen courses (not including EPH 600) from the following courses or their equivalents. Course substitutions must be identified and approved by the student's adviser and the DGS.

CDE 617	Developing a Research Proposal ¹	1
or EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	
EPH 508	Foundations of Epidemiology and Public Health ³	1
EPH 600	Research Ethics and Responsibility ²	0
EPH 608	Frontiers of Public Health ³	1
SBS 574	Developing a Health Promotion and Disease Prevention Intervention	1
or SBS 541	Community Health Program Evaluation	
or SBS 593	Community-Based Participatory Research in Public Health	
SBS 580	Qualitative Research Methods in Public Health	1
SBS 610	Applied Area Readings for Qualifying Exams	1
SBS 699	Advanced Topics in Social and Behavioral Sciences	1

Core Requirements (All Students)

¹ CDE 617 (or EMD 625) is not required of students funded by the Yale AIDS Prevention Training Program. Those students must take an additional elective in order to meet the fifteen-course requirement.

² This course does not count toward the minimum of fifteen courses.

³ Students entering the program with an M.P.H. degree may be exempt. Students granted an exception must take an alternate course to replace EPH 608.

In consultation with their dissertation adviser, SBS students (not in the Maternal and Child Health Promotion Pathway) will choose three advanced-level (600 or above) statistics or methods courses from biostatistics, psychology, political science, sociology, anthropology, or statistics and data science (S&DS 563, Multivariate Statistical Methods for the Social Sciences and CDE 516, Principles of Epidemiology II also qualify as statistics or methods courses).

Students must also take five additional electives that will best prepare them for their dissertation research.

Maternal and Child Health (MCH) Promotion Pathway: Required Courses

These are in addition to SBS core requirements listed above.

EMD 533	Implementation Science	1
HPM 542	Health of Women and Children	1
SBS 594	Maternal-Child Public Health Nutrition	1

MCH Promotion Pathway: Required Electives

Any *three* from this list and *two* additional electives chosen in consultation with the student's adviser.

BIS 505	Biostatistics in Public Health II	1
BIS 621	Regression Models for Public Health	1
or BIS 623	Advanced Regression Models	
BIS 628	Longitudinal and Multilevel Data Analysis	1
BIS 630	Applied Survival Analysis	1
CDE 516	Principles of Epidemiology II	1
CDE 566	Causal Inference Methods in Public Health Research	1
or EMD 582	Political Epidemiology	
EPH 505	Biostatistics in Public Health	1
HPM 575	Evaluation of Global Health Policies and Programs	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences	1

M.D.-PH.D. PROGRAM REQUIREMENTS FOR PUBLIC HEALTH

All M.D.-Ph.D. students must meet with the director of graduate studies (DGS) in public health, if they are considering affiliating with public health. Students in this program are expected to meet the guidelines listed below in the time frame outlined. The DGS must approve any variations to these requirements.

Teaching

One term of teaching is required. If students are approved by the DGS to teach beyond this requirement, they can be compensated. In the rare instance that teaching beyond the requirement is approved, the student will only be allowed to serve as a TF 10. If a student has served as a teaching fellow elsewhere on campus, this experience may be counted toward the requirement. DGS approval is required to waive the teaching requirement on the basis of previous Yale teaching experience.

Rotations/Internships

Students should do two rotations/internships with potential advisers in public health. The purpose of these rotations/internships is to learn research approaches and methodologies and/or to allow the student time to determine if the faculty's research interests are compatible with the student's research interests. These rotations/ internships are usually done during the summer between the first and second years of medical school. In some cases, students may need to defer this requirement until the summer after the second year after taking certain courses and/or completing readings in order to possess the background necessary for a successful rotation/internship.

Required Coursework

M.D.-Ph.D. students are generally expected to take the same courses as traditional Ph.D. students. Departmental requirements vary; therefore, students should confer with the DGS and their Ph.D. adviser.

Timeline for Qualifying Exam

Students generally will take medical school courses in years one and two. Students can take public health courses or other appropriate courses during this time, if scheduling allows. Once affiliated with the public health program, students will complete all course requirements for the department. This generally takes a minimum of two terms but can take up to four terms after affiliating with public health. The qualifying exam is commonly completed after the fourth term of affiliation with the Ph.D. program in public health, but it can be done earlier with approval of the Ph.D. adviser and the DGS.

Prospectus Timeline

Following completion of the qualifying exam, students should focus on the prospectus, which must be approved by the Public Health Graduate Studies Executive Committee (GSEC) before the end of the student's sixth term as an affiliated Ph.D. student in public health.

Admission to Candidacy

To be admitted to candidacy, students must: (1) satisfactorily complete the course requirements for their department as outlined above, achieve grades of Honors in at least two full-term courses, and achieve an overall High Pass average; (2) obtain an average grade of High Pass on the qualifying exam; and (3) have the dissertation prospectus approved by the GSEC. All M.D.-Ph.D. students must be admitted to candidacy before the start of their fourth year in the Ph.D. program (i.e., before the start of the seventh term).

MASTER'S DEGREES

M.Phil. The M.Phil. is awarded to doctoral students who have advanced to candidacy. When students advance to candidacy, the registrar's office automatically submits a petition for the awarding of the M.Phil. degree.

Terminal Master's Degree Program The school offers a terminal master's degree program leading to an M.S. in public health in four concentrations: biostatistics (a two-year program), chronic disease epidemiology (a one-year program), epidemiology of infectious diseases (a one-year program), and health informatics (a two-year program). All students must fulfill both the departmental and Graduate School requirements for a terminal M.S. degree.

Students must have an overall grade average of High Pass, including a grade of Honors in at least one full-term graduate course (for students enrolled in the one-year programs in chronic disease epidemiology and epidemiology of infectious diseases) or in at least two full-term graduate courses (for students enrolled in the two-year programs in biostatistics and health informatics). In order to maintain the minimum average of High Pass, each grade of Pass must be balanced by one grade of Honors. For more details, please see Course and Honors Requirements under Policies and Regulations.

A biostatistics, chronic disease epidemiology, or epidemiology of microbial diseases student who is withdrawing from the Ph.D. program, and has successfully completed all required coursework for the terminal M.S. degree (described below), may apply and be recommended for the M.S. in public health. In the other departments, students must have successfully completed (prior to withdrawal) at least ten courses in the doctoral program and a capstone experience, achieving a minimum of two Honors grades and an overall High Pass average. Students who withdraw after qualifying or receiving the M.Phil. are not eligible for an M.S. degree.

Fields of Study

TERMINAL M.S. WITH CONCENTRATION IN BIOSTATISTICS

The M.S. with a concentration in biostatistics is a two-year program that provides training in clinical trials, epidemiologic methodology, implementation science, data science, statistical genetics, and mathematical models for infectious diseases. Students have a choice of three pathways: the *Biostatistics Standard Pathway*, the *Biostatistics Implementation and Prevention Science Methods Pathway*, and the *Biostatistics Data Science Pathway*. In contrast to the more general M.P.H. degree, the M.S. degree emphasizes the mastery of biostatistical skills from the beginning of the plan of study. While graduates of this program may apply to the Ph.D. degree program, the M.S. degree is itself quite marketable as a terminal degree. Part-time enrollment is permitted.

Degree Requirements

The biostatistics concentration requires the completion of fifteen required and elective courses for the Standard Pathway and the Implementation and Prevention Sciences Pathway. Sixteen required and elective courses must be completed for the Data Science Pathway. These requirements exclude the Seminar, BIS 525/BIS 526; the Summer Internship, BIS 695; EPH 100; and EPH 101.

NOTE: Half-term courses cannot count as an elective unless an additional half-term course is taken and the biostatistics faculty have approved both courses as an elective.

The Graduate School requires an overall grade average of High Pass, including grades of Honors in at least two full-term graduate courses for students enrolled in a two-year program. In order to maintain the minimum average of High Pass, each grade of Pass on the student's transcript must be balanced by one grade of Honors. Each grade of Fail must be balanced by two grades of Honors. If a student retakes a course in which the student has received a failing grade, only the newer grade will be considered in calculating this average. The initial grade of Fail, however, will remain on the student's transcript. A grade awarded at the conclusion of a full-year course in which no grade is awarded at the end of the first term would be counted twice in calculating this average.

Curriculum

Required Courses for All Pathways (or substitutions approved by the student's adviser and the DGS)

BIS 525	Seminar in Biostatistics and Journal Club ¹	0
BIS 526	Seminar in Biostatistics and Journal Club ¹	0

BIS 623	Advanced Regression Models	1
or S&DS 612	Linear Models	
BIS 628	Longitudinal and Multilevel Data Analysis	1
BIS 630	Applied Survival Analysis	1
or BIS 643	Theory of Survival Analysis	
BIS 678	Statistical Practice I	1
BIS 695	Summer Internship in Biostatistics 1	0
EPH 100	Professional Skills Series 1	0
EPH 101	Professional Skills Series ¹	0
EPH 509	Fundamentals of Epidemiology	1
EPH 608	Frontiers of Public Health ²	1
S&DS 541	Probability Theory	1
or S&DS 551	Stochastic Processes	
or S&DS 600	Advanced Probability	
S&DS 542	Theory of Statistics	1
or S&DS 610	Statistical Inference	

¹ These courses do not count toward the fifteen required courses.

² Students entering the program with an M.P.H. or relevant graduate degree may be exempt.

Additional Required Courses: Standard Pathway

BIS 679	Advanced Statistical Programming in SAS and R	1
BIS 681	Statistical Practice II ¹	1
or BIS 649	Master's Thesis Research	
or BIS 650	Master's Thesis Research	

A minimum of two of the following biostatistics electives:

BIS 536	Measurement Error and Missing Data	1
BIS 537	Statistical Methods for Causal Inference	1
BIS 540	Fundamentals of Clinical Trials	1
BIS 550	Topics in Biomedical Informatics and Data Science	1
BIS 555	Machine Learning with Biomedical Data	1
BIS 560	Introduction to Health Informatics	1
BIS 567	Bayesian Statistics	1
BIS 568	Applied Artificial Intelligence in Healthcare	1
BIS 620	Data Science Software Systems	1
BIS 629	Advanced Methods for Implementation and Prevention Science	1
BIS 631	Advanced Topics in Causal Inference Methods	1
BIS 633	Population and Public Health Informatics	1
BIS 634	Computational Methods for Informatics	1

BIS 638	Clinical Database Management Systems and Ontologies	1
BIS 640	User-Centered Design of Digital Health Tools	1
BIS 643	Theory of Survival Analysis ²	1
BIS 645	Statistical Methods in Human Genetics	1
BIS 646	Nonparametric Statistical Methods and Their Applications	1
BIS 662	Computational Statistics	1
BIS 691	Theory of Generalized Linear Models	1
BIS 692	Statistical Methods in Computational Biology	1
Additional electives n	nust be approved by the Standard Pathway faculty liaison	

¹ MS Biostatistics (Standard Pathway) students are required to complete a two-

semester capstone experience in the second year. This requirement can be fulfilled by:

- Taking two semesters of the capstone course: BIS 678 (fall) and BIS 681 (spring); *or*
- Taking the fall semester capstone course BIS 678 and completing a thesis. The thesis is a yearlong project. Students who plan to complete a thesis should register for BIS 649 (fall; 1 credit) and BIS 650 (spring; 1 credit).

All students who complete a thesis will be required to present their research during a public seminar to the Biostatistics faculty and students in order to graduate.

² Cannot fulfill elective if substituted for BIS 630.

A minimum of three electives must be taken from either the Biostatistics electives list or the list below:

CDE 566	Causal Inference Methods in Public Health Research	1
CDE 634	Advanced Applied Analytic Methods in Epidemiology and Public Health	1
CPSC 540	Database Design and Implementation	1
CPSC 546	Data and Information Visualization	1
CPSC 552	Deep Learning Theory and Applications	1
CPSC 570	Artificial Intelligence	1
CPSC 577	Natural Language Processing	1
CPSC 582	Current Topics in Applied Machine Learning	1
CPSC 583	Deep Learning on Graph-Structured Data	1
CPSC 640	Topics in Numerical Computation	1
CPSC 670	Topics in Natural Language Processing	1
CPSC 677	Advanced Natural Language Processing	1
CPSC 680	Trustworthy Deep Learning	1
CPSC 752	Biomedical Data Science: Mining and Modeling	1
ECON 554	Econometrics V	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	1
ENAS 912	Biomedical Image Processing and Analysis	1
HPM 573	Advanced Topics in Modeling Health Care Decisions	1

HPM 583	Methods in Health Services Research	1
INP 558	Computational Methods in Human Neuroscience	1
INP 599	Statistics and Data Analysis in Neuroscience	1
MGT 803	Decision Making with Data ¹	2
S&DS 517	Applied Machine Learning and Causal Inference	1
S&DS 551	Stochastic Processes	1
S&DS 562	Computational Tools for Data Science	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences	1
S&DS 565	Introductory Machine Learning	1
S&DS 569	Numerical Linear Algebra: Deterministic and Randomized Algorithms	1
S&DS 580	Neural Data Analysis	1
S&DS 600	Advanced Probability	1
S&DS 610	Statistical Inference	1
S&DS 611	Selected Topics in Statistical Decision Theory	1
S&DS 612	Linear Models ²	1
S&DS 618	Asymptotic Statistics	1
S&DS 625	Statistical Case Studies	1
S&DS 631	Optimization and Computation	1
S&DS 632	Advanced Optimization Techniques	1
S&DS 661	Data Analysis	1
S&DS 662	Statistical Computing	1
S&DS 663	Computational Mathematics Situational Awareness and Survival Skills	1
S&DS 664	Information Theory	1
S&DS 665	Intermediate Machine Learning	1
S&DS 674	Applied Spatial Statistics	1
S&DS 685	Theory of Reinforcement Learning	1
Additional electives r	nust be approved by the Standard Pathway faculty liaison	

¹ These courses are offered in the School of Management

² Cannot fulfill elective credit if substituted for BIS 623.

Students wishing to complete a thesis may enroll in BIS 649 and BIS 650, Master's Thesis Research. This would be an additional requirement and cannot replace any of the required courses noted above. All students who complete a thesis will be required to present their research during a public seminar to the Biostatistics faculty and students in order to graduate.

Additional Required Courses: Implementation and Prevention Science Methods Pathway

BIS 629	Advanced Methods for Implementation and Prevention	1
	Science	

BIS 679	Advanced Statistical Programming in SAS and R	1
BIS 681	Statistical Practice II ¹	1
or BIS 649	Master's Thesis Research	
or BIS 650	Master's Thesis Research	
EMD 533	Implementation Science	1

¹ MS Biostatistics (Implementation Science Pathway) students are required to complete a two-semester capstone experience in the second year. This requirement can be fulfilled by:

- Taking two semesters of the capstone course: BIS 678 (fall) and BIS 681 (spring); or
- Taking the fall semester capstone course BIS 678 and completing a thesis. The thesis is a yearlong project. Students who plan to complete a thesis should register for:BIS 649 (fall; 1 credit) and BIS 650 (spring; 1 credit).

Students in this pathway are strongly encouraged to complete a thesis. All students who complete a thesis will be required to present their research during a public seminar to the Biostatistics faculty and students in order to graduate.

At least one of the following:

BIS 536	Measurement Error and Missing Data	1
BIS 537	Statistical Methods for Causal Inference	1
BIS 631	Advanced Topics in Causal Inference Methods	1

At least two of the following:

	e	
CDE 516	Principles of Epidemiology II	1
CDE 534	Applied Analytic Methods in Epidemiology	1
EMD 538	Quantitative Methods for Infectious Disease Epidemiology	1
HPM 570	Cost-Effectiveness Analysis and Decision-Making ¹	1
HPM 575	Evaluation of Global Health Policies and Programs	1
HPM 586	Microeconomics for Health Policy and Health Management	1
HPM 587	Advanced Health Economics	1
MGT 611	Policy Modeling	4
SBS 541	Community Health Program Evaluation ¹	1
SBS 574	Developing a Health Promotion and Disease Prevention Intervention	1
SBS 580	Qualitative Research Methods in Public Health ¹	1
S&DS 565	Introductory Machine Learning	1
Alternative electives r	nust be approved by the Implementation Science Pathway	

director.

¹ These courses are highly recommended.

Additional Required Courses: Data Science Pathway

BIS 620	Data Science Software Systems	1
BIS 687	Data Science Capstone ¹	1

or BIS 649	Master's Thesis Research
or BIS 650	Master's Thesis Research

¹ MS Biostatistics (Data Science Pathway) students are required to complete a twosemester capstone experience in the second year. This requirement can be fulfilled by:

- Taking two semesters of the capstone course: BIS 678 (fall) and BIS 687 (spring); *or*
- Taking the fall semester capstone course BIS 678 and completing a thesis. The thesis is a yearlong project. Students who plan to complete a thesis should register for BIS 649 (fall; 1 credit) and BIS 650 (spring; 1 credit).

All students who complete a thesis will be required to present their research during a public seminar to the Biostatistics faculty and students in order to graduate.

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BIS 536	Measurement Error and Missing Data	1
BIS 537	Statistical Methods for Causal Inference	1
BIS 540	Fundamentals of Clinical Trials	1
BIS 550	Topics in Biomedical Informatics and Data Science	1
BIS 555	Machine Learning with Biomedical Data ¹	1
BIS 567	Bayesian Statistics	1
BIS 629	Advanced Methods for Implementation and Prevention Science	1
BIS 634	Computational Methods for Informatics ¹	1
BIS 645	Statistical Methods in Human Genetics	1
BIS 646	Nonparametric Statistical Methods and Their Applications	1
BIS 662	Computational Statistics ¹	1
BIS 692	Statistical Methods in Computational Biology	1
CB&B 562	Modeling Biological Systems II	1
CB&B 752	Biomedical Data Science: Mining and Modeling	1
CPSC 519	Full Stack Web Programming	1
CPSC 526	Building Distributed Systems	1
CPSC 539	Software Engineering	1
CPSC 565	Theory of Distributed Systems	1
CPSC 577	Natural Language Processing	1
CPSC 588	AI Foundation Models	1
CPSC 640	Topics in Numerical Computation	1
CPSC 642	Modern Challenges in Statistics: A Computational Perspective	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	1
HPM 573	Advanced Topics in Modeling Health Care Decisions	1
S&DS 541	Probability Theory ³	1
S&DS 551	Stochastic Processes ⁴	1

Two of the following biostatistics, computer science, or statistical methods courses

S&DS 611	Selected Topics in Statistical Decision Theory	1
S&DS 625	Statistical Case Studies	1
S&DS 661	Data Analysis	1
S&DS 664	Information Theory	1
Additional electives n	nust be approved by the Data Science Pathway director	
One of the following	Machine Learning courses:	
BIS 555	Machine Learning with Biomedical Data ¹	1
BIS 568	Applied Artificial Intelligence in Healthcare	1
BIS 634	Computational Methods for Informatics ¹	1
BIS 662	Computational Statistics ¹	1
BIS 691	Theory of Generalized Linear Models	1
CB&B 555	Unsupervised Learning for Big Data	1
CB&B 663	Deep Learning Theory and Applications	1
CPSC 569	Randomized Algorithms	1
CPSC 583	Deep Learning on Graph-Structured Data	1
CPSC 644	Geometric and Topological Methods in Machine Learning	1
CPSC 670	Topics in Natural Language Processing	1
S&DS 517	Applied Machine Learning and Causal Inference	1
S&DS 562	Computational Tools for Data Science	1
S&DS 565	Introductory Machine Learning	1
S&DS 569	Numerical Linear Algebra: Deterministic and Randomized Algorithms	1
S&DS 631	Optimization and Computation	1
S&DS 632	Advanced Optimization Techniques	1
S&DS 665	Intermediate Machine Learning	1
S&DS 674	Applied Spatial Statistics	1
S&DS 684	Statistical Inference on Graphs	1
S&DS 685	Theory of Reinforcement Learning	1
S&DS 686	High-Dimensional Phenomena in Statistics and Learning	1
Additional electives n	nust be approved by the Data Science Pathway director	
One of the following	Database courses:	
BIS 550	Topics in Biomedical Informatics and Data Science ¹	1
BIS 638	Clinical Database Management Systems and Ontologies	1
BIS 679	Advanced Statistical Programming in SAS and R	1
CPSC 537	Database Systems	1
MGT 656	Management of Software Development ²	4
MGT 660	Advanced Management of Software Development ²	4
Additional electives n	nust be approved by the Data Science Pathway director	

¹ These courses can only be counted to fulfill the requirement of one category; they cannot be counted twice.

- ² These courses are offered at the School of Management.
- ³ Cannot fulfill elective if taken as a requirement
- ⁴ Cannot fulfill elective if taken as a substitute for S&DS 541

Two additional electives are required from the biostatistics, machine learning, or database list. Other courses from public health or other departments must be approved by the Data Science Pathway faculty liaison.

Competencies

Upon receiving an M.S. in the biostatistics concentration of public health, the student will be able to:

- Select from a variety of analytical tools to test statistical hypotheses, interpret results of statistical analyses, and use these results to make relevant inferences from data.
- Design efficient computer programs for study management, statistical analysis, as well as presentation using R, SAS, and other programming languages.
- Demonstrate oral and written communication and presentation skills to effectively communicate and disseminate results to professional audiences.

TERMINAL M.S. WITH CONCENTRATION IN CHRONIC DISEASE EPIDEMIOLOGY

This one-year program is designed for medical and health care professionals (e.g., M.D., Ph.D., D.V.M., D.D.S., D.M.D.) or others seeking the skills necessary to conduct epidemiological research in their professional practice. Part-time enrollment is permitted.

Degree Requirements

The chronic disease epidemiology concentration consists of required and elective coursework and satisfactory completion of the capstone experience. A total of ten courses is required (excluding the Seminar, CDE 525/CDE 526). It is expected that this program will be completed during a single academic year when a student enrolls full-time. Students with an M.P.H. or relevant graduate degree may be eligible to substitute advanced courses for some of the required courses. Written permission of the DGS is required prior to enrolling in substitute courses.

The Graduate School requires an overall grade average of High Pass, including a grade of Honors in at least one full-term graduate course for students enrolled in a one-year program. In order to maintain the minimum average of High Pass, each grade of Pass on the student's transcript must be balanced by one grade of Honors. Each grade of Fail must be balanced by two grades of Honors. If a student retakes a course in which the student has received a failing grade, only the newer grade will be considered in calculating this average. The initial grade of Fail, however, will remain on the student's transcript. A grade awarded at the conclusion of a full-year course in which no grade is awarded at the end of the first term would be counted twice in calculating this average.

Curriculum

Required Courses (or approved substitutions)

CDE 516	Principles of Epidemiology II	1
CDE 525	Seminar in Chronic Disease Epidemiology ¹	0
CDE 526	Seminar in Chronic Disease Epidemiology ¹	0
CDE 617	Developing a Research Proposal ²	1
or CDE 600	Independent Study or Directed Readings	
or EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	
EPH 508	Foundations of Epidemiology and Public Health	1
EPH 608	Frontiers of Public Health ³	1

¹ These courses do not count toward the ten required courses.

 2 In the capstone courses CDE 617 or EMD 625, the student is required to develop a grant application that is deemed reasonably competitive by the instructor. An alternative to one of these capstone courses, is an individualized tutorial (CDE 600), in which the student completes a manuscript that is suitable for submission for publication in a relevant journal.

 $^3\,$ Students entering the program with an M.P.H. or relevant graduate degree may be exempt.

Quantitative courses (choose three from the following or an approved substitution)

BIS 536	Measurement Error and Missing Data	1
BIS 537	Statistical Methods for Causal Inference	1
BIS 575	Introduction to Regulatory Affairs	1
BIS 621	Regression Models for Public Health	1
BIS 630	Applied Survival Analysis	1
BIS 633	Population and Public Health Informatics	1
S&DS 530	Data Exploration and Analysis	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences	1

Chronic Disease Epidemiology (choose two of the following)

CDE 502	Physiology for Public Health	1
CDE 532	Epidemiology of Cancer	1
CDE 534	Applied Analytic Methods in Epidemiology	1
CDE 535	Epidemiology of Heart Disease and Stroke	1
CDE 545	Health Disparities by Race and Social Class: Application to Chronic Disease Epidemiology	1
CDE 551	Global Noncommunicable Disease	1
CDE 562	Nutrition and Chronic Disease	1
CDE 572	Obesity Prevention and Lifestyle Interventions	1
CDE 582	Health Outcomes Research: Matching the Right Research Question to the Right Data	1
CDE 588	Perinatal Epidemiology	1

CDE 597	Genetic Concepts in Public Health	1
CDE 650	Introduction to Evidence-Based Medicine and Health Care	1

Students must complete one additional elective, chosen in consultation with their adviser.

Competencies

Upon receiving an M.S. in the chronic disease epidemiology concentration of public health, the student will be able to:

- · Evaluate the scientific merit and feasibility of epidemiologic study designs.
- · Review and evaluate epidemiologic reports and research articles.
- Analyze data and draw appropriate inferences from epidemiologic studies.
- Write an epidemiologic research proposal.

TERMINAL M.S. WITH CONCENTRATION IN EPIDEMIOLOGY OF INFECTIOUS DISEASES

This one-year program offers two areas of specialization: a quantitative area aims to provide quantitatively focused research training in the epidemiology of infectious diseases, focusing on the analysis of communicable disease data as well as modeling and simulation; and a clinical area aims to provide research training for clinicians and clinical trainees interested in furthering their research expertise. Part-time enrollment is permitted. Part-time students must complete the degree requirements in two years.

Degree Requirements

The epidemiology of infectious diseases concentration requires a total of ten courses (excluding the yearlong Seminar, EMD 525/EMD 526), including satisfactory completion of the capstone course. There are two capstone course options:

Option 1 Students may elect to enroll in EMD 625, How to Develop, Write, and Evaluate an NIH Proposal. Students in this course develop an NIH-style research proposal focusing on a topic related to infectious disease epidemiology. This course is taken by students in the final term of their M.S. program. Students meet as a group for cross-cutting didactic sessions on reading RFAs, NIH peer review and scoring, and effective grant writing and grantsmanship. Students work one-on-one outside of these sessions with faculty mentors to construct their grant proposals over the course of the term. They work with other students in the course to refine their projects and will do an oral presentation of their proposal at the final capstone course symposium at the end of the term.

Option 2 Students may elect to enroll in EMD 563, Laboratory and Field Studies in Infectious Diseases. This course provides students with hands-on training in laboratory or epidemiological research techniques. Students work one-on-one with faculty members on existing or new projects. Students choosing this option write-up and present their findings at the final capstone course symposium at the end of their final term.

The Graduate School requires an overall grade average of High Pass, including a grade of Honors in at least one full-term graduate course for students enrolled in a one-year program. In order to maintain the minimum average of High Pass, each grade of Pass

on the student's transcript must be balanced by one grade of Honors. Each grade of Fail must be balanced by two grades of Honors. If a student retakes a course in which the student has received a failing grade, only the newer grade will be considered in calculating this average. The initial grade of Fail, however, will remain on the student's transcript. A grade awarded at the conclusion of a full-year course in which no grade is awarded at the end of the first term would be counted twice in calculating this average.

Curriculum

Required Courses: Quantitative Specialization (or substitutions approved by the student's adviser and the DGS)

BIS 623	Advanced Regression Models	1
BIS 630	Applied Survival Analysis	1
EMD 517	Principles of Infectious Diseases I	1
EMD 518	Principles of Infectious Diseases II	1
EMD 525	Seminar in Epidemiology of Microbial Diseases ¹	0
EMD 526	Seminar in Epidemiology of Microbial Diseases ¹	0
EMD 538	Quantitative Methods for Infectious Disease Epidemiology	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	1
or EMD 539	Introduction to the Analysis and Interpretation of Public Health Surveillance Data	1
EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	1
or EMD 563	Laboratory and Field Studies in Infectious Diseases	
EPH 508	Foundations of Epidemiology and Public Health	1
EPH 608	Frontiers of Public Health (EPH 600 no longer required for MS students) ²	1

¹ These courses do not count toward the ten required courses.

² Students entering the program with an M.P.H. or relevant graduate degree may be exempt.

In addition, students must complete one elective course in epidemiology of infectious diseases (approved by the student's adviser and the DGS).

Required Courses: Clinical Specialization (or substitutions approved by the student's adviser and the DGS)

BIS 505	Biostatistics in Public Health II	1
or CDE 534	Applied Analytic Methods in Epidemiology	
EMD 517	Principles of Infectious Diseases I	1
EMD 518	Principles of Infectious Diseases II	1
EMD 525	Seminar in Epidemiology of Microbial Diseases ¹	0
EMD 526	Seminar in Epidemiology of Microbial Diseases ¹	0
EMD 530	Health Care Epidemiology: Improving Health Care Quality through Infection Prevention	1
or EMD 536	Outbreak Investigations: Principles and Practice	

EMD 567	Tackling the Big Three: Malaria, TB, and HIV in Resource- Limited Settings	1
or EMD 533	Implementation Science	
EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	1
or EMD 563	Laboratory and Field Studies in Infectious Diseases	
EPH 505	Biostatistics in Public Health	1
EPH 508	Foundations of Epidemiology and Public Health	1
EPH 608	Frontiers of Public Health ²	1

¹ These courses do not count toward the ten required courses.

² Students entering the program with an M.P.H. or relevant graduate degree may be exempt.

In addition, students must complete one elective course in epidemiology of infectious diseases (approved by the student's adviser and the DGS).

Suggested Electives for Both Specializations

EMD 531	Genomic Epidemiology of Infectious Diseases	1
EMD 537	Water, Sanitation, and Global Health	1
EMD 541	Health in Humanitarian Crises	1
EMD 546	Vaccines and Vaccine-Preventable Diseases	1
EMD 580	Reforming Health Systems: Using Data to Improve Health in Low- and Middle-Income Countries	1
EMD 582	Political Epidemiology	1

Alternate electives must be approved in consultation with the student's adviser and the DGS.

Competencies

Upon receiving an M.S. in the epidemiology of infectious diseases concentration of public health, the student will be able to:

- Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health (especially in terms of risk/burden of infectious diseases).
- Explain ecological perspective on the connection between human health, animal health, and ecosystem health with respect to microbial threats.
- Analyze datasets that arise in the context of outbreaks, epidemics, and endemic infectious diseases. (Quantitative specialization only)
- Design observational and/or experimental studies to study the relationship between host, microbial, or environmental factors on the occurrence or control of infectious diseases. (Clinical specialization only)

TERMINAL M.S. WITH CONCENTRATION IN HEALTH INFORMATICS

This two-year program provides well-rounded training in health informatics, with a balance of core courses from such areas as information sciences, clinical informatics, clinical research informatics, consumer health and population health informatics,

and data science, and more broadly health policy, social and behavioral science, biostatistics, and epidemiology. First-year courses survey the field; the typical secondyear courses are more technical and put greater emphasis on mastering the skills in health informatics. Part-time enrollment is not permitted.

Degree Requirements

The health informatics concentration consists of a total of fourteen courses: eight required courses, four electives, and satisfactory completion and presentation of a yearlong capstone project. Students demonstrating a mastery of topics covered by the required courses may replace them with more advanced courses but must receive written permission from the DGS and their adviser prior to enrolling in the substitute courses.

The Graduate School requires an overall grade average of High Pass, including grades of Honors in at least two full-term graduate courses for students enrolled in a two-year program. In order to maintain the minimum average of High Pass, each grade of Pass on the student's transcript must be balanced by one grade of Honors. Each grade of Fail must be balanced by two grades of Honors. If a student retakes a course in which the student has received a failing grade, only the newer grade will be considered in calculating this average. The initial grade of Fail, however, will remain on the student's transcript. A grade awarded at the conclusion of a full-year course in which no grade is awarded at the end of the first term would be counted twice in calculating this average.

Curriculum

Required Courses

BIS 550	Topics in Biomedical Informatics and Data Science	1
BIS 560	Introduction to Health Informatics	1
BIS 562	Clinical Decision Support	1
or BIS 640	User-Centered Design of Digital Health Tools	
BIS 633	Population and Public Health Informatics	1
BIS 634	Computational Methods for Informatics	1
BIS 638	Clinical Database Management Systems and Ontologies	1
BIS 685	Capstone in Health Informatics	1
BIS 686	Capstone in Health Informatics	1
EPH 508	Foundations of Epidemiology and Public Health	1
or EPH 509	Fundamentals of Epidemiology	
EPH 608	Frontiers of Public Health ¹	1

¹ Students entering the program with an M.P.H. or relevant graduate degree may be exempt.

MS Suggested Electives in Informatics, Statistics and Data Science (4 course units)

BIS 540	Fundamentals of Clinical Trials	1
BIS 567	Bayesian Statistics	1
BIS 568	Applied Artificial Intelligence in Healthcare	1
BIS 620	Data Science Software Systems	1

BIS 621	Regression Models for Public Health	1
BIS 623	Advanced Regression Models	1
BIS 628	Longitudinal and Multilevel Data Analysis	1
BIS 630	Applied Survival Analysis	1
BIS 645	Statistical Methods in Human Genetics	1
BIS 662	Computational Statistics	1
BIS 691	Theory of Generalized Linear Models	1
BIS 692	Statistical Methods in Computational Biology	1
CB&B 555	Unsupervised Learning for Big Data	1
CB&B 567	Topics in Deep Learning: Methods and Biomedical Applications	1
CB&B 645	Statistical Methods in Computational Biology	1
CB&B 663	Deep Learning Theory and Applications	1
CDE 534	Applied Analytic Methods in Epidemiology	1
CPSC 540	Database Design and Implementation	1
CDE 566	Causal Inference Methods in Public Health Research	1
CPSC 546	Data and Information Visualization	1
CPSC 564	Algorithms and their Societal Implications	1
CPSC 577	Natural Language Processing	1
CPSC 581	Introduction to Machine Learning	1
CPSC 582	Current Topics in Applied Machine Learning	1
CPSC 583	Deep Learning on Graph-Structured Data	1
CPSC 670	Topics in Natural Language Processing	1
EMD 533	Implementation Science	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	1
ENAS 529		0
ENAS 544	Fundamentals of Medical Imaging	1
HPM 559	Big Data, Privacy, and Public Health Ethics	1
EPH 510	Health Policy and Health Care Systems	1
HPM 560	Health Economics and U.S. Health Policy	1
HPM 570	Cost-Effectiveness Analysis and Decision-Making	1
HPM 573	Advanced Topics in Modeling Health Care Decisions	1
IMED 625	Principles of Clinical Research	1
INP 560	R Stats for Neuroscience	1
MGT 525	Competitive Strategy ¹	4
MGT 534	Personal Leadership ¹	4
MGT 612	Introduction to Social Entrepreneurship	4
MGT 656	Management of Software Development ¹	4
S&DS 517	Applied Machine Learning and Causal Inference	1
S&DS 530	Data Exploration and Analysis	1

S&DS 562	Computational Tools for Data Science	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences	1
S&DS 565	Introductory Machine Learning	1
S&DS 583	Time Series with R/Python	1
S&DS 610	Statistical Inference	1
S&DS 663	Computational Mathematics Situational Awareness and Survival Skills ¹	1
S&DS 664	Information Theory	1

¹ These courses are offered in the School of Management.

In addition, in the second year of the program, students are required to complete an independent capstone project (BIS 685/BIS 686) under the direction of a faculty member. This project may fall into one of the main areas – clinical informatics; clinical research informatics; population health informatics; and implementation of new methods and technology – and may include elements from several of these areas. Students are required to prepare a carefully written report and make an oral presentation of the work to the faculty and students. A capstone committee consisting of two faculty members and one outside reader will provide guidance to the candidate as to the suitability of the project and will monitor its progress.

Competencies

Upon receiving an M.S. in the health informatics concentration of public health, the student will be able to:

- · Select informatics methods appropriate for a given public health context.
- Compare the health information system structure and function across regional, national, and international settings.
- Assess population informatics needs, assets, and capacities that affect communities' health.
- Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health informatics.
- Communicate audience-appropriate public health content, both in writing and through oral presentation.
- Apply systems thinking tools to a public health informatics issue.

Ph.D. or terminal M.S. degree program materials are available upon request to the Office of the Director of Graduate Studies (c/o M. Elliot), School of Public Health, Yale University, PO Box 208034, New Haven CT 06520-8034; 203.785.6383; email, phdms.publichealth@yale.edu.

REQUIRED COURSES

For a complete list of Public Health courses, see the School of Public Health bulletin, available online at https://bulletin.yale.edu; and Yale Course Search at https://courses.yale.edu.

All Ph.D. students are required to take the following courses. Students entering the program with an M.P.H. may be exempt from EPH 608.

EPH 600	Research Ethics and Responsibility
EPH 608	Frontiers of Public Health

Religious Studies

Humanities Quadrangle, 203.432.0828 http://religiousstudies.yale.edu M.A., M.Phil., Ph.D.

Chair Travis Zadeh

Director of Graduate Studies Linn Tonstad (Divinity)

Professors Joel Baden (*Divinity*), Stephen Davis, Carlos Eire, Steven Fraade, Paul Franks (*Philosophy*), Bruce Gordon (*Divinity*), Jennifer Herdt (*Divinity*), Hwansoo Kim, Nancy Levene, Kathryn Lofton, Ivan Marcus, Andrew McGowan (*Divinity*), Laura Nasrallah, Sally Promey (*American Studies*), Chloë Starr (*Divinity*), Gregory Sterling (*Divinity*), Elli Stern, Kathryn Tanner (*Divinity*), Miroslav Volf (*Divinity*), Tisa Wenger (*Divinity*), Travis Zadeh

Associate Professors Maria Doerfler, Eric Greene, Willie Jennings (*Divinity*), Noreen Khawaja, Todne Thomas, Linn Tonstad (*Divinity*)

Assistant Professors Supriya Gandhi, Sonam Kachru

Lecturers Jimmy Daccache, Felicity Harley-McGowan (*Divinity*), Adam Ployd, Matthew Steele

FIELDS OF STUDY

Students must enroll in one of the following fields of study: American Religious History, Asian Religions, Early Mediterranean and West Asian Religions, Hebrew Bible/Old Testament, Islamic Studies, Medieval and Modern Judaism, Philosophy of Religion, Religion and Modernity, Religious Ethics, and Theology.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to take a minimum of twelve term courses that meet the graduate school Honors requirement, including RLST 510, Method and Theory, normally taken in a student's first year. Proficiency in two modern scholarly languages, normally French and German, must be shown, one before the end of the first year, the other before the beginning of the third; this may be done by passing an examination administered by the department, by accreditation from a Yale Summer School course designed for this purpose, or by a grade of A or B in one of Yale's intermediate language courses. In the field of American Religious History, students must demonstrate proficiency in two skilled areas. Typically students study two foreign languages, but occasionally students study one foreign language and one technical knowledge area directly related to their proposed dissertation, such as musicology, financial accounting, or a performance art. Mastery of the languages needed in one's chosen field (e.g., Chinese, Hebrew, Greek, Japanese) is also required in certain fields of study. A set of four qualifying examinations is designed for each student, following guidelines and criteria set by each field of study; these are normally completed in the third year. The dissertation prospectus must be approved by a colloquium, and the completed dissertation by a committee of readers and the departmental faculty. Upon completion

of all predissertation requirements, including the prospectus, students are admitted to candidacy for the Ph.D. This is expected before the seventh term in American Religious History, Philosophy of Religion, Religion and Modernity, Religious Ethics, and Theology; before the eighth term in other fields. Students begin writing their dissertation in the fourth year and normally will have finished by the end of the sixth. There is no oral examination on the dissertation.

In the Department of Religious Studies, the faculty considers learning to teach to be an important and integral component of the professional training of its graduate students. Students are therefore required to teach as teaching fellows for three terms as an academic requirement and one term as a financial requirement during their graduate programs. Such teaching normally takes place during their third and fourth years, unless other arrangements are approved by the director of graduate studies.

A combined Ph.D. degree is available with African American Studies. Consult department for details.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. Students in Religious Studies must take seven graduate-level courses to be eligible for the M.A.

Program materials are available online at http://religiousstudies.yale.edu.

COURSES

RLST 510a, Method and Theory Tisa Wenger

Required seminar for doctoral students in Religious Studies. Others admitted with instructor's permission.

RLST 538a, Religion and State in Early Modern South Asia Supriya Gandhi Exploration of religion, state, and society during a formative period in South Asian history, from 1500 to 1800. Topics include models of empire and sovereignty, spheres of temporal and religious authority, the circulation of texts and ideas across regions, linguistic and religious traditions, and vernacular literary and religious cultures. We also consider the question of epistemological disruption arising out of colonial rule.

RLST 560a, Ethnographic Methods in Religious Studies Todne Thomas Long considered a hallmark of anthropological knowledge production, ethnographic fieldwork generates rich humanistic perspectives and robust debates. This new interactive methods course introduces students to myriad contexts and research techniques involved in ethnographic studies of religion. Organized into three sections, the course examines: (1) the interior politics and experiences of the fieldwork process, (2) the central skills vital to conducting ethnographic research, and (3) the various types of methodologies employed by contemporary researchers. The course ends with presentations of capstone research projects in which students apply disciplinary, reflective, and skills-based knowledge cultivated through course readings, discussions, and practice modules. **RLST 568a / EALL 521a, Introduction to Chinese Buddhist Literature** Eric Greene This class is an introduction to Chinese Buddhist literature. Although written in classical Chinese, Buddhist texts in China were written in a particular idiom that was much influenced by the Indian languages and which can be difficult to understand without special training. This class introduces students who already have some reading ability in literary Chinese to this idiom and the tools and background knowledge needed to read and understand Chinese Buddhist literature. We read a series of selections of some of the most influential Chinese Buddhist texts from various genres including canonical scriptures, apocryphal scriptures, monastic law, doctrinal treatises, and hagiography. Secondary readings introduce the basic ideas of Indian and Chinese Buddhist thought to the extent necessary for understanding our readings. Prerequisite: CHNS 571 or equivalent, or permission of the instructor. Students of Japanese or Korean literature who can read basic *kanbun* or *gugyeol* are also welcome to enroll; no knowledge of modern, spoken Chinese is required.

RLST 574b, Chinese Buddhist Texts Eric Greene

Close reading of selected Chinese Buddhist texts in the original.

RLST 610b, The Psalms, A Cultural History of Ancient Prayer Stephen Davis This course introduces students to the Book of Psalms and its significant cultural and religious impact in ancient Judaism, Christianity, and Islam. The course is organized in three units. Unit 1 focuses on the text of the Psalms, with special attention to their literary forms, editorial organization, and early ritual context in ancient Israel. Unit 2 focuses on the reception and use of the Psalms in late ancient Judaism, Christianity, and Islam, with special attention to matters of translation, interpretation, worship, prayer, and scriptural authority. Unit 3 focuses on material and sensory encounters with the Psalms from antiquity to the present day within these three religious traditions – case studies related to tactile and visual contact with the physical book, oral and aural engagement through song or chant, and embodied forms of writing, reciting, and enacting the Psalms in the context of ritual practice, including magical spells. The goal of the course is thus to trace the life and afterlife – to write the textual and extra-textural "biography," as it were – of a major biblical book.

RLST 630a / AMST 696a / ENGL 906a / ER&M 696a / HSHM 782a / WGSS 696a,

Michel Foucault I: The Works, The Interlocutors, The Critics Greta LaFleur This graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on *The History* of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit

of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Instructor permission required.

RLST 643a / JDST 845a, The Global Right: From the French Revolution to the American Insurrection Elli Stern

This seminar explores the history of right-wing political thought from the late eighteenth century to the present, with an emphasis on the role played by religious and pagan traditions. This course seeks to answer the question, what constitutes the right? What are the central philosophical, religious, and pagan, principles of those groups associated with this designation? How have the core ideas of the right changed over time? We do this by examining primary tracts written by theologians, political philosophers, and social theorists as well as secondary literature written by scholars interrogating movements associated with the right in America, Europe, Middle East, and Asia. Though touching on specific national political parties, institutions, and think tanks, its focus is on mapping the intellectual overlap and differences between various right-wing ideologies. While the course is limited to the modern period, it adopts a global perspective to better understand the full scope of right-wing politics.

RLST 653a / EGYP 514a, Gnostic Texts in Coptic Staff

The course reads selected portions of important texts from the Nag Hammadi collection, including the Apocryphon of John, the Gospel of Thomas, the Gospel of Truth, Thunder, the Treatise on Resurrection, the Tripartite Tractate, as well as other noncanonical texts preserved in Coptic, including the Gospel of Mary and the Gospel of Judas. Prerequisite: EGYP 510 or equivalent.

RLST 658b / EGYP 512b, Egyptian Monastic Literature in Coptic Stephen Davis Readings in the early Egyptian classics of Christian ascetism in Sahidic Coptic, including the Desert Fathers and Shenoute. Prerequisite: EGYP 510b or equivalent.

RLST 667a / NELC 668a, Arabic Bible and Biblical Interpretation Stephen Davis This graduate seminar focuses on the ways the Bible was transmitted and interpreted in the medieval Arabic-speaking world. *The topic for fall 2024 is the Book of Psalms, with a focus on the Psalms' use and interpretation in Jewish, Christian, and Muslim contexts.* Students who have completed the equivalent of three terms of Arabic instruction, including Classical Arabic, are eligible to enroll in the course with permission of the instructor.

RLST 691a / EMST 660a / HIST 560a, Society and the Supernatural in Early Modern Europe Carlos Eire

Readings in primary texts from the period 1500–1700 that focus on definitions of the relationship between the natural and supernatural realms, both Catholic and Protestant.

Among the topics covered: mystical ecstasy, visions, apparitions, miracles, and demonic possession. All assigned readings in English translation.

RLST 699a / AMST 805a / HSAR 720a / WGSS 779a, Sensational Materialities: Sensory Cultures in History, Theory, and Method Sally Promey

This interdisciplinary seminar explores the sensory and material histories of (often religious) images, objects, buildings, and performances as well as the potential for the senses to spark contention in material practice. With a focus on American things and religions, the course also considers broader geographical and categorical parameters so as to invite intellectual engagement with the most challenging and decisive developments in relevant fields, including recent literatures on material agencies. The goal is to investigate possibilities for scholarly examination of a robust human sensorium of sound, taste, touch, scent, and sight-and even "sixth senses"-the points where the senses meet material things (and vice versa) in life and practice. Topics include the cultural construction of the senses and sensory hierarchies; investigation of the sensory capacities of things; and specific episodes of sensory contention in and among various religious traditions. In addition, the course invites thinking beyond the "Western" five senses to other locations and historical possibilities for identifying the dynamics of sensing human bodies in religious practices, experience, and ideas. The Sensory Cultures of Religion Research Group meets approximately once per month at 7 p.m. on Tuesdays; class participants are strongly encouraged, but not required, to attend. Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but encouraged to join us. There are no set prerequisites, but, assuming available seats, permission will be granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

RLST 737a, Romance, Idea Noreen Khawaja Advanced readings in the philosophy of myth.

RLST 773a / HIST 596a / JDST 761a / MDVL 596a, Jews and the World: From the Bible through Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings.

RLST 803a / ANTH 531a / CLSS 815a / EALL 773a / HIST 502a / HSAR 564a /

JDST 653a / NELC 533a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

RLST 819b / AMST 630b / HSAR 529b, Museums and Religion: The Politics of Preservation and Display Sally Promey

This interdisciplinary seminar focuses on the tangled relations of religion and museums, historically and in the present. What does it mean to "exhibit religion" in the institutional context of the museum? What practices of display might one encounter for this subject? What kinds of museums most frequently invite religious display? How is religion suited (or not) for museum exhibition and museum education? Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but also encouraged to join us. There are no set prerequisites, but, assuming available seats, permission is granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

RLST 834a / SMTC 546a, Northwest Semitic Inscriptions: Phoenician and Punic Epigraphy Jimmy Daccache

This course completes the introduction of Phoenician epigraphy. It is designed to study the Phoenician and Punic inscriptions found in the western Mediterranean basin. The chronological span stretches from the eighth century BCE to the Roman period. The study of inscriptions – examined from photographs and drawings – follows a chronological order: Phoenician inscriptions from the eighth and seventh centuries BCE (Italy, Iberian Peninsula); Punic and Late Punic inscriptions between the sixth century BCE and the first century CE (Italy, Iberian Peninsula, North Africa [Carthage, Maktar, etc.]). At the end of the term, students have a firm grasp of the Phoenician language and script and its evolution toward Punic and Late Punic. Prerequisite: RLST 832.

RLST 838a / SMTC 513a, Elementary Syriac I Jimmy Daccache

Syriac was an Aramaic dialect that developed its own written tradition in the northern Levantine city of Edessa in classical antiquity. It became (and remains to this day) the liturgical language of Eastern Christianity in its various manifestations. This course provides students with a basic working knowledge of the language, namely, the three principal scripts (Estrangela, Serto, and "Nestorian"), verbal morphology, and the fundamental rules of syntax. Extracts of several Syriac texts are studied for purposes of application. At the end of the course, students are able to read, translate, and analyze simple texts.

RLST 839b / SMTC 514b, Elementary Syriac II Jimmy Daccache

Syriac was an Aramaic dialect that developed its own written tradition in the northern Levantine city of Edessa in classical antiquity. This course provides students with a basic working knowledge of the language, namely, the three principal scripts (Estrangela, Serto, and "Nestorian"), verbal morphology, and the fundamental rules of syntax. The course completes the introduction to the Syriac language. Extracts of several Syriac texts are studied for purposes of application. At the end of the course, students are able to read, translate, and analyze simple texts. Prerequisite: RLST 838/ SMTC 513.

RLST 848a / SMTC 523a, Intermediate Syriac I Chris Mezger

This two-term course is designed to enhance students' knowledge of the Syriac language by reading a selection of texts, sampling the major genres of classical Syriac literature. By the end of the year, students are familiar with non-vocalized texts and are capable of confronting specific grammatical or lexical problems. Prerequisite: RLST 839/SMTC 514 or knowledge of Syriac.

RLST 868b / SMTC 524b, Intermediate Syriac II Chris Mezger

The goal of this course is to enable students to gain proficiency in the Syriac language at a higher level. We continue readings in the major genres of classical Syriac literature, with special emphasis on texts from the ninth century onward. By the end of the term, students will have mastered complex grammatical structures. Prerequisite: RLST 848/ SMTC 523 or knowledge of Syriac.

RLST 874a / SMTC 553a, Advanced Syriac I Jimmy Daccache

This course is designed for graduate students who are proficient in Syriac and is organized topically. Topics vary each term and are listed in the syllabus on Canvas.

RLST 875b / SMTC 554b, Advanced Syriac II Jimmy Daccache

This course is designed for graduate students who are proficient in Syriac and is organized topically. Topics vary each term and are listed in the syllabus on Canvas.

RLST 882b, Readings on Mind and Nature Nancy Levene Study of works on nature, history, reason, person. Readings vary from year to year.

RLST 961a, Directed Readings: American Religious History Staff

RLST 962a, Directed Readings: EMWAR Staff Directed readings in Early Mediterranean and West Asian Religions.

RLST 963a, Directed Readings: Asian Religions Staff

RLST 964a, Directed Readings: Ethics Staff

RLST 965a, Directed Readings: Judaic Studies Staff

RLST 966a, Directed Readings: Islamic Studies Staff

RLST 968a, Directed Readings: Old Testament/Hebrew Bible Staff

RLST 969a, Directed Readings: Philosophy of Religion Staff

RLST 970a, Directed Readings: Religion and Modernity Staff

RLST 971a, Directed Readings: Theology Staff

Slavic Languages and Literatures

Humanities Quadrangle, 203.432.1300, slavic.department@yale.edu http://slavic.yale.edu M.A., M.Phil., Ph.D.

Chair Edyta Bojanowska

Director of Graduate Studies Marijeta Bozovic

Professors Edyta Bojanowska, Marijeta Bozovic, John MacKay

Associate Professor Molly Brunson

Assistant Professors Jinyi Chu, Claire Roosien, Nariman Shelekpayev

Senior Lectors II Constantine Muravnik, Julia Titus

Senior Lectors I Krystyna Illakowicz, Anastasia Selemeneva, Olha Tytarenko

Lecturer Spencer Small

FIELDS OF STUDY

The graduate program of the Department of Slavic Languages and Literatures values interdisciplinary and comparative perspectives on Russian, East European, and Eurasian literatures and cultures. While maintaining a foundation in the study and teaching of language and literature, the department sees both as embedded in a global context and a broad network of cultural production. Students are encouraged to develop their primary fields of study as well as meaningful connections with other disciplines, including comparative literature, history of art, film and media studies, history and the social sciences, gender and sexuality studies, the environmental humanities, and the digital humanities.

The department's primary doctoral track is the Ph.D. in Slavic and Eurasian Literatures and Cultures, with a strong emphasis on transnational and transmedial approaches. The department also offers a combined degree in Slavic and Eurasian Literatures and Cultures and Film and Media Studies (see below). By special arrangement, the department will consider individualized ad hoc programs with other departments. Students are encouraged to complement their research and teaching interests with one of Yale's certificate programs, such as Women's, Gender, and Sexuality Studies; Film and Media Studies; Translation Studies; Environmental Humanities; or the MacMillan Center's Councils on African, European, Latin American and Iberian, and Middle East Studies.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Course Requirements All graduate students are required to take sixteen courses in their first two years of graduate study, which must include RUSS 851, Proseminar: Theory and Methods. In addition to this one mandatory course, students must fulfill the following distributional requirements through graduate-level coursework:

- Minimum of one course on Slavic and/or Eurasian literature or culture before the eighteenth century
- Minimum of one course on eighteenth-century Slavic and/or Eurasian literature or culture
- Minimum of two courses on nineteenth-century Slavic and/or Eurasian literature or culture
- Minimum of two courses on twentieth-century Slavic and/or Eurasian literature or culture
- Minimum of one course on twenty-first-century Slavic and/or Eurasian literature or culture
- Minimum of two (but no more than four out of the required sixteen) courses outside the Slavic department.

Students who have done graduate-level coursework elsewhere may petition for up to three courses taken at another institution to count toward degree requirements, and may use any course slots freed through prior study to take additional elective courses at Yale. Language courses do not count toward the required sixteen courses.

Language Requirements Entering students are expected to have sufficient knowledge of Russian to allow for satisfactory work at the graduate level and are required to pass a departmental proficiency examination in Russian. Students must also demonstrate competence in a second foreign language, as soon as possible or by the beginning of the fifth term of study. Students may choose to pursue proficiency in a second East European or Eurasian language; in a language useful for broader access to scholarship; or in any language relevant for well-motivated comparative work. Competence in a second foreign language may be demonstrated through coursework or a reading examination.

Minor Field Students are responsible for developing a minor field of specialization in one of the following:

- 1. a second language or literature;
- 2. visual culture or one of the other arts;
- 3. a topic in intellectual history or a specific interdisciplinary approach; or
- 4. another discipline relevant to their primary interests.

To demonstrate competency in their chosen minor field, students are required to submit a minor field portfolio no later than September 1 of their third year of graduate study.

Qualifying Paper Students must submit a qualifying paper (7000–9000 words) no later than September 1 of their third year. The paper, which in many cases will be a revised version of a seminar paper, should be developed in consultation with a faculty adviser.

Comprehensive and Qualifying Examinations In early October of their third year, students will take a comprehensive examination on Russian literature and culture from the nineteenth century to the present. The comprehensive is split into two sixhour take-home exams, to be completed several days apart. This exam is meant to test the students' knowledge of the broad scope of Russian literature and culture, as

well as their ability to analyze various kinds of cultural products and position specific works within their historical, cultural, and critical contexts. Students should use the departmental reading list as a guide in preparing for this exam, but they are also welcome to draw from beyond the list in their answers. In early December of their third year, students will also take a qualifying examination based on two specialized reading lists. This exam is a one-hour oral exam with twenty-five minutes allotted to each list, evaluated by two faculty advisers and the Director of Graduate Studies. The exam is meant to test the student's knowledge of two specific areas of study, which often serve as important preparation for the development of a dissertation topic.

Pre-Prospectus Colloquium and Prospectus Presentation In early February of their third year, students will present a preliminary version of their dissertation prospectus (the pre-prospectus) at a one-hour colloquium attended by all Slavic ladder faculty. At the colloquium, students will present a brief introduction to their prospective dissertation, which will be followed by discussion and feedback. After the pre-prospectus colloquium, students will ask two faculty members to serve on their dissertation committee. These committee members will oversee the revision of the preliminary prospectus into a final draft (approximately 5000 words plus a detailed bibliography). In early April, students will present the final version of their dissertation will take one hour, beginning with a brief introduction by the student and followed by discussion.

Dissertation The dissertation committee should include at least three faculty members: a chair (who must be a ladder faculty member from Slavic), one additional ladder faculty member from Slavic, and one faculty member either from Slavic, another department, or outside Yale. Students can petition to add additional committee members. Students must determine the constitution of their committee by October 1 of their fourth year. The dissertation is the culmination of the student's work in the doctoral program and an important emblem of professional competence, intellectual rigor, and academic potential. As such, it should demonstrate mastery of a defined field of research and should articulate an original and substantive contribution to knowledge. While all dissertations should have clearly defined empirical and theoretical stakes and be grounded in appropriate methodological choices, each project will approach its central questions in necessarily distinct ways: some based more heavily in archival research, others shaped more profoundly by theoretical discussions, and still others determined by entirely different disciplinary or interdisciplinary demands.

First-Chapter Talk During the spring semester of the fourth year, students will deliver a forty-five-minute talk on their first chapter to the entire department. Students will revise their chapter after the talk, submitting a final draft to their dissertation committee no later than May 1.

Teaching All graduate students are expected to teach for a minimum of four semesters, typically in the third and fourth years of study. Teaching is required to receive additional sixth-year funding. Students are usually assigned at least two semesters of language teaching and two semesters of literature/culture teaching.

Combined Ph.D. Program with Film and Media Studies

The Department of Slavic Languages and Literatures also offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. in Slavic and Eurasian Literatures and Cultures and Film and Media Studies. For further details, see Film and Media Studies in this bulletin and the department's website. Applicants to the combined program must indicate on their application that they are applying both to Film and Media Studies and to Slavic Languages and Literatures. All documentation within the application should include this information.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. The Department of Slavic Languages and Literatures does not admit students for the terminal M.A. degree, nor does it award an M.A. en route to the Ph.D. degree. If, however, a student admitted for the Ph.D. leaves the program prior to completion of the doctoral degree, the student may be eligible to receive a terminal master's degree. The student must have completed at least fifteen term courses in Slavic and/or Eurasian literature and culture, chosen in consultation with the DGS. A grade of Honors in at least two term courses and an average of High Pass in the remaining courses must be attained. Candidates must pass a departmental proficiency examination in Russian, and prove competency in a second foreign language.

More information is available on the department's website, http://slavic.yale.edu.

RUSS 603a, Russian Realist Literature and Painting Molly Brunson An interdisciplinary examination of the development of nineteenth-century Russian realism in literature and the visual arts. Topics include the Natural School and the formulation of a realist aesthetic; the artistic strategies and polemics of critical realism; narrative, genre, and the rise of the novel; the Wanderers and the articulation of a Russian school of painting; realism, modernism, and the challenges of periodization. Readings include novels, short stories, and critical works by Dostoevsky, Turgenev, Goncharov, Tolstoy, Chekhov, and others. Painters of focus include Fedotov, Perov, Shishkin, Repin, and Kramskoy. Special attention is given to the particular methodological demands of interart analysis.

RUSS 605a / CPLT 612a / EALL 588a / EAST 616a / RSEE 605a, Socialist '80s: Aesthetics of Reform in China and the Soviet Union Jinyi Chu

This course offers an interdisciplinary introduction to the study of the complex cultural and political paradigms of late socialism from a transnational perspective by focusing on the literature, cinema, and popular culture of the Soviet Union and China in 1980s. How were intellectual and everyday life in the Soviet Union and China distinct from and similar to that of the West of the same era? How do we parse "the cultural logic of late socialism?" What can today's America learn from it? Examining two major socialist cultures together in a global context, this course queries the ethnographic, ideological, and socio-economic constituents of late socialism. Students analyze cultural materials in the context of Soviet and Chinese history. Along the way, we explore themes of identity, nationalism, globalization, capitalism, and the Cold War. Students with knowledge of Russian and Chinese are encouraged to read in original. All readings are available in English. RUSS 606b / RSEE 606b, Socialist Realism and Its Legacies Claire Roosien Socialist Realism was promulgated in the 1930s as the sole mode for cultural production in the Soviet Union. Since that time, it has been maligned as totalitarian, lauded as emancipatory, dismissed as hackish, and reappropriated in a variety of ways-from homage to parody. This course offers an introduction to Socialist Realism and its legacies, beginning with its prehistory in the early Soviet avant-garde and other cultural movements, tracing its official adoption under Stalin, its reassessment in the late Soviet period, and its legacies after the fall of the Soviet Union. Special attention is paid to the interpretations of Socialist Realism in the emerging national cultures beyond the Russian SFSR. The course also examines select examples of the impact of Socialist Realism beyond the Soviet Union, particularly in the "Third World" during the era of Cold War cultural diplomacy. Questions for discussion include: How did Socialist Realism imagine, enforce, and unsettle hierarchies of gender, race, and ethnicity? What did Socialist Realism look like beyond literature: in film, visual art, architecture, and music? How did the imperative to use Socialist Realism connect to the Soviet project to create minority cultures that would be "national in form, socialist in content"? How did people outside the Second World co-construct and appropriate Socialist Realism?

RUSS 613a / CPLT 689a / E&RS 629a / RSEE 613a / SLAV 613a, Art and Resistance in Belarus, Russia, and Ukraine Andrei Kureichyk

This interdisciplinary seminar is devoted to the study of protest art as part of the struggle of society against authoritarianism and totalitarianism. It focuses on the example of the Soviet and post-Soviet transformation of Belarus, Russia, and Ukraine. The period under discussion begins after the death of Stalin in 1953 and ends with the art of protest against the modern post-Soviet dictatorships of Alexander Lukashenka in Belarus and Vladimir Putin in Russia, the protest art of the Ukrainian Maidan, and the anti-war movement of artists against the Russian-Ukrainian war. The course begins by looking at the influence of the "Khrushchev Thaw" on literature and cinema, which opened the way for protest art to a wide Soviet audience. We explore different approaches to protest art in conditions of political unfreedom: "nonconformism," "dissidence," "mimicry," "rebellion." The course investigates the existential conflict of artistic freedom and the political machine of authoritarianism. These themes are explored at different levels through specific examples from the works and biographies of artists. Students immerse themselves in works of different genres: films, songs, performances, plays, and literary works.

RUSS 692b, The Russian Fin de Siecle Jinyi Chu

This course offers an interdisciplinary overview of modernist culture in Russia. Focus is on how poets, prose writers, artists, intellectuals, and politicians (from Merezhkovsky to Stravinsky, from Diaghilev to Lenin) interacted with each other and how imperial Russia developed its own modernist culture in global context. Topics include close readings of poetry and prose; institutions of art and media; literary journals and groups; translation and book market; European thoughts in Russia; theosophy and literature; modernist sexuality; prerevolutionary urban culture; gentry life; dance, music, costume design; Russia between East and West; revolution and modernism. Students establish an in-depth understanding of the cultural milieu in Russia from the 1890s to the 1910s and are introduced to the scholarly discourses on Russian modernism.
RUSS 714b / FILM 630b, Russian and Soviet Film John MacKay

Overview of Russian, Soviet, and post-Soviet cinema, from prerevolutionary Russia to the present. Theoretical writings and canonical films of important figures such as Sergei Eisenstein, Dziga Vertov, Andrei Tarkovsky, Kira Muratova, Aleksei German, and Alexander Sokurov. A variety of film genres and modes are investigated, as well as non-Russophone Soviet film.

RUSS 834a, Aspects of Russian Grammar and Teaching Methodology Olha Tytarenko

The course examines various aspects of Russian grammar and the use of different teaching methodologies. Special emphasis is placed on the connection between linguistic knowledge and its application for teaching Russian in an English-speaking classroom. Different types of language learners, diverse teaching strategies, and existing resources for teaching Russian are discussed.

SLAV 610a / E&RS 619a / RSEE 610a, Eurasian Ecomedia Claire Roosien This course explores the relationship between Eurasian environments and popular media (film, photography, television, literature, and other media). Conversations about environmental humanities and ecomedia have thus far centered capital as the operative category; this course asks what we might gain from considering state socialism and postsocialism in conversation with that broader scholarship. The goal is to tell the environmental and cultural history of Eurasia as part of the connected history of the Anthropocene. Questions for discussion include: how do Eurasian publics engage with the mass media and how does that engagement shape environmental subjectivities in the region? How can we think about media histories in dialogue with material histories? How do narratives of the environment and ecological catastrophe correlate with broader Eurasian political discourses (socialist construction, collapse, post-Soviet nation-building)? Discussions comprise close analysis of cultural artifacts alongside relevant theory and scholarship about environmental and cultural histories of the region. Case studies focus on Central Asia, with transregional engagement with Siberia, the Caucasus, and Eastern Europe, focusing on the twentieth and twentyfirst centuries. Major assignments include a translation/curatorial project and a final, polished conference-style presentation. Knowledge of Russian or another Eurasian language is required.

SLAV 613a / CPLT 689a / E&RS 629a / RSEE 613a / RUSS 613a, Art and Resistance in Belarus, Russia, and Ukraine Andrei Kureichyk

This interdisciplinary seminar is devoted to the study of protest art as part of the struggle of society against authoritarianism and totalitarianism. It focuses on the example of the Soviet and post-Soviet transformation of Belarus, Russia, and Ukraine. The period under discussion begins after the death of Stalin in 1953 and ends with the art of protest against the modern post-Soviet dictatorships of Alexander Lukashenka in Belarus and Vladimir Putin in Russia, the protest art of the Ukrainian Maidan, and the anti-war movement of artists against the Russian-Ukrainian war. The course begins by looking at the influence of the "Khrushchev Thaw" on literature and cinema, which opened the way for protest art to a wide Soviet audience. We explore different approaches to protest art in conditions of political unfreedom: "nonconformism," "dissidence," "mimicry," "rebellion." The course investigates the existential conflict of artistic freedom and the political machine of authoritarianism. These themes are explored at different levels through specific examples from the works and biographies

of artists. Students immerse themselves in works of different genres: films, songs, performances, plays, and literary works.

SLAV 745b / FILM 744, Yugoslav Film Marijeta Bozovic TBD.

SLAV 900a, Directed Reading Staff

By arrangement with faculty.

Sociology

493 College Street, 203.432.3323 http://sociology.yale.edu M.A., M.Phil., Ph.D.

Chair Emily Erikson

Director of Graduate Studies Jonathan Wyrtzen

Professors Julia Adams, Rene Almeling, Elijah Anderson, Scott Boorman, Nicholas Christakis, Emily Erikson, Philip Gorski, Grace Kao, Philip Smith, Jonathan Wyrtzen

Associate Professors Rourke O'Brien

Assistant Professors Angel Escamilla Garcia, Yuan Hsaio, Yagmur Karakaya, Daniel Karell, Alka Menon, Ramina Sotoudeh, Emma Zang

FIELDS OF STUDY

Fields include comparative sociology/macrosociology; cultural and historical sociology; economic sociology; life course/social stratification; mathematical sociology; medical sociology; methodology (qualitative and quantitative approaches); networks; political sociology; race/gender/ethnic/minority relations; social change; social demography; social movements; theory (general, critical, hermeneutic); urban sociology.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Qualification for admission to candidacy for the Ph.D. will take place during the student's first three years of study at Yale. A student who has not been admitted to candidacy will not be permitted to register for the seventh term of study. To qualify for candidacy the student must take twelve seminars to be completed in years one and two: four required courses (SOCY 542, SOCY 578, SOCY 580, SOCY 581) and eight electives, including at least one workshop. After completion of courses, students prepare a research paper and one field exam and defend a dissertation prospectus.

Teaching is an important part of the professional preparation of graduate students in Sociology. Students teach therefore in the third and fourth years of study.

COMBINED PH.D. PROGRAMS

Sociology and African American Studies

The Department of Sociology offers, in conjunction with the Department of African American Studies, a combined Ph.D. degree in Sociology and African American Studies.

Students accepted to the combined Ph.D. program must meet all of the requirements of the Ph.D. in Sociology with the exception that, excluding the courses required, a research paper, and a field exam, combined-degree students may substitute African American Studies courses for six of the twelve term courses required to qualify for the Ph.D. in Sociology. For further details, see African American Studies.

Sociology and Women's, Gender, and Sexuality Studies

The Department of Sociology also offers, in conjunction with the Program in Women's, Gender, and Sexuality Studies, a combined Ph.D. in Sociology and Women's, Gender, and Sexuality Studies. For further details, see Women's, Gender, and Sexuality Studies.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. Students who withdraw from the Ph.D. program may be eligible to receive the M.A. degree if they have met the requirements and have not already received the M.Phil. degree. For the M.A., students must successfully complete eight term courses, two of which must include statistics and theory. A grade of High Pass or Honors must be achieved in five of the eight required courses. Candidates in combined programs will be awarded the M.A. only when the master's degree requirements for both programs have been met.

Program materials are available at http://sociology.yale.edu.

COURSES

SOCY 503a / PLSC 522a, Archival Methods and Historical Approaches in the Social Sciences Jonny Steinberg

The aim of the course is to equip students to navigate different sorts of archives, to interpret archival material, and to survey debates in the social sciences about using historical material and theory to build arguments.

SOCY 508b / PLSC 505b, Qualitative Field Research Egor Lazarev

In this seminar we discuss and practice qualitative field research methods. The course covers the basic techniques for collecting, interpreting, and analyzing ethnographic data, with an emphasis on the core ethnographic techniques of participant observation and in-depth interviewing. All participants carry out a local research project. Open to undergraduates with permission of the instructor.

SOCY 542a, Sociological Theory Emily Erikson

The course seeks to give students the conceptual tools for a constructive engagement with sociological theory and theorizing. We trace the genealogies of dominant theoretical approaches and explore the ways in which theorists contend with these approaches when confronting the central questions of both modernity and the discipline.

SOCY 554a, Research Topics on Human Nature and Social Networks Nicholas Christakis

This seminar focuses on ongoing research projects in human nature, behavior genetics, social interactions, and social networks.

SOCY 560a / PLSC 734a, Comparative Research Workshop Jonathan Wyrtzen This weekly workshop is dedicated to group discussion of work-in-progress by visiting scholars, Yale graduate students, and in-house faculty from Sociology and affiliated disciplines. Papers are distributed a week ahead of time and also posted on the website of the Center for Comparative Research (http://ccr.yale.edu). Students who are enrolled for credit are expected to present a paper-in-progress.

SOCY 580a, Introduction to Methods in Quantitative Sociology Staff

Introduction to methods in quantitative sociological research. Covers data description; graphical approaches; elementary probability theory; bivariate and multivariate linear regression; regression diagnostics. Includes hands-on data analysis using Stata.

SOCY 595a, Stratification and Inequality Workshop Ramina Sotoudeh

In this workshop we present and discuss ongoing empirical research work, primarily but not exclusively quantitative analyses. In addition, we address theoretical and methodological issues in the areas of the life course (education, training, labor markets, aging, as well as family demography), social inequality (class structures, stratification, and social mobility), and related topics.

SOCY 598a, Independent Study Rourke O'Brien

By arrangement with faculty. When students register for the course online, the dropdown menu should be completed.

SOCY 605b / WGSS 570b, LGBTQ Population Health John Pachankis Sexual and gender minority individuals (e.g., those who identify as LGBTQ) represent a key health disparity population in the United States and worldwide, but highquality evidence of this problem has historically been slow to accumulate. This course engages students in critically examining today's rapidly expanding empirical knowledge regarding sexual and gender minority health by considering challenges to, and opportunities for, conducting this research with methodological rigor. Students consider social and ecological influences on sexual and gender minority health, including migration, community, and neighborhood influences. Social institutions, including religion, school, family, and close relationships, are examined as sources of both stress and support. Given the relevance of individual and collective identity and stress as mechanisms through which stigma impacts sexual and gender minority health, the empirical platform of the course is complemented by intersectionality theory, critical postmodern work on identity fluidity and multiplicity across the life course, and minority stress conceptualizations of health. Students apply lessons learned in the course to evaluating and developing policy and health care interventions for this increasingly visible segment of the global population. Also SBS 570.

SOCY 617a / ANTH 541a / ENV 836a / HIST 965a / PLSC 779a, Agrarian Societies: Culture, Society, History, and Development Jonathan Wyrtzen and Elisabeth Wood

An interdisciplinary examination of agrarian societies, contemporary and historical, Western and non-Western. Major analytical perspectives from anthropology, economics, history, political science, and environmental studies are used to develop a meaning-centered and historically grounded account of the transformations of rural society. Team-taught.

SOCY 624a, Sociology of International Migration: U.S. and Global Perspectives Angel Escamilla Garcia

The study of international migration in sociology is today a well-stablished field that has studies almost every corner of the planet, expanding both our classic sociological theories and concepts but also generating new ones. This graduate course explores recent sociological scholarship on sociology of international immigration from both a U.S. and a global perspective. During this class we cover diverse topics of relevance in the field of international migration: the evolution of immigration theories, social construction of immigrants, the methods that sociologist employ to study international migration, the tensions between the categories that we use to study international migrants, refugees, and asylum seekers, structural factors in transnational migration, globalized borders, immigrant incorporation, transnationalism, and changing attitudes influencing immigration policies. The discussions during class integrate diverse sociological themes like gender, race, economics, nationalism, nativism, culture, religion, crime, and social inequality. During the course we review the work of sociologist of sociology of migration conducted around the world like Eritrea, Vietnam, India, Mexico, China, France, Saudi Arabia, and the U.S. The main objective of this course to provide the students with a global perspective of the field of international migration and use this literature for their own projects.

SOCY 625a, Analysis of Social Structure Scott Boorman

Emphasizing analytically integrated viewpoints, the course develops a variety of major contemporary approaches to the study of social structure and social organization. Building in part on research viewpoints articulated by Kenneth J. Arrow in *The Limits of Organization* (1974), by János Kornai in an address at the Hungarian Academy of Sciences published in 1984, and by Harrison C. White in *Identity and Control* (2nd ed., 2008), four major species of social organization are identified as focal: (1) social networks, (2) competitive markets, (3) hierarchies/bureaucracy, and (4) collective choice/legislation. This lecture course uses mathematical and computational models – and comparisons of their scientific styles and contributions – as analytical vehicles in coordinated development of the four species.

SOCY 628a, Workshop in Cultural Sociology Yagmur Karakaya and Philip Smith This workshop is designed to be a continuous part of the graduate curriculum. Meeting weekly throughout both the fall and spring terms, it constitutes an ongoing, informal seminar to explore areas of mutual interest among students and faculty, both visiting and permanent. The core concern of the workshop is social meaning and its forms and processes of institutionalization. Meaning is approached as both structure and performance, drawing not only on the burgeoning area of cultural sociology but on the humanities, philosophy, and other social sciences. Discussions range widely among methodological, theoretical, empirical, and normative issues. Sessions alternate between presentations by students of their own work and by visitors. Contents of the workshop vary from term to term, and from year to year. Enrollment is open to auditors who fully participate and for credit to students who submit written work.

SOCY 630a / AFAM 773a, Workshop in Urban Ethnography Elijah Anderson The ethnographic interpretation of urban life and culture. Conceptual and methodological issues are discussed. Ongoing projects of participants are presented in a workshop format, thus providing participants with critical feedback as well as the opportunity to learn from and contribute to ethnographic work in progress. Selected ethnographic works are read and assessed.

SOCY 653a, Workshop in Advanced Sociological Writing and Research Philip Smith This class concerns the process of advanced writing and research that converts draft material into work ready for publication, preferably in refereed journals, or submission as a substantial grant proposal. It investigates problem definition, the craft of writing, the structure of argument and data presentation, and the nature of persuasion more generally. The aim is to teach a professional orientation that allows work that is promising to become truly polished and compelling within the full range of sociological

genres. Prerequisite: permission of the instructor; participants must enter the class with suitable draft material for group analysis and discussion.

SOCY 656a, Professional Seminar Jonathan Wyrtzen

This required seminar aims at introducing incoming sociology graduate students to the department and the profession. Yale Sociology faculty members are invited to discuss their research. There are minimum requirements, such as writing a book review. No grades are given; students should take for Audit. Held biweekly.

SOCY 661a / ANTH 553a / CPLT 503a / GMAN 553a, Karl Marx's Capital Paul North A careful reading of Karl Marx's classic critique of capitalism, *Capital* volume 1, a work of philosophy, political economy, and critical social theory that has had a significant global readership for over 150 years. Selected readings also from *Capital* volumes 2 and 3.

Spanish and Portuguese

Humanities Quadrangle, 203.432.5439, 203.432.1151 http://span-port.yale.edu M.A., M.Phil., Ph.D.

Chair Jesús Velasco

Director of Graduate Studies Aníbal González-Pérez

Professors Santiago Acosta, Alexandra Cook (*Visiting*), Aníbal González-Pérez, K. David Jackson, Nicholas R. Jones, Olivia Lott, Noël Valis, Jesús Velasco, Aurélie Vialette, Lisa Voigt

Senior Lecturer II Alex Gil

Emeritus Rolena Adorno, Roberto González Echevarría

FIELDS OF STUDY

The Ph.D. program in the Department of Spanish and Portuguese explores the dynamic fields of Latin American, Luso-Brazilian, Latinx, and Iberian studies in all their rich and diverse linguistic, literary, and cultural traditions, and adopting multiple intellectual approaches. The Ph.D. program encourages students to engage with related disciplines in the humanities and social sciences, including African American Studies, Anthropology, Comparative Literature, Early Modern Studies, Film and Media Studies, History of Art, Medieval Studies, and Philosophy, as well as emerging multidisciplinary fields such as Race, Indigeneity, and Transnational Migration; Women's, Gender, and Sexuality Studies; and Digital Humanities.

The department participates in a combined Ph.D. program in Spanish and Portuguese and African American Studies offered in conjunction with the Department of African American Studies and a combined Ph.D. program in Spanish and Portuguese and Early Modern Studies offered in conjunction with the Early Modern Studies Program. Ph.D. students are also encouraged to obtain certificates from programs and areas complementary to their teaching and research interests; at Yale, such certificates exist in connection with the programs in Film and Media Studies; Public Humanities; Translation Studies; and Women's, Gender, and Sexuality Studies.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The department requires two years of coursework, a grade of Honors in at least two of these courses each year, and a minimum grade average of High Pass. Coursework consists of fourteen elective seminars (up to four outside the department); four of the fourteen seminars as auditor (no exam or paper required), inside or outside the department; and a required course, SPAN 790, Methodologies of Modern Language Teaching. Prior to the third year, students are also expected to become proficient in two languages other than English and their primary study language (either Spanish or Portuguese); these languages could be other Romance languages, Latin, or other language families pertinent to the research interests of each student. In the third year, the student is expected to pass the qualifying examination (written and oral components) and submit and receive approval of the dissertation prospectus. Upon completion of all predissertation requirements, including the dissertation prospectus, students are admitted to candidacy for the Ph.D.

Participation in the department's teaching and pedagogy program is a degree requirement. It consists of taking the required seminar in language pedagogy, SPAN 790, in the second year and teaching four courses during the third and fourth years of study. Students will have the opportunity to teach beginning (L1–L2), advanced (L3–L4), and L5-level courses with supervision by the director of the language program, course directors, and department faculty members.

COMBINED PH.D. PROGRAMS Spanish and Portuguese and African American Studies

The Department of Spanish and Portuguese also offers, in conjunction with the Department of African American Studies, a combined Ph.D. in Spanish and Portuguese and African American Studies. For further details, see African American Studies.

Spanish and Portuguese and Early Modern Studies

The Department of Spanish and Portuguese also offers, in conjunction with the Early Modern Studies Program, a combined Ph.D. in Spanish and Portuguese and Early Modern Studies. For further details, see Early Modern Studies.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. (en route to the Ph.D.) The M.A. en route is awarded upon the satisfactory completion of eight term courses and the language requirement (detailed above).

COURSES

PORT 652a / CPLT 657a, Clarice Lispector: The Short Stories Kenneth David Jackson This course is a seminar on the complete short stories of Clarice Lispector (1920–1977), a master of the genre and one of the major authors of twentieth-century Brazil known for existentialism, mysticism, and feminism.

PORT 970a, Fernando Pessoa, Inc. Kenneth David Jackson

This course surveys the main facets of Pessoa's works and considers the principal theories and interpretations of his complex literary universe. A reading knowledge of Portuguese is essential; however, students may supplement his texts with translations into English, Spanish, French, or Italian.

SPAN 744a, The Spanish Civil War: Words and Images Noel Valis

An introduction to the history and cultural and literary impact of the Spanish Civil War (1936–39), through national and international perspective and an analysis of the literature and culture produced during and after the conflict. The course is divided into four sections: the war "from within," the war "from outside," women in war, and the memory of war. Authors include George Orwell, Ernest Hemingway, Javier Cercas, Mercè Rodoreda, Julio Llamazares, Ramón J. Sender, and others; films: *The Spanish Earth, The Good Fight, El laberinto del fauno, Rojo y negro*; arte: *Guernika* (Picasso), *El rostro de la guerra* (Dalí), war posters. In Spanish.

SPAN 780a / CPLT 507a / ER&M 647a, Biopolitics in the Carceral Archipelago: The Case of the Philippines Aurelie Vialette

This seminar examines the racial, ethical, political, environmental, and social implications of the penal colonization process in the Philippines. We analyze archival documents (manuscripts) from the Philippines and engage with theoretical and historical texts on prison labor, racial capitalism, ecocriticism, indigenous studies, carceral studies, gender studies, and law and the humanities. Overseas incarceration was a method employed by empires to dispose of criminals, the poor, sex workers, and vagrants. In the Philippines (a Spanish colony until 1898), the dispossession of indigenous people of their land and the implication of intensive farming were also consequences of the colonial project. We see that labor and procreation were crucial to the project of using prisoners to build the colonial structure and strengthen the Spanish presence in the archipelago. We discover the centrality of this transnational and transhistorical approach to understanding the contemporary treatment of imprisoned people. Spanish reading knowledge is required.

SPAN 790b, Methodologies of Modern Language Teaching Jorge Méndez-Seijas Preparation for a teaching career through readings, lectures, classroom discussions, and presentations on current issues in foreign/second language acquisition theory and teaching methodology. Classroom techniques at all levels. In Spanish.

SPAN 865a / CPLT 895a, Translation in Latin American and Latinx Literature Staff Involving languages, cultures, nations, and publishing markets of varying power, translation is a highly charged zone where hierarchies may be established, reinforced, or toppled. This graduate seminar offers an overview of how translation has functioned, in site-specific fashion, as theoretical program and experimental mode within "original" Latin American and the US Latinx literatures. We examine texts from much of the twentieth and twenty-first centuries that engage translation (interlinguistic, intralinguistic, intersemiotic) as trope, form, or material apparatus. These featured works include pseudotranslations, unreliable self-translations, transcreations, translingual texts, and fictions with translator-protagonists. We read these materials alongside essential theory and criticism that surface distinctly Latin(x) American itineraries for translation and that provide students with an analytical toolbox for attending to translation in original and unoriginal writing alike. This course is taught in English, with materials provided in the original Spanish or Portuguese when available.

SPAN 904a / CPLT 965a / ER&M 681, Latin American Political Thought I:

Neocolonial, Anticolonial, Decolonial: 1800–1930 Moira Fradinger This seminar consists of two parts. The first part is taught in the fall and the second one in the spring. The year-long plan introduces students to two centuries of Latin American political thought in the form of social and literary essays produced since the times of independence. It studies how Latin American writers and politicians have theorized the political/cultural heritage of the colony. The fall seminar starts with the Haitian constitution and contemporary Haitian authors who assess the legacy of the Haitian revolution. It ends with the anarchist movements and socialist thought of the turn of the twentieth century. The second part (spring) starts with the 1930s and the rise of populism and ends with writings on current indigenous movements across the region. The fall engages nineteenth-century debates over "American identity" that were foundational to the newly constituted nation-states (authors include Bolívar, Lastarria, Alamán, Martí, Sarmiento, Echeverría, Hostos, Montalvo,Burgos, Rodó, da Cunha, Mariategui, Gonzalez Prada, Zapata). The spring explores twentiethcentury debates over cultural independence, the movement of "indigenismo," mestizaje, transculturation and heterogeneity, the Caribbean movement of "negritude," the metaphor of "cannibalism" to account for the cultural politics of the region, concepts such as "internal colonialism" and "motley society," and the polemics over the region's capitalist modernity and postmodernity (authors include Ortiz, Moreno Fraginals, Lezama Lima, Vasconcelos, Reyes, de Andrade, Antenor Orrego, Zapata, J.L. Borges, J.M. Arguedas, Sérgio Buarque de Holanda, Caio Prado Júnior, Jean Price-Mars, Jacques Roumain, Aimé Césaire, George Lamming, C.L.R. James, Fanon, Léon Damas, Paulo Freire, Angel Rama, Retamar, Edmundo O'Gorman, Antonio Candido, Darcy Ribeiro, Pablo González Casanova, León-Portilla, R. Kusch, René Zavaleta Mercado, A. Quijano, Rita Segato, Bolívar Echeverría, Silvia Rivera Cusicanqui, Viveiros de Castro). Weekly sessions are conducted in Spanish, and most of the readings are Spanish, French, and Portuguese materials (with a few Anglo-Caribbean sources). Students are provided with English translations if they prefer and are allowed to write their papers in English.

SPAN 919a, *Modernismo: Literatura, periodismo, filología* Anibal González-Pérez A comprehensive study of the first autonomous Spanish American literary movement and its foundational role in modern Spanish American literature. *Modernismo's* cosmopolitanism and its relation to the discourses of philology, journalism, and literature are examined through readings of *modernista* poetry, novels, short stories, essays, and *crónicas*. Authors include Delmira Agustini, Rubén Darío, Manuel Díaz Rodríguez, Julián del Casal, Enrique Gómez Carrillo, Manuel Gutiérrez Nájera, Julio Herrera y Reissig, Enrique Larreta, Leopoldo Lugones, José Martí, José Enrique Rodó, José Asunción Silva, and José María Vargas Vila. In Spanish.

Statistics and Data Science

219 Prospect Street, 203.432.0666 http://statistics.yale.edu M.A., M.S., Ph.D.

Chair Yihong Wu

Acting Chair Daniel Spielman [Sp]

Directors of Graduate Studies

John Emerson (219 Prospect, john.emerson@yale.edu) Zhou Fan (219 Prospect, zhou.fan@yale.edu)

Professors Donald Andrews (*Economics*), Andrew Barron, Jeffrey Brock (*Mathematics*), Joseph Chang, Katarzyna Chawarska (*Child Study Center*), Xiaohong Chen (*Economics*), Nicholas Christakis (*Sociology*), Ronald Coifman (*Mathematics*), James Duncan (*Radiology and Biomedical Imaging*), John Emerson (*Adjunct*), Alan Gerber (*Political Science*), Mark Gerstein (*Molecular Biophysics and Biochemistry*), Anna Gilbert, John Hartigan (*Emeritus*), Edward Kaplan (*School of Management*), Harlan Krumholz (*Internal Medicine*), John Lafferty, Zongming Ma, David Pollard (*Emeritus*), Nils Rudi (*School of Management*), Jasjeet Sekhon, Donna Spiegelman (*Biostatistics*), Daniel Spielman, Hemant Tagare (*Radiology and Biomedical Engineering*), Van Vu (*Mathematics*), Yihong Wu, Heping Zhang (*Biostatistics*), Hongyu Zhao (*Biostatistics*), Harrison Zhou, Steven Zucker (*Computer Science*)

Associate Professors P.M. Aronow, Forrest Crawford (*Biostatistics*), Joshua Kalla (*Political Science*), Amin Karbasi (*Electrical Engineering*), Vahideh Manshadi (*School of Management/Operations*), Ethan Meyers (*Visiting*), Sekhar Tatikonda

Assistant Professors Elisa Celis, Sinho Chewi, Zhou Fan, Melody Huang (*Political Science*), Roy Lederman, Lu Lu, Theodor Misiakiewicz, Omar Montasser, Fredrik Savje (*Political Science*), Dustin Scheinost (*Radiology and Biomedical Imaging*), Ramina Sotoudeh (*Sociology*), Andre Wibisono (*Computer Science*), Zhuoran Yang, Ilker Yildirim (*Psychology*), Ilias Zadik

FIELDS OF STUDY

Fields of study include the main areas of statistical theory (with emphasis on foundations, Bayes theory, decision theory, nonparametric statistics), probability theory (stochastic processes, asymptotics, weak convergence), information theory, bioinformatics and genetics, classification, data mining and machine learning, neural nets, network science, optimization, statistical computing, and graphical models and methods.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE IN STATISTICS AND DATA SCIENCE

There is no foreign language requirement. Students take at least twelve courses, usually during the first two years. The department requires that students take S&DS 625,

Stochastic Processes S&DS 551 1 S&DS 600 Advanced Probability 1 S&DS 610 Statistical Inference 1 S&DS 612 Linear Models S&DS 631 Optimization and Computation 1 Advanced Optimization Techniques S&DS 632 1 S&DS 661 Data Analysis 1

Statistical Case Studies, and S&DS 626, Practical Work. The department strongly recommends that students take:

Substitutions are possible with the permission of the director of graduate studies (DGS); courses from other complementary departments such as Mathematics and Computer Science are encouraged. With the permission of the DGS and under special circumstances, appropriate courses may be taken at the undergraduate level in departments outside of Statistics and Data Science to fulfill these elective requirements.

The qualifying examination consists of three parts: a written report on an analysis of a data set, one or more written examination(s), and an oral examination. The examinations are taken as scheduled by the department. All parts of the qualifying examination must be completed before the beginning of the third year. A prospectus for the dissertation should be submitted no later than the first week of March in the third year. The prospectus must be accepted by the department before the end of the third year if the student is to register for a fourth year. Upon successful completion of the qualifying examination and the prospectus (and meeting of graduate school requirements), the student is admitted to candidacy. Students are expected to attend weekly departmental seminars.

Students normally serve as teaching fellows for several terms to acquire professional training. All students are required to be teaching fellows for a minimum of two terms, regardless of the nature of their funding. The timing of this teaching is at the discretion of the DGS.

COMBINED PH.D. PROGRAM

The Department of Statistics and Data Science also offers, in conjunction with the Department of Political Science, a combined Ph.D. in Statistics and Data Science and Political Science. For further details, see Political Science.

MASTER'S DEGREES

Three different M.A. in Statistics are offered. All require completion of eight term courses approved by the DGS; of which one must be in probability, one must be in statistical theory, and one must be in data analysis. The remaining five elective courses may include courses from other departments and, with the permission of the DGS and under special circumstances, appropriate courses may be taken at the undergraduate level in departments outside of Statistics and Data Science.

M.A. in Statistics (en route to the Ph.D. in Statistics and Data Science) This degree requires an average grade of HP or higher, and two terms of residence.

M.A. in Statistics (en route to the Ph.D. in other areas of study) Pursuit of this degree requires an application process managed by the DGS of Statistics and Data Science followed by approval from the DGSs from both programs and the cognizant Graduate School dean. All eight courses for this degree must earn grades of HP or higher. This degree also has an academic teaching fellow requirement, to be determined by the DGSs from both programs and the cognizant graduate school dean.

Terminal M.A. in Statistics Students are also admitted directly to a terminal master of arts program in Statistics. Students must earn an average grade of HP or higher and receive at least one grade of Honors. Full-time students must take a minimum of four courses per term. Part-time students are also accepted into the program. All students are expected to complete two terms of full-time tuition and residence, or the equivalent, at Yale. See Degree Requirements: Terminal M.A./M.S. Degrees, under Policies and Regulations.

Terminal M.S. in Statistics and Data Science Students are also admitted directly to a terminal master of science program in Statistics and Data Science. To qualify for the M.S., the student must successfully complete an approved program of twelve term courses with an average grade of HP or higher and receive at least two grades of Honors, chosen in consultation with the DGS. With the permission of the DGS and under special circumstances, appropriate courses may be taken at the undergraduate level in departments outside of Statistics and Data Science to fulfill elective requirements. Full-time students must take a minimum of four courses per term. Part-time students are also accepted into the program. All students are expected to complete three terms of full-time tuition and residence, or the equivalent, at Yale. See Degree Requirements: Terminal M.A./M.S. Degrees, under Policies and Regulations.

Program information is available online at http://statistics.yale.edu.

COURSES

S&DS 500a or b, Introductory Statistics Robert Wooster

An introduction to statistical reasoning. Topics include numerical and graphical summaries of data, data acquisition and experimental design, probability, hypothesis testing, confidence intervals, correlation and regression. Application of statistical concepts to data; analysis of real-world problems.

S&DS 517b, Applied Machine Learning and Causal Inference P. Aronow Approaches to causal inference using machine learning. Covers randomized experiments with and without noncompliance, observational studies with and without ignorable treatment assignment, instrumental variables, and regression discontinuity. Machinelearning methods include bagging, boosting, tree-based methods such as random forests, and neural networks. Assignments provide students with hands-on experience with the methods. Applications are drawn from a variety of fields including political science, economics, public health, and medicine. Programming is central to the course and is based on the R programming language. Prerequisites: the equivalent of at least two of the following courses: S&DS 530, S&DS 538, S&DS 541, and S&DS 542; and previous programming experience (e.g., R, MATLAB, Python, C++), R preferred. Strong knowledge of OLS is assumed.

S&DS 520b, Intensive Introductory Statistics Robert Wooster

An introduction to statistical reasoning designed for students with particular interest in data science and computing. Using the R language, topics include exploratory data analysis, probability, hypothesis testing, confidence intervals, regression, statistical modeling, and simulation. Computing is taught and used extensively throughout the course. Application of statistical concepts to the analysis of real-world data science problems.

S&DS 523a or b, YData: An Introduction to Data Science Ethan Meyers

Computational, programming, and statistical skills are no longer optional in our increasingly data-driven world; they are essential for opening doors to manifold research and career opportunities. This course aims to dramatically enhance students' knowledge and capabilities in fundamental ideas and skills in data science, especially computational and programming skills and inferential thinking. It emphasizes the development of these skills while providing opportunities for hands-on experience and practice. The course is designed to be accessible to students with little or no background in computing, programming, or statistics, but also engaging for more technically oriented students through extensive use of examples and hands-on data analysis. Python 3 is the computing language used. Enrollment is limited.

S&DS 530a or b / PLSC 530a or b, Data Exploration and Analysis Staff Survey of statistical methods: plots, transformations, regression, analysis of variance, clustering, principal components, contingency tables, and time series analysis. The R computing language and web data sources are used.

S&DS 538a, Probability and Statistics Joseph Chang

Fundamental principles and techniques of probabilistic thinking, statistical modeling, and data analysis. Essentials of probability: conditional probability, random variables, distributions, law of large numbers, central limit theorem, Markov chains. Statistical inference with emphasis on the Bayesian approach: parameter estimation, likelihood, prior and posterior distributions, Bayesian inference using Markov chain Monte Carlo. Introduction to regression and linear models. Computers are used throughout for calculations, simulations, and analysis of data. Prerequisite: after or concurrently with MATH 118 or MATH 120.

S&DS 540b, An Introduction to Probability Theory Elisa Celis

Introduction to probability theory. Topics include probability spaces, random variables, expectations and probabilities, conditional probability, independence, discrete and continuous distributions, central limit theorem, Markov chains, and probabilistic modeling. *This course may be appropriate for non-S&DS graduate students*. Prerequisite: MATH 115 or equivalent.

S&DS 541a, Probability Theory Harrison Zhou

A first course in probability theory: probability spaces, random variables, expectations and probabilities, conditional probability, independence, some discrete and continuous distributions, central limit theorem, Markov chains, probabilistic modeling. Prerequisite: calculus of functions of several variables.

S&DS 542a or b, Theory of Statistics Staff

Principles of statistical analysis: maximum likelihood, sampling distributions, estimation, confidence intervals, tests of significance, regression, analysis of variance, and the method of least squares. Prerequisite: S&DS 541.

S&DS 551b / ENAS 502b, Stochastic Processes Ilias Zadik

Introduction to the study of random processes, including Markov chains, Markov random fields, martingales, random walks, Brownian motion, and diffusions. Techniques in probability such as coupling and large deviations. Applications chosen from image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, genetics, and evolution.

S&DS 563b, Multivariate Statistical Methods for the Social Sciences Jonathan Reuning-Scherer

An introduction to the analysis of multivariate data. Topics include principal components analysis, factor analysis, cluster analysis (hierarchical clustering, k-means), discriminant analysis, multidimensional scaling, and structural equations modeling. Emphasis on practical application of multivariate techniques to a variety of examples in the social sciences. Students complete extensive computer work using either SAS or SPSS. Prerequisites: knowledge of basic inferential procedures, experience with linear models (regression and ANOVA). Experience with some statistical package and/or familiarity with matrix notation is helpful but not required.

S&DS 565a, Introductory Machine Learning John Lafferty

This course covers the key ideas and techniques in machine learning without the use of advanced mathematics. Basic methodology and relevant concepts are presented in lectures, including the intuition behind the methods. Assignments give students hands-on experience with the methods on different types of data. Topics include linear regression and classification, tree-based methods, clustering, topic models, word embeddings, recurrent neural networks, dictionary learning, and deep learning. Examples come from a variety of sources including political speeches, archives of scientific articles, real estate listings, natural images, and others. Programming is central to the course and is based on the Python programming language.

S&DS 572a, YData: Data Science for Political Campaigns Joshua Kalla Political campaigns have become increasingly data driven. Data science is used to inform where campaigns compete, which messages they use, how they deliver them, and among which voters. In this course, we explore how data science is being used to design winning campaigns. Students gain an understanding of what data is available to campaigns, how campaigns use this data to identify supporters, and the use of experiments in campaigns. The course provides students with an introduction to political campaigns, an introduction to data science tools necessary for studying politics, and opportunities to practice the data science skills presented in S&DS 523.

S&DS 573b, YData: Analysis of Baseball Data Ethan Meyers

The field of data science aims to extract insights from large data sets that often contain random variation. Baseball is a game that contains a high degree of randomness, and because professional baseball has been played since the nineteenth century, a large amount of data has been collected about players' performance. In this class we use baseball data to understand key concepts in data science including data visualization, data wrangling, and statistical inference. To understand these concepts, we analyze data that include season-level statistics going back to the 1870s, play-by-play statistics going back to the 1930s, and pitch trajectory statistics going back to 2006. The course uses the Python programming language and is paced to be accessible to students who have previously taken or are currently enrolled in S&DS 523. Co-requisite: S&DS 523.

S&DS 600a, Advanced Probability Sekhar Tatikonda

Measure theoretic probability, conditioning, laws of large numbers, convergence in distribution, characteristic functions, central limit theorems, martingales. Some knowledge of real analysis is assumed.

S&DS 602a, High-Dimensional Probability and Applications Zhou Fan

This course covers techniques for studying high-dimensional probabilistic problems, with a focus on non-asymptotic methods that find common use in applications across statistics, machine learning, computer science, and engineering. Topics covered include tail bounds for i.i.d. sums and martingale differences, concentration inequalities for non-linear functions, matrix concentration inequalities, suprema of Gaussian processes, and interpolation techniques for understanding universality of high-dimensional phenomena. Prerequisite: S&DS 351b/551b, S&DS 400/600 (may be taken concurrently), or permission of instructor.

S&DS 605a, Sampling and Optimal Transport Sinho Chewi

MCMC sampling and variational inference have long been utilized in Bayesian statistics and machine learning; what can we say about the convergence of these methods? Recently, a modern theory has emerged which blends principles from convex optimization with a geometric perspective on the space of probability distributions based on optimal transport. This course provides an introduction to this theory, as well as to related tools used for modern algorithmic analysis: Markov semigroup theory and stochastic calculus, coupling, and functional inequalities. Much of the course focuses on the complexity of log-concave sampling, but we also discuss applications to diffusion models and variational inference. Prerequisite: Advanced Probability (S&DS 400 / S&DS 600 MATH 330). The following are helpful but not required: Optimization (S&DS 431 / S&DS 631, S&DS 432 / S&DS 632) and Stochastic Processes (S&DS 351 / S&DS 551). Enrollment is limited; requires permission of the instructor.

S&DS 610a, Statistical Inference Theodor Misiakiewicz

A systematic development of the mathematical theory of statistical inference covering methods of estimation, hypothesis testing, and confidence intervals. An introduction to statistical decision theory. Knowledge of probability theory at the level of S&DS 541 is assumed.

S&DS 612a, Linear Models Zongming Ma

The geometry of least squares; distribution theory for normal errors; regression, analysis of variance, and designed experiments; numerical algorithms (with particular reference to the R statistical language); alternatives to least squares. Prerequisites: linear algebra and some acquaintance with statistics.

S&DS 625a or b, Statistical Case Studies Staff

Statistical analysis of a variety of statistical problems using real data. Emphasis on methods of choosing data, acquiring data, assessing data quality, and the issues posed by extremely large data sets. Extensive computations using R. Enrollment limited; requires permission of the instructor.

S&DS 626b, Practical Work Jay Emerson

Individual one-term projects, with students working on studies outside the department, under the guidance of a statistician.

S&DS 627a and S&DS 628a or b, Statistical Consulting Jay Emerson Statistical consulting and collaborative research projects often require statisticians to explore new topics outside their area of expertise. This course exposes students to real problems, requiring them to draw on their expertise in probability, statistics, and data analysis. Students complete the course with individual projects supervised jointly by faculty outside the department and by one of the instructors. Students enroll for both terms (S&DS 627 and 628) and receive one credit at the end of the year. Enrollment limited; requires permission of the instructor. ½ Course cr per term

S&DS 631a / AMTH 631a, Optimization and Computation Zhuoran Yang An introduction to optimization and computation motivated by the needs of computational statistics, data analysis, and machine learning. This course provides foundations essential for research at the intersections of these areas, including the asymptotic analysis of algorithms, an understanding of condition numbers, conditions for optimality, convex optimization, gradient descent, linear and conic programming, and NP hardness. Model problems come from numerical linear algebra and constrained least squares problems. Other useful topics include data structures used to represent graphs and matrices, hashing, automatic differentiation, and randomized algorithms. Prerequisites: multivariate calculus, linear algebra, probability, and permission of the instructor. Enrollment is limited, with preference given to graduate students in Statistics and Data Science.

S&DS 632b, Advanced Optimization Techniques Staff

This course covers fundamental theory and algorithms in optimization, emphasizing convex optimization. Topics covered include convex analysis; duality and KKT conditions; subgradient methods; interior point methods; semidefinite programming; distributed methods; stochastic gradient methods; robust optimization; and an introduction to nonconvex optimization. Applications from statistics and data science, economics, engineering, and the sciences. Prerequisites: knowledge of linear algebra, such as MATH 222 or MATH 225; multivariate calculus, such as MATH 120; probability, such as S&DS 541; optimization, such as S&DS 631; and comfort with proof-based exposition and problem sets.

S&DS 661b, Data Analysis Brian Macdonald

By analyzing data sets using the R statistical computing language, a selection of statistical topics are studied: linear and nonlinear models, maximum likelihood, resampling methods, curve estimation, model selection, classification, and clustering. Prerequisite: after or concurrent with S&DS 542.

S&DS 663a, Computational Mathematics Situational Awareness and Survival Skills Roy Lederman

Are you using a computer to analyze data? Will the computer ever finish processing the data? Will the result be junk? Will you recognize that it is junk? We discuss the difference between math on paper and math on a computer and the difference between general programming and implementing mathematics on a computer. We experience benign mathematical operations failing catastrophically without any error message. We experience mathematically equivalent operations taking anywhere between a fraction of a second and a lifetime. We develop situational awareness and survival skills for this harsh environment. We discuss algorithms, complexity, numerical computation, linear algebra, data analysis, programming, and prototyping. Assignments include theory, programming, data analysis, individual work, and collaborative work. We use C (optionally, FORTRAN) and Python. Making mistakes on assignments and respectful class discussions of insights from such mistakes are integral parts of the course. Prerequisites: linear algebra, multivariate calculus, and programming experience (any language). Prior experience with C, FORTRAN, or Python is recommended but not required; students unfamiliar with these languages must be comfortable independently learning them during the course. Limited size. Instructor permission is required.

S&DS 664b, Information Theory Staff

Foundations of information theory in communications, statistical inference, statistical mechanics, probability, and algorithmic complexity. Quantities of information and their properties: entropy, conditional entropy, divergence, redundancy, mutual information, channel capacity. Basic theorems of data compression, data summarization, and channel coding. Applications in statistics.

S&DS 665a, Intermediate Machine Learning John Lafferty

S&DS 365 is a second course in machine learning at the advanced undergraduate or beginning graduate level. The course assumes familiarity with the basic ideas and techniques in machine learning, for example as covered in S&DS 265. The course treats methods together with mathematical frameworks that provide intuition and justifications for how and when the methods work. Assignments give students hands-on experience with machine learning techniques, to build the skills needed to adapt approaches to new problems. Topics include nonparametric regression and classification, kernel methods, risk bounds, nonparametric Bayesian approaches, graphical models, attention and language models, generative models, sparsity and manifolds, and reinforcement learning. Programming is central to the course, and is based on the Python programming language and Jupyter notebooks.

S&DS 669a, Statistical Learning Theory Omar Montasser

This course covers classical topics and recent advances in statistical learning theory. This includes topics such as PAC learning, VC theory, boosting, and online learning. We explore statistical and computational aspects, with an emphasis on developing a rigorous quantitative understanding of key machine learning concepts. A second aim is to introduce technical tools that help with designing learning algorithms and proving learning guarantees. Prerequisites: Mathematical maturity and comfort with proof-oriented courses. Background in probability (e.g., S&DS 241), machine learning (e.g., S&DS 265), and algorithms (e.g., CPSC 365). Familiarity with basic concepts in computational complexity (e.g., NP-hardness) is helpful but not required.

S&DS 674b, Applied Spatial Statistics Timothy Gregoire

An introduction to spatial statistical techniques with computer applications. Topics include modeling spatially correlated data, quantifying spatial association and autocorrelation, interpolation methods, variograms, kriging, and spatial point patterns. Examples are drawn from ecology, sociology, public health, and subjects proposed by students. Four to five lab/homework assignments and a final project. The class makes extensive use of the R programming language as well as ArcGIS.

S&DS 685b, Theory of Reinforcement Learning Zhuoran Yang

There has been a surge of research interest in reinforcement learning recently, fueled by exciting applications of reinforcement learning techniques to various challenging decision-making problems in artificial intelligence, robotics, and natural sciences. Many of these advances were made possible by a combination of innovative use of flexible neural network architectures, modern optimization techniques, and new and classical RL algorithms. However, a systematic understanding of when, why, and to what extent these algorithms work remains active ongoing research. This course aims to introduce the theoretical foundations of reinforcement learning, with the goal of equipping students with necessary tools for conducting research. This graduate level course focuses on theoretical and algorithmic foundations of reinforcement learning. Specifically, there are four main themes of the course: (a) fundamentals of RL (Markov decision process, planning algorithms, Q-learning and temporal difference learning, policy gradient), (b) online RL (bandit algorithms, online learning, exploration), (c) offline RL (off-policy evaluation, offline policy learning), and (d) further topics (multiagent RL, partial observability). Prerequisites: knowledge of linear algebra (MATH 225/226/240), multivariate calculus (MATH 255/256), probability (S&DS 241), and statistics (S&DS 242). Comfort with proof-based exposition and problem sets is also required.

S&DS 688a, Computational and Statistical Trade-offs in High Dimensional Statistics Ilias Zadik

Modern statistical tasks require the use of both computationally efficient and statistically accurate methods. But, can we always find a computationally efficient method that achieves the information-theoretic optimal statistical guarantees? If not, is this an artifact of our techniques, or a potentially fundamental source of computational hardness? This course surveys a new and growing research area studying such questions on the intersection of high dimensional statistics and theoretical computer science. We discuss various tools to explain the presence of such "computational-tostatistical gaps" for several high dimensional inference models. These tools include the "low-degree polynomials" method, statistical query lower bounds, and more. We also discuss connections with other fields such as statistical physics and cryptography. Prerequisites: maturity with probability theory (equivalent of 241/541) and linear algebra and a familiarity with basic algorithms and mathematical statistics.

S&DS 689a, Scientific Machine Learning Lu Lu

There are two main branches of technical computing: scientific computing and machine learning. Recently, there has been a convergence of the two disciplines in the emerging scientific machine learning (SciML) field. The main objective of this course is to teach theory, algorithms, and implementation of SciML techniques to graduate students. This course entails various methods to solve a broad range of computational problems frequently encountered in solid mechanics, fluid mechanics, nondestructive evaluation of materials, systems biology, chemistry, and non-linear dynamics. The topics in this course cover multi-fidelity learning, physics-informed neural networks, deep neural operators, uncertainty quantification, and parallel computing. Certain materials are discussed through student presentations of selected publications in the area. Students should have prior coursework in advanced calculus, linear algebra, and probability. Having a background in scientific computing, Python, and/or machine learning is helpful but not mandatory.

S&DS 690a or b, Independent Study Jay Emerson By arrangement with faculty. Approval of DGS required.

S&DS 695b, Summer Internship in Statistics and Data Science Jay Emerson The purpose of this course is to provide students with the opportunity to gain practical experience in statistics and data science. Students who identify a suitable summer internship consult with the DGS and prepare a one-page description of the plan. The internship must be full-time: 35–40 hours per week for 10–12 weeks during the summer. Upon completion of the internship, the student must submit a written report of the work to the instructor no later than October 1. Prerequisites: completion of at least one term of the M.S. program (or the M.A. program if transferring into the M.S. program) and permission of the DGS.

S&DS 700a or b, Departmental Seminar Staff

Presentations of recent breakthroughs in statistics and data science. o Course cr

Translational Biomedicine

Boyer Center for Molecular Medicine BCMM110, 203.737.4628 https://medicine.yale.edu/ptb/ M.S., M.Phil., Ph.D.

Director Megan King

Associate Director Richard Kibbey

Directors of Graduate Studies

Richard Kibbey Megan King

Professors Nita Ahuja (Surgery; Pathology), Anton Bennett (Comparative Medicine; Pharmacology), Johnathan Bogan (Endocrinology; Cell Biology), Angelique Bordey (Neurosurgery), Kristen Brennand (Psychiatry), Lloyd Cantley (Internal Medicine/ Nephrology; Physiology), Michael Caplan (Cellular And Molecular Physiology; Cell Biology), Keith Choate (Dermatology), Joseph Contessa (Therapeutic Radiology; Pharmacology), Marie Egan (Pediatrics; Cellular and Molecular Physiology), Richard Flavell (Immunobiology), Michael Girardi (Dermatology), Fred Gorelick (Internal Medicine/Digestive Diseases; Cell Biology), Jaime Grutzendler (Neurology), David Hafler (Immunology; Neurology), Stephanie Halene (Hematology; Pathology), Erica Herzog (Pathology; Pulmonary, Critical Care, and Sleep Medicine), Mustafa Khokha (Genetics; Pediatrics), Richard Kibbey (Cellular and Molecular Physiology; Internal Medicine/ Endocrinology), Diane Krause (Cell Biology; Laboratory Medicine; Pathology), Mark Lemmon (Pharmacology), Chuan-Ju Liu (Orthopaedics and Rehabilitation), Ruth Montgomery (Epidemiology; Pathology), Katerina Politi (Pathology), Gerald Shulman (Endocrinology; Cellular And Molecular Physiology), Stefan Solmo (Nephrology; Genetics), Roel Verhaak (Neurosurgery), Lawrence Young (Cardiology; Cellular And Molecular Physiology), David Zenisek (Cellular and Molecular Physiology; Ophthalmology)

Associate Professors Titus Boggon (Pharmacology; Molecular Biophysics and Biochemistry), Demetrios Braddock (Pathology), Emanuela Bruscia (Pediatric Pulmonology, Allergy, Immunology and Sleep Medicine), Christopher Bunick (Dermatology), Engin Deniz (Pediatrics, Critical Care), Monique Hinchcliff (Rheumatology), Megan King (Cell Biology; Molecular, Cellular, and Developmental Biology; Therapeutic Radiology), Daryl Klein (Pharmacology), Liza Konnikova (Neonatal-Perinatal Medicine), Madhav Menon (Kidney Transplantation, Nephrology), Peggy Myung (Dermatology; Pathology) Don Nguyen (Pathology), Renato Polimanti (Psychiatry), Faye Rogers (Therapeutic Radiology), Kurt Schalper (Medical Oncology; Pathology)

Assistant Professors David Alagpulinsa (*Comparative and Cardiovascular Medicine*), David Braun (*Medical Oncology*), William Damsky (*Dermatology; Dermatopathology*), Sarah Fineberg (*Psychiatry*), Salil Garg (*Laboratory Medicine*), Vikas Gupta (*Internal Medicine/Endocrinology; Digestive Diseases*), Brian Hafler (*Ophthalmology; Pathology*), Won Jae Huh (*Pathology*), Mark Lee (*Laboratory Medicine*), Janitza Montalvo-Ortiz (*Psychiatry*), Ian Odell (*Dermatology*), Emily Olfson (*Child Study Center*), Richard Pierce (*Pediatrics*), Jason Sheltzer (*Surgery Oncology; Genetics*), Dennis Shung (*Digestive*) Diseases), Wan-Ling Tseng (Child Study Center), Juan Vasquez (Pediatrics, Hematology/ Oncology), Daniel Vatner (Endocrinology)

Lecturer Agnès Vignery (Cell Biology)

FIELDS OF STUDY

Cancer biology: leukemogenesis, metastasis, growth control, immune checkpoint therapy. Cell biology: cytoskeleton, nuclear structure and dynamics. Cell signaling: kinases, phosphatases, growth signaling. Epithelial cell biology: epithelial patterning, skin development and disease. Immunology: autoimmune disease, immunotherapy, systems biology. Genetics: disease etiology, birth defects. Lung function: cystic fibrosis, lung disease, idiopathic lung fibrosis. Maternal-fetal medicine. Metabolism: signaling and systems biology, diabetes. Neuroscience: pathogenesis of brain disease, neurogenomics. Organ homeostasis and injury: pancreatitis, kidney injury, macular degeneration, scleroderma. Physiology.

Students seeking admission into the Ph.D. program in Translational Biomedicine (PTB) apply to the Translational Molecular Medicine, Pharmacology, and Physiology (TMMPP) track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs/molmed/.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The primary mission of the PTB is to prepare the next generation of translational scientists to be forward-thinking leaders in academic research, medicine, education, industry, and society. To achieve this mission, the PTB leverages its interdepartmental structure to break down silos between disciplines and to foster a collaborative community comprising laboratories across all the departments at the Yale School of Medicine. The PTB emphasizes a flexible curriculum, personalized professional development, and a supportive environment in which all participants can reach their full potential.

The first three to four terms of graduate study are spent in formal course work, independent reading, laboratory rotations, and early thesis work. Each student's program of study is designed in consultation with the TMMPP Track director during the first year and with an advisory committee of the PTB that includes the PTB director of graduate studies once the student affiliates with the PTB, typically in the spring of the first year of study. The goal is to provide flexibility, rigor, and breadth while ensuring that students are well prepared to meet the PTB course requirements and to have a strong foundation for their thesis research. Students also participate in at least three laboratory rotations during their first two terms.

PTB coursework includes at least five graduate-level courses typically taken over the first four terms. Students must meet the graduate school requirement of a grade of Honors in two courses, taking additional courses to fulfill this requirement if necessary. The graduate school requires this requirement be met by the end of the second year.

PTB students are expected to take at least one of the following: C&MP 550a, PATH 690b, or PHAR 504a; as well as CBIO 604 and the year-long graduate seminar course in the TMMPP Track. They are also required to take one course in biostatistics (from several offered). In their second year, PTB students are required to take four modules (one year) of the Mentored Clinical Experience (MCE) and the PTB Grant Writing Course.

A qualifying examination is given during the second year of study and consists of a written research proposal based on the proposed thesis project followed by an oral exam. Within one year after a successful qualifying exam, the student schedules the first thesis committee meeting and provides an updated summary of the thesis project (in the form of a revised Specific Aims page). At this meeting the student is considered for advancement to candidacy, which must occur prior to the end of year three. In addition to all other requirements, students must successfully complete the Responsible Conduct in Research course (PHAR 580/C&MP 650/PATH 660) prior to the end of their first year of study. In their fourth year of study, all students must successfully complete B&BS 503, the RCR Refresher for Senior BBS Students.

An important dimension of graduate training in the program in Translational Biomedicine is the acquisition of teaching skills through participation in courses appropriate for the student's academic interests. Ph.D. students are expected to participate in two terms (or the equivalent) of teaching.

M.D.-PH.D. STUDENTS

M.D.-Ph.D. students who affiliate with the Ph.D. program in Translational Biomedicine follow a different course than other incoming graduate students, resulting in some modifications of the academic requirements for the Ph.D. portion of the M.D.-Ph.D. degree. Typically, one or more research rotations are done during the first two years of medical school. (In many cases, several rotations are done during the summer between year one and year two.) No set number of research rotations is required. M.D.-Ph.D. students officially affiliate with the Ph.D. program in Translational Biomedicine after selecting a thesis adviser and consulting with the Director of Graduate Studies (DGS). M.D.-Ph.D. students interested in affiliating with the PTB are encouraged to consult with the DGS as early as possible to determine an appropriate set of courses tailored to the student's background and interests.

The courses, rotations, and teaching requirements for M.D.-Ph.D. students entering the PTB (see below) may be modified from the normal requirements for Ph.D. students with permission of the DGS. Although five graduate-level courses are still required, some medical school courses are recognized. M.D.-Ph.D. students must also meet the graduate school requirement of a grade of Honors in two courses, taking additional courses beyond the five required in the department to fulfill this requirement if necessary. Students must also maintain an average grade of High Pass in all courses. M.D./Ph.D students are also not required to take the MCE course. In addition, only one term of teaching is required.

M.D.-Ph.D. students will be admitted to candidacy once they have completed their course work, obtained two Honors grades, passed their qualifying exam, and had their dissertation prospectus accepted by their thesis committee.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Students are not admitted for this degree. They may receive this recognition if they leave Yale without completing the qualifying exam but have satisfied the course

requirements as described above as well as the graduate school's Honors requirement. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

Prospective applicants are encouraged to visit the PTB website at https:// medicine.yale.edu/ptb.

PTB 504a / PHAR 504a, Molecular Mechanisms of Drug Actions Elias Lolis This course provides fundamental background in core principles of pharmacology, molecular mechanisms of drug action, and important research areas in contemporary pharmacology. Material covered includes quantitative topics in pharmacology such as drug-receptor theory, multiple equilibria and kinetics, pharmacokinetics, therapeutic drug monitoring, and drug metabolism. Specific content on the mechanisms of drug action includes autonomics; ion channel blockers; endocrine agents (hormones); cardiovascular drugs (ACE inhibitors, organic nitrates, β -blockers, acetylsalicylic acid); antimicrobials (anti-bacterials, fungals, and virals); anti-cancer, anti-inflammatory, anti-asthma, and anti-allergy drugs; and immunosuppressants. Students learn how to model drug-receptor interaction parameters and how to analyze steady-state enzyme kinetics and inhibition data. Senior students serving as teaching assistants lead discussion groups covering problem sets, review topics or assigned manuscripts. The course includes a self-study component consisting of video modules produced in collaboration with Yale faculty and Merck that explore the preclinical and clinical phases of drug development.

PTB 550a / C&MP 550a / ENAS 550a / MCDB 550a / PHAR 550a, Physiological

Systems W. Mark Saltzman and Stuart Campbell The course develops a foundation in human physiology by examining the homeostasis of vital parameters within the body, and the biophysical properties of cells, tissues, and organs. Basic concepts in cell and membrane physiology are synthesized through exploring the function of skeletal, smooth, and cardiac muscle. The physical basis of blood flow, mechanisms of vascular exchange, cardiac performance, and regulation of overall circulatory function are discussed. Respiratory physiology explores the mechanics of ventilation, gas diffusion, and acid-base balance. Renal physiology examines the formation and composition of urine and the regulation of electrolyte, fluid, and acid-base balance. Organs of the digestive system are discussed from the perspective of substrate metabolism and energy balance. Hormonal regulation is applied to metabolic control and to calcium, water, and electrolyte balance. The biology of nerve cells is addressed with emphasis on synaptic transmission and simple neuronal circuits within the central nervous system. The special senses are considered in the framework of sensory transduction. Weekly discussion sections provide a forum for in-depth exploration of topics. Graduate students evaluate research findings through literature review and weekly meetings with the instructor.

PTB 610a / C&MP 610a, Medical Research Scholars Program: Mentored Clinical

Experience Yelizaveta Konnikova and Richard Pierce The purpose of the Mentored Clinical Experience (MCE), an MRSP-specific course, is to permit students to gain a deep understanding of and appreciation for the interface between basic biomedical research and its application to clinical practice. The MCE is intended to integrate basic and translational research with direct exposure to clinical medicine and patients afflicted with the diseases or conditions under discussion. The course provides a foundation and a critically important forum for class discussion because each module stimulates students to explore a disease process in depth over four ninety-minute sessions led by expert clinician-scientists. The structure incorporates four perspectives to introduce the students to a particular disease or condition and then encourages them to probe areas that are not understood or fully resolved so they can appreciate the value and challenge inherent in using basic science to enhance clinical medicine. Students are provided biomedical resource material for background to the sessions as well as articles or other publicly available information that offers insight to the perspective from the non-scientific world. During this course students meet with patients who have experienced the disease and/or visit and explore facilities associated with diagnosis and treatment of the disease process. Students are expected to prepare for sessions, to participate actively, and to be scrupulously respectful of patients and patient facilities. Prior to one of the sessions students receive guidance as to what they will observe and how to approach the experience; and at the end of the session, the students discuss their thoughts and impressions. All students receive HIPAA training and appropriate training in infection control and decorum relating to patient contact prior to the course.

PTB 629a and PTB 630b / C&MP 629a and C&MP 630b / PATH 679a and PATH 680b / PHAR 501a and PHAR 502b, Seminar in Molecular Medicine, Pharmacology, and Physiology Staff

Readings and discussion on a diverse range of current topics in molecular medicine, pharmacology, and physiology. The class emphasizes analysis of primary research literature and development of presentation and writing skills. Contemporary articles are assigned on a related topic every week, and a student leads discussions with input from faculty who are experts in the topic area. The overall goal is to cover a specific topic of medical relevance (e.g., cancer, neurodegeneration) from the perspective of three primary disciplines (i.e., physiology: normal function; pathology: abnormal function; and pharmacology: intervention). Required of and open only to Ph.D. and M.D./Ph.D. students in the Molecular Medicine, Pharmacology, and Physiology track.

PTB 690a / PATH 690a, Molecular Mechanisms of Disease Demetrios Braddock This course covers aspects of the fundamental molecular and cellular mechanisms underlying various human diseases. Many of the disorders discussed represent major forms of infectious, degenerative, vascular, neoplastic, and inflammatory disease. Additionally, certain rarer diseases that illustrate good models for investigation and/ or application of basic biologic principles are covered in the course. The objective is to highlight advances in experimental and molecular medicine as they relate to understanding the pathogenesis of disease and the formulation of therapies.

Women's, Gender, and Sexuality Studies

315 William L. Harkness Hall, 203.432.0845 http://wgss.yale.edu M.A., M.Phil., Ph.D.

Chair Roderick Ferguson

Director of Graduate Studies Dara Strolovitch

Professors Rene Almeling, Claire Bowern, Daphne Brooks, Jill Campbell, Carolyn Dean, Erica Edwards, Fatima El-Tayeb, Roderick Ferguson, Scott Herring, Margaret Homans, Regina Kunzel, Gail Lewis (*Visiting*), Lisa Lowe, Joanne Meyerowitz, Laura Nasrallah, Tav Nyong'o, Ana Ramos-Zayas, Dara Strolovitch, Kalindi Vora, Laura Wexler

Associate Professors Marijeta Bozovic, Rohit De, Robin Dembroff, Crystal Feimster, Marta Figlerowicz, Joseph Fischel, Greta LaFleur, Mary Lui, Alice Miller, Ayesha Ramachandran, Juno Richards, Linn Tonstad, Deb Vargas

Assistant Professors Gregg Gonsalves, Alka Menon, Eda Pepi, Evren Savci

Senior Lecturer Maria Trumpler

Lecturers Craig Canfield, Igor De Souza, Graeme Reid, Talya Zemach-Bersin

FIELDS OF STUDY

Women's, Gender, and Sexuality Studies (WGSS) is an interdisciplinary program that critically interrogates gender and sexuality as categories of inequality, difference, and identification. Gender (the social and historical meanings of distinctions across sexes) and sexuality (the domain of sexual practices, identities, discourses, and institutions) are studied as they intersect with class, race, indigeneity, nationality, religion, ability, and other axes of power, difference, and zones of experience. The introduction of these perspectives into all fields of knowledge necessitates new research paradigms, organizing concepts and analytics, and critique.

The Program in Women's, Gender, and Sexuality Studies offers a combined Ph.D. in conjunction with five partner departments and programs: African American Studies, American Studies, Anthropology, English, and Sociology. Students may only apply for the Ph.D. in WGSS in conjunction with their application to one of these five partnering departments or programs. Students already pursuing a Ph.D. in one of the partnering departments and programs may apply for transfer into the combined Ph.D. in WGSS in the first or second year of their degree study. Graduate students in other programs may also petition to pursue an ad hoc combined degree. They must do so during their first year in their Ph.D. programs.

There are no subfields, specified areas of study, or concentrations within the combined Ph.D. program, but current WGSS faculty concentrate on gender and sexuality as they articulate across transnational politics and security regimes; citizenship and statelessness; public law and sexual violence; public policy and political representation;

kinship, reproduction, and reproductive technologies; policing, surveillance, and incarceration; social movements and protest; indigeneity, racialization, and racism; literature, language, and translation; Islam and neoliberalism; colonialism and postcolonialism.

Students pursuing the combined Ph.D. in WGSS will determine their research and doctoral foci in coordination with their advisers and with the directors of graduate studies (DGS) in WGSS and the partnering department or program.

REQUIREMENTS FOR TRANSFER INTO THE COMBINED PH.D. PROGRAM

Students in the first or second year of their degree study in American studies, anthropology, English, and sociology wishing to transfer into the combined Ph.D. in WGSS should submit a departmental transfer request form and a two- to threepage statement of interest describing why they wish to pursue the combined Ph.D. to wgss.dgs@yale.edu. Please indicate whether you have completed WGSS 600 and/or WGSS 900, and if not, when you intend to do so. Your statement of interest should also outline a plan of completion for any outstanding WGSS course requirements.

Interested students in their first year of other Ph.D. programs may apply to do an ad hoc combined degree with WGSS. They must do so before they have advanced to candidacy and must first get permission from their current DGS, after which they should submit a departmental transfer request form and prepare a two- to threepage written proposal describing why they wish to pursue the combined Ph.D. The proposal should indicate whether they have completed WGSS 600 and/or WGSS 900 and should include a plan of completion for any other outstanding requirements in both WGSS and their other program. They should submit both the form and proposal for review and approval by the associate dean as well as by the DGS in the relevant departments.

Interested students should submit their forms and statements of interest to wgss.dgs@yale.edu by December 15. The WGSS graduate admissions committee will inform applicants of its decisions by early March.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

As a default rule, students should assume that a WGSS or WGSS-affiliated faculty member should participate in any partnering program/department requirements involving faculty committee supervision or assessment. For example, if a program requires oral exams or a dissertation prospectus to be defended to a multiperson faculty committee, at least one member of the committee should be WGSS or WGSS affiliated faculty. If the partnering program/department requires students to construct multiple reading lists for oral and/or written exams, one such list should substantively include gender and sexuality scholarship. At least one faculty member of the student's dissertation committee will hold a primary or secondary tenured or tenure-track appointment in WGSS.

In their first two years of study, students in the combined Ph.D. program will complete a minimum of twelve term courses. The WGSS combined Ph.D. student's course of

study and research will be coordinated with the student's adviser, the DGS of WGSS, and the DGS of the partnering department or program.

Students are required to complete the following courses:

- · WGSS 600, Introduction to Women's, Gender, and Sexuality Studies
- · WGSS 700, Feminist and Queer Theories
- WGSS 900, Colloquium and Working Group (half credit per term; students should enroll for two sequential terms, ideally in the same academic year)
- One elective. Typically, electives taken in the student's partnering department will be cross-titled with WGSS or will substantively examine gender and sexuality.
- Students are also required to take at least one graduate-level methods course. Students are strongly encouraged to fulfill this requirement by taking WGSS 800, Methods in Gender and Sexuality Studies, but may also do so using the methods courses offered by their partner department. Students should consult with the WGSS DGS about their plan to fulfill the WGSS methods requirement.

WGSS combined-Ph.D. students typically teach or serve as a teaching fellow (TF) in their third and fourth years in the program, unless their dissertation research plans require other arrangements (funding permitting). WGSS combined-degree students will be given priority for TF slots in WGSS classes, and at least one of the courses for which they serve as a TF should have undergraduate WGSS numbers.

Students will be admitted to candidacy when they have fulfilled all requirements of both WGSS and the relevant partnering department or program. The scheduling and structure of qualifying examinations, prospectuses, and dissertations will follow the protocols of the partnering department. However, WGSS combined-degree students are strongly encouraged to hold a prospectus meeting and at least one post-approval meeting at which all members of their committee are present.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.A. (en route to the combined Ph.D.) Students will be awarded a combined M.A. degree in Women's, Gender, and Sexuality Studies and the partnering department or program upon successful completion of all course work with the exception of the WGSS dissertation proposal workshop. See also Degree Requirements under Policies and Regulations.

COURSES

WGSS 520b / AMST 520b / ER&M 520b / HSHM 757b, Applied Research in Feminist Science and Technology Studies Kalindi Vora

In this seminar, participants conduct applied research on projects with the primary investigator/instructor. Structured as a lab, we learn research methods, design research activities including building bibliographies for scholarly review, and collecting data through surveys and interviews. Topics vary but are linked to active research by instructor in feminist science and technology studies. Permission of instructor is required. Undergraduates may enroll by permission of instructor.

WGSS 570b / SOCY 605b, LGBTQ Population Health John Pachankis Sexual and gender minority individuals (e.g., those who identify as LGBTQ) represent a key health disparity population in the United States and worldwide, but highquality evidence of this problem has historically been slow to accumulate. This course engages students in critically examining today's rapidly expanding empirical knowledge regarding sexual and gender minority health by considering challenges to, and opportunities for, conducting this research with methodological rigor. Students consider social and ecological influences on sexual and gender minority health, including migration, community, and neighborhood influences. Social institutions, including religion, school, family, and close relationships, are examined as sources of both stress and support. Given the relevance of individual and collective identity and stress as mechanisms through which stigma impacts sexual and gender minority health, the empirical platform of the course is complemented by intersectionality theory, critical postmodern work on identity fluidity and multiplicity across the life course, and minority stress conceptualizations of health. Students apply lessons learned in the course to evaluating and developing policy and health care interventions for this increasingly visible segment of the global population. Also SBS 570.

WGSS 600a, Introduction to Women's, Gender, and Sexuality Studies Joseph Fischel Introduction to women's, gender, and sexuality studies as a field of knowledge and to the interdiscipline's structuring questions and tensions. The course genealogizes feminist and queer knowledge production, and the institutionalization of WGSS, by examining several of our key terms.

WGSS 607b, Feminist and Queer Ethnographies: Borders and Boundaries Eda Pepi This seminar gives students a storm's eye view of contemporary crises, where borders are as volatile as the ring of a wedding bell or the birth of a child. Feminist and queer ethnographies explore the geopolitical lines and social divides that define and confine us. Manifesting through laws, social norms, and physical barriers, borders and boundaries shape our identities, turning the intimate act of living into a fiercely political one. We consider them as lived experiences that cross militarized lines - as the everyday realities of families, detention centers, workplaces, universities, and even nightclubs. Our readings trace the fluidity of borders, the extension of the global north's influence, and the internal colonialism that redraws the landscapes of nations. Contemporary ways of bridging time and space are profoundly gendered, sexualized racialized, and class-specific, capable of materializing with sudden intensity for some and remaining imperceptible to others, morphing from ephemeral lines to seemingly permanent barriers. The course is an invitation to think beyond the map-to understand borders as something people live, challenge, and transform. Our intellectual battleground is the liminal space where geopolitics meets the raw human struggle for recognition, peeling back the layers of political theatre to witness the making and unmaking of our borderlands. Anchored by a "radical hope for living otherwise," the seminar also aims to expand the intellectual horizons necessary for dreaming of, and working towards, the world to come.

WGSS 608a, Gender and Citizenship in the Middle East Eda Pepi

This seminar explores the complex interplay between gender, sexuality, and citizenship in the Middle East and North Africa. We examine how they are both shaped by and shape experiences of nationality, migration, and statelessness. Highlighting how gender and sexual minorities, and the gendered regulation of life, more broadly, both animate and contest colonial legacies tied to a racialized notion of "modernity." Through ethnography, history, and literature, students confront a political economy of intimacies that continuously reshape what it means to be or not to be a citizen. Our approach extends beyond borders and laws to include the everyday acts of citizenship that rework race, religion, and ethnicity across transnational fronts. We discuss how people navigate their lives in the everyday, from the ordinary poetry of identity and belonging to the spectacular drama of war and conflict. Our goal is to challenge orientalist legacies that dismiss theoretical insights from scholarship on and from this region by labeling it as focused on exceptional cases instead of addressing "universal" issues. Instead, we take seriously that the specific historical and social contexts of the Middle East and North Africa reveal how connections based on gender and sexuality within and across families and social classes are deeply entwined with racial narratives of state authority and political sovereignty on a global scale.

WGSS 620a / AMST 619a / ER&M 620a / HSHM 792a, Enduring Conditions: Chronic Illness, Disability, Care, and Access Kalindi Vora

This interdisciplinary course brings together scholarship on access and care that bridges concerns in the fields of disability studies and humanistic approaches to chronic illness. Scholarly texts are drawn from the fields of critical race and ethnic studies, gender and sexuality studies, anthropology and sociology of medicine, history, and feminist science and technology studies (fSTS). Seminar participants also engage with the arts and media as critical sites for understanding culture work bringing together knowledge in disability and chronic illness spaces. To embrace community-based research and knowledge sharing, the course features regular guest lectures from grassroots disability justice organizers and culture workers. The course is offered in a hybrid format. To consider what disability studies and work on chronic illness can build together, we explore the work of Moya Bailey, Aimi Hamraie, Jina B. Kim, Sami Schalk, Akemi Nishida, Ryan Cartwright, and Arthur Kleinman, among others. Permission of instructor.

WGSS 652a / AMST 652a, Queer Repertoires and the "Great American Songbook" Karen Tongson

Queer Repertoires is a critical writing and intensive reading workshop using the "Great American Songbook" (in some of its canonical, as well as wildly innovative reimaginings) alongside recent and key texts about popular music, sound, sexuality, and race to explore other ways of approaching "academic writing," broadly conceived. The class is suitable for students interested in queer studies, sound studies, musical theater studies, and popular music studies, as well as students who are interested in exploring other styles and methods of public writing with scholarly/research-based foundations. From Water Pater's "Preface to The Renaissance" declaring that "all arts aspire to the condition of music," to Roland Barthes' claim in "The Grain of the Voice" that writing about music inspires an endlessly evasive and "predicative" language, aesthetes, philosophers, and critical theorists have struggled to find methods for writing about music, while playing with musicality in their own language. Meanwhile, American studies has engaged with popular music not merely as another archive constitutive of what constitutes "the American," but also as a theoretical apparatus and set of stylistic techniques. This course encourages your experiments in critical writing about music, race, and sexuality in and beyond academic contexts. Seminar participants are expected to write short weekly assignments and to create playlists, while also

exploring other multimedia modes (including audio storytelling) to workshop with the group on a rotating basis.

WGSS 661a, Queer Theology Linn Tonstad

In the United States, queer theory emerged out of the Reagan years, the devastation of the HIV/AIDS pandemic, and the combined impacts of neoliberalism and gentrification (politically, geographically, and socially) on queer communities. In spring 2022, we encounter each other in the midst of two pandemics: COVID-19 and the one that is not over. This course thinks and reads queer theology with attention to the many challenges highlighted by the two pandemics, HIV/AIDS and COVID-19, focusing on how flesh is thought and represented. Readings take up questions of ethics and moralization; stigma and fear of the other; togetherness and the risk of difference; pleasure, wisdom, foolishness, and loss; negativity, sodomy, and divine violence; race (especially antiblackness) and gender; and the genres of queer theological writings. Prerequisite: at least two graduate-level seminars in religion, philosophy, or WGSS, or permission of the instructor.

WGSS 665b / CPLT 665b / ENGL 5865b, African Feminism and African Women Writers Helen Yitah

This course looks at how major African women writers such as Ama Ata Aidoo, Mariama Ba, Bessie Head, Nawal El Saadawi, Grace Ogot, and Chimamanda Adichie have represented African feminist concerns and aesthetics in their works. We explore some of their interrogation of sexism and patriarchal social structures, the thematization of gender relations, a rethinking of marginality, and the presentation of alternative frames of reference for (re)defining female subjectivities and identities by reading selected works through the lens of African feminist thought, including Molara Ogundipe-Leslie's stiwanism, Catherine Acholonu's motherism, Obioma Nnaemeka's nego-feminism, and Mary Kolawole's and Chikwenye Ogunyemi's versions of womanism.

WGSS 667b / FREN 900b / HIST 667b, History of Gender and Sexuality in Modern Europe Carolyn Dean

An introduction to the various lines of inquiry informing the history of sexuality. The course asks how historians and others constitute sexuality as an object of inquiry and addresses different arguments about the evolution of sexuality in Europe, including the relationship between sexuality and the state and sexuality and gender.

WGSS 677a / PHIL 677a, Feminist Philosophy: Theories of Sex, Gender, and Sexual Orientation Robin Dembroff

This course surveys several feminist frameworks for thinking about sex, gender, and sexual orientation. We consider questions such as: Is there a tenable distinction between sex and gender? Between gender and sexual orientation? What does it mean to say that gender is a social construction, or that sexual orientation is innate? What is the place of politics in gender and sexual identities? How do these identities – and especially resistant or transgressive identities – impact the creation and revision of social categories?

WGSS 691a, Reimagining Gender Equality in International Human Rights Law Claudia Flores, Graeme Reid, and Ali Miller

In this seminar, Professors Claudia Flores, member of the UN Working Group on discrimination against women and girls, Graeme Reid, the UN's independent expert on protection against violence and discrimination based on sexual orientation and gender identity, and Alice Miller, co-director of Global Health Justice Partnership explore the development, current state, and future prospects of gender equality within international human rights norms and legal framework. The seminar delves into the historical development, transnational contestations, and contemporary debates surrounding gender inclusivity and equality, with a particular focus on tensions between universal human rights standards, and claims to traditional values and cultural norms.

WGSS 696a / AMST 696a / ENGL 906a / ER&M 696a / HSHM 782a / RLST 630a, Michel Foucault I: The Works, The Interlocutors, The Critics Greta LaFleur

This graduate-level course presents students with the opportunity to develop a thorough, extensive, and deep (though still not exhaustive!) understanding of the oeuvre of Michel Foucault, and his impact on late-twentieth-century criticism and intellectual history in the United States. Non-francophone and/or U.S. American scholars, as Lynne Huffer has argued, have engaged Foucault's work unevenly and frequently in a piecemeal way, due to a combination of the overemphasis on The History of Sexuality, Vol 1 (to the exclusion of most of his other major works), and the lack of availability of English translations of most of his writings until the early twentyfirst century. This course seeks to correct that trend and to re-introduce Foucault's works to a generation of graduate students who, on the whole, do not have extensive experience with his oeuvre. In this course, we read almost all of Foucault's published writings that have been translated into English (which is almost all of them, at this point). We read all of the monographs, and all of the Collège de France lectures, in chronological order. This lightens the reading load; we read a book per week, but the lectures are shorter and generally less dense than the monographs. [The benefit of a single author course is that the more time one spends reading Foucault's work, the easier reading his work becomes.] We read as many of the essays he published in popular and more widely-circulated media as we can. The goal of the course is to give students both breadth and depth in their understanding of Foucault and his works, and to be able to situate his thinking in relation to the intellectual, social, and political histories of the twentieth and twenty-first centuries. Alongside Foucault himself, we read Foucault's mentors, interlocutors, and inheritors (Heidegger, Marx, Blanchot, Canguilhem, Derrida, Barthes, Althusser, Bersani, Hartman, Angela Davis, etc); his critics (Mbembe, Weheliye, Butler, Said, etc.), and scholarship that situates his thought alongside contemporary social movements, including student, Black liberation, prison abolitionist, and anti-psychiatry movements. Instructor permission required.

WGSS 700b, Feminist and Queer Theories Roderick Ferguson

This course is designed as a graduate introduction to feminist and queer thought. It is organized by a number of key terms and institutions around which feminist and queer thinking has clustered, such as the state, the law, religion, family and kinship, capitalism and labor, the body and language, knowledge and affect, globalization and imperialism, militarism and security. The "conversations" that happen around each term speak to the richness of feminist and queer theories, the multidimensionality of feminist and queer intellectual and political concerns, and the "need to think our way out of these crises," to cite Jacqui Alexander and Chandra Mohanty. The aim is to leave students appreciating the hard labor of feminist and queer thought, and understanding the urgencies out of which such thinking emerges.

WGSS 712a / AMST 866a / HIST 775a, Readings in the History of Sexuality Regina Kunzel

Selected topics in the history of sexuality. Emphasis on key theoretical works and recent historical literature.

WGSS 757a / ANTH 753a, Feminist Anthropology Eda Pepi

This seminar explores the impact of feminist theory on anthropology and interdisciplinary ethnography, charting its influence from the decline of structural functionalism to the embrace of poststructuralist and post-colonial perspectives. It engages feminist contributions on pivotal debates over the universality of women's subordination, the denaturalization of kinship, and the reframing of gender and sexuality as performative, highlighting the intersection of the "sex/gender system" with other analytical categories on a global scale. Through the feminist reevaluation of kinship studies, once the bedrock of anthropology, the course takes up how traditional analyses of biological, social, and societal reproduction that treat politics, economy, kinship, and religion as distinct cultural domains naturalize power and inequality. This paradigm shift inspired empirically informed interdisciplinary analyses across the social sciences and humanities – including in women's studies, Black and Latina studies, queer studies, masculinity studies, affect theory, and science and technology studies. As such, the seminar is also an invitation to participate in both hopeful and skeptical new visions of anthropology – to dream of an "otherwise" future for our and other fields.

WGSS 779a / AMST 805a / HSAR 720a / RLST 699a, Sensational Materialities:

Sensory Cultures in History, Theory, and Method Sally Promey This interdisciplinary seminar explores the sensory and material histories of (often religious) images, objects, buildings, and performances as well as the potential for the senses to spark contention in material practice. With a focus on American things and religions, the course also considers broader geographical and categorical parameters so as to invite intellectual engagement with the most challenging and decisive developments in relevant fields, including recent literatures on material agencies. The goal is to investigate possibilities for scholarly examination of a robust human sensorium of sound, taste, touch, scent, and sight-and even "sixth senses"-the points where the senses meet material things (and vice versa) in life and practice. Topics include the cultural construction of the senses and sensory hierarchies; investigation of the sensory capacities of things; and specific episodes of sensory contention in and among various religious traditions. In addition, the course invites thinking beyond the "Western" five senses to other locations and historical possibilities for identifying the dynamics of sensing human bodies in religious practices, experience, and ideas. The Sensory Cultures of Religion Research Group meets approximately once per month at 7 p.m. on Tuesdays; class participants are strongly encouraged, but not required, to attend. Enrollment is by permission of the instructor; qualified undergraduates are not only welcome but encouraged to join us. There are no set prerequisites, but, assuming available seats, permission will be granted on the basis of response to three questions: Why do you wish to take this course? What relevant educational or professional background/experience do you bring to the course? How does the course help you to meet your own intellectual, artistic, or career aspirations?

WGSS 782b / HIST 940b / HSHM 770b, Disability Histories: Research Seminar Naomi Rogers

This course introduces students to the major issues in current disability history as well as theoretical debates in disability studies. We discuss cultural, social, and political meanings of citizenship; efforts to define and classify disabled bodies; contested notions of bodily difference; and the ways disability has and continues to be used as a metaphor for socially defined inferiority like gender, race, or sexuality. By the fourth week students have identified the topic for their research papers and discussed them in class. The next month is devoted to research and writing. We then start meeting again to read and discuss a draft of each paper.

WGSS 787a / AMST 787a, Transgender Legal History Greta LaFleur This course offers a graduate-level introduction to the histories of the regulation of gendered and sexual comportment in the United States from the colonial period through the present, understanding gendered and sexual comportment to be historical formations indelibly shaped by racialization, religion, immigration status, disability, and class and labor status (among others). Building on the work of trans studies scholars and legal historians (which are not, of course, mutually exclusive constituencies), this course offers a substantive introduction to trans and legal archives and the unique questions and methodologies that engagement with each of these fields demands. Drawing on the work of scholars such as Dean Spade, Emily Skidmore, Katrina Rose, Sonia Katyal, C. Riley Snorton, Kimberlé Crenshaw, Paisley Currah, Marie-Amélie George, Michael Silverman, Kendra Field, Kyle Kirkup, Kevin Barry, Elizabeth Glazer, Catharine MacKinnon, Siobhan Somerville, Stephen Robertson, Colby Gordon, Sahar Sadjadi, and many more, this course provides graduate students with an advanced introduction to four vectors of inquiry: First and foremost, the course grapples with historical and historiographical questions surrounding what might be included under the umbrella of trans history or histories. Second, the course introduces students to legal history as a field and a method. Third, the course explores the complicated patchwork of laws that, together, make up the legal histories of gendered and gender nonconforming experience. Finally, we consider the role of law and policy in the *production* of *transgender* as a framework for experience and site of legislation, regulation, protection, enforcement, etc. Students must be enrolled in a Ph.D. program at Yale University.

WGSS 800b / AMST 798b, Methods in Gender and Sexuality Studies Eda Pepi This seminar explores the dynamics of power and knowledge, the ethics of representation and accountability, and the nexus between disciplinarity and interdisciplinarity. It is designed for graduate students developing research projects that engage feminist, queer, postcolonial, and critical race methodologies, among others. The course adopts an epistemological approach that centers "encounter" across geopolitical scales and multiple disciplinary fronts in the humanities and social sciences. It posits that research methods, regardless of their origin, can adopt feminist, queer, decolonial/postcolonial, and critical race perspectives and potentially serve counterdisciplinary purposes. Although we cover a broad spectrum of methods – ranging from ethnographic, historiographic/archival, and geographic, to literary, media, and textual analysis, cultural studies, and political theory – our work does not unfold as a practicum. Instead of experimenting with a predefined "toolkit," students critically engage book-length works that demonstrate counter-disciplinary methodologies, reflecting hermeneutically on how method and theory relate in these texts by drawing on Foucault's framework of "the archaeology of knowledge."

WGSS 857b / AMST 857b, Frailties Scott Herring

An overview of the methodologies and interdisciplinary potentials of critical age studies. After beginning with a recent issue of *Radical History Review* on "Old/Age," we spend our weeks discussing topics such as ageism and age discrimination; immigrant caregiving and servitude; black debility; creative iterations of queer and trans aging; age standardizations in the early twentieth-century United States; "deaths of despair" amidst "the new longevity"; feminist critiques of optimal aging; and junctures of disability and aging. The course brings together a range of thinkers including historians such as Corinne T. Field and Nicholas L. Syrett; theorists such as Kathleen Woodward and Margaret Morganroth Gullette; disability justice activists such as Leah Lakshmi Piepzna-Samarasinha; and sociologists such as Mignon R. Moore. Two governing concerns that we answer as a class: How do considerations of age, aging, and gerontophobia featured in our readings amplify the contemporary investments of American studies? How can we chart political and aesthetic formations of the frail that offset their persistent nonrecognition?

WGSS 900a or b, Colloquium and Working Group Joseph Fischel The course is made up of two components: the WGSS Graduate Colloquium, in which graduate students present ongoing research (meets every two to three weeks); and the WGSS Working Group, in which faculty present pre-circulated works-in-progress for critical feedback from the WGSS community (meets every two to three weeks). ½ Course cr
NON-DEGREE-GRANTING PROGRAMS, COUNCILS, AND RESEARCH INSTITUTES

Students enrolled in the graduate school have the opportunity to participate in a number of non-degree-granting programs, councils, and institutes at Yale.

Archaia

http://archaia.yale.edu Graduate Certificate in the Study of Ancient and Premodern Cultures and Societies

Graduate Coordinators Sonam Kachru (*Religious Studies*) Laura Nasrallah (*Divinity*; *Religious Studies*)

Program Director Keith Geriak

Steering Committee Brent Bianchi (South and Southeast Asian Studies), Lisa Brody (Yale University Art Gallery), Malina Buturovic (Classics), Maria Doerfler (Religious Studies), Alexander Ekserdjian (Classics; History of Art), Milette Gaifman (Classics; History of Art), Felicity Harley-McGowan (Divinity), Michael Hunter (East Asian Languages and Literatures), Andrew Johnston (Classics), Denise Leidy (Yale University Art Gallery), Noel Lenski (Classics; History), Colin McCaffrey (Classics), James Patterson (Classics), Alexander Uskokov (Sanskrit; South Asian Studies) Kevin van Bladel (Near Eastern Languages and Civilizations), Jacqueline Vayntrub (Divinity), Molly Zahn (Divinity)

GRADUATE CERTIFICATE IN THE STUDY OF ANCIENT AND PREMODERN CULTURES AND SOCIETIES

Archaia is a collaborative forum bringing together one of the largest groups of scholars in the world working on early civilizations. Scholars in the humanities and social sciences join with those working in the Yale Divinity School, the Yale Law School, the collections, and the university libraries. While admiring and encouraging traditional modes of work and traditional fields of scholarship, we build a new inter- and multidisciplinary framework that redefines old disciplinary boundaries.

Archaia aims to enhance an already world-class graduate education by exposing students early in their careers to a wider intellectual world and to understand in new ways the value of antiquity, from the Mediterranean to Japan, and its rich cultural heritage for our own world. It supplements the curriculum with seminars, conferences, and special lectures by scholars from Yale as well as visiting scholars and offers a graduate certificate. The certificate in Archaia is open to Yale Ph.D. students and to students at the Divinity School.

Students with an interest in Archaia should apply to one of the university's degreegranting departments and should meet the entrance standards of the admitting department. Departments and schools currently participating in Archaia are Anthropology, Classics, East Asian Languages and Literatures, History, History of Art, Judaic Studies, Near Eastern Languages and Civilizations, Religious Studies, and the Divinity School; students from other relevant units should contact the Archaia graduate coordinators.

The certificate program provides enhanced training to graduate students with wideranging interests in the ancient and premodern world to extend their studies beyond departmental lines. Program students are expected to fulfill the requirements of the home department, but their course of study is individually modified to allow for interdisciplinary work through classes, examinations, and guidance by faculty in several departments.

Graduate students who are enrolled in and funded by participating departments will earn a certificate upon satisfactory completion of the requirements. Students should apply to the department that coincides best with their backgrounds and their prospective areas of specialization, and they should indicate an interest in the interdepartmental program at the time of their application to that department. Students in participating Ph.D. programs earn the certificate en route to the doctorate.

A program of study for completion of the certificate must include the Core Seminar – or, in special cases, an approved alternative seminar – introducing students to issues in the study of the premodern world. In addition, a minimum of three other courses plus a capstone project is required, the courses to be selected in consultation from offerings of advanced language study and seminars related to the premodern world at the graduate level. The course of study must be approved by a graduate coordinator of Archaia and by the director of graduate studies (DGS) of the student's home department, who, together with the student, will lay out a blueprint for completing the requirements, articulating a field of concentration and a direction for the capstone project, and identifying potential mentors.

REQUIREMENTS FOR THE CERTIFICATE

- A team-taught Core Seminar or, in special cases, an approved alternative seminar – introducing students to issues in the study of global antiquity, from a cross- and multidisciplinary perspective. Initiative students normally take the Core Seminar in the first year of study. Offered each year in the spring, the seminar is normally a team-taught class sponsored by two or more of the cooperating departments. There will be supplementary sessions in the Yale collections (e.g., the Yale Art Gallery or the Beinecke) and a required monthly colloquium component. Specific topics vary, but each seminar has significant interdisciplinary and comparative dimensions emphasizing the methodologies and techniques of the fields involved.
- 2. A minimum of three courses, of which at least two must be seminar or seminar-type courses, chosen in consultation with the DGS of the student's home department from courses offered across the university. These will in most cases be courses that also fill requirements for the student's home department and must be at a level that would normally be accepted for graduate study in that department.
- 3. A capstone project that demonstrates the student's capacity to pursue independent, interdisciplinary research (the equivalent of 1 or 2 course units, depending on the scope), to be approved in consultation with the Archaia coordinators and the DGS of the student's home department (e.g., an exhibition, documentary, research paper, conservation project). The capstone project may take the form of a research paper (approximately 10,000 words), an exhibition, a documentary, an annotated syllabus, or something else of the student's choosing. The project may evolve from work accomplished in a related seminar. The project should demonstrate the student's ability to conduct research on antiquity from an interregional, global, and/or interdisciplinary perspective. The committee welcomes explicit reflection, in the project's introduction and in the project itself, of how a project that is interdisciplinary and/or interregional may challenge scholarly consensus or notions entrenched in institutionally separate fields or departments.

4. Regular participation in events hosted by Archaia throughout the academic year, especially the monthly meetings of the Ancient Societies Workshop.

Students who fulfill these requirements will receive a letter from the Archaia coordinators indicating that they have completed the work for the certificate.

CORE SEMINAR

The 2024–2025 Core Seminar, "Law and Society in China and Rome: 200 B.C.E.–750 C.E.," will be taught by Valerie Hansen (*History*) and Noel Lenski (*Classics*). Please check the Archaia website for details.

Atmospheric Science

Advisory Committee Sarbani Basu (Astronomy), Michelle Bell (School of the Environment), Alexey Fedorov (Earth and Planetary Sciences), Debra Fischer (Astronomy), Gary Haller (Emeritus; Chemical and Environmental Engineering), Xuhui Lee (School of the Environment), Juan Lora (Earth and Planetary Sciences), Mitchell Smooke (Mechanical Engineering and Materials Science; Applied Physics), Mary-Louise Timmermans (Earth and Planetary Sciences), John Wettlaufer (Earth and Planetary Sciences; Mathematics; Physics)

A number of departments of the graduate school offer courses dealing with the physics, dynamics, and chemistry of the atmosphere, and the interactions of the atmosphere with the biosphere, oceans, and cryosphere, including all biogeochemical cycles. The mathematical and physical science basis for these phenomena is developed in course work and research foci across a range of departments. In order to permit students whose interests lie in the field of atmospheric science to develop an integrated program of studies, an interdisciplinary program is offered. Typical areas of interest included in the scope of the program are theory of weather and climate, computational fluid dynamics, air pollution from industrial and natural sources, urban environmental health, global climatic change, paleoclimatology, hydrometeorology, and dynamics of atmospheric and oceanic motions. The program is individually planned for each student through a faculty adviser system.

SPECIAL ADMISSIONS REQUIREMENTS

A student should, on the basis of scientific orientation, seek admission to one of the participating departments. Individuals interested in Atmospheric Science should complete the admissions requirements for the specific participating department to which they will be applying, which may include the GRE General or Subject Test. The Department of Earth and Planetary Sciences is the focus for studies of physical and dynamical meteorology, oceanography, and atmospheric chemistry, with allied methods and approaches in the Program on Applied Mathematics. The departments of Applied Physics, Public Health, and Engineering & Applied Science (which includes the programs of Biomedical Engineering, Chemical and Environmental Engineering, Electrical Engineering, and Mechanical Engineering and Materials Science) provide additional courses in environmental health and atmospherically related processes. The Ph.D. and M.Phil. requirements are those of the admitting departments. (See entries in this bulletin.)

Combined Program in the Biological and Biomedical Sciences (BBS)

55 College Street, 203.785.5663 https://medicine.yale.edu/bbs

Director Craig Roy

FIELDS OF STUDY

The Combined Program in the Biological and Biomedical Sciences (BBS) is intended to enable students to explore their research interests before committing to a Ph.D. program or thesis adviser. To accomplish this aim, students apply to and spend their first year within one of eight scientific homes, called "tracks":

Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BQBS) Computational Biology and Bioinformatics (CBB) Immunology Microbiology Molecular Cell Biology, Genetics, and Development (MCGD) Translational Molecular Medicine, Pharmacology, and Physiology (TMMPP) Neuroscience Plant Molecular Biology (PMB)

There are approximately 450 faculty affiliated with the BBS Program, and they may affiliate with up to two of the tracks listed above. BBS faculty come from departments within the Faculty of Arts and Sciences, School of Medicine, School of Public Health, and School of Engineering & Applied Science.

TYPICAL COURSE OF STUDY

Year One From within their track students take two to four courses per semester and conduct two to four lab rotations over the course of the year. Each track has its own course requirements and course recommendations, though students may take elective courses from anywhere in BBS. Although each track also has its own list of participating faculty, with the guidance of the track director, students may rotate in any BBS labs. In the spring of their first year students select a thesis adviser.

Year Two Prior to the start of the year students leave their BBS track and formally join one of the Ph.D.-granting programs below that best aligns with the thesis lab and research project:

Cell Biology Cellular and Molecular Physiology Computational Biology and Bioinformatics Experimental Pathology Genetics Immunobiology Interdepartmental Neuroscience Program Microbiology Molecular Biophysics and Biochemistry Molecular, Cellular, and Developmental Biology Pharmacology Translational Biomedicine

Students in year two complete the course requirements for the graduate program they have joined, take a qualifying exam, and begin thesis research. Each BBS student is required to participate in two semesters (or its equivalent) of teaching during graduate school, but no student is expected to teach during the first year of study. Students may begin to fulfill this requirement in the second year.

Year Three and Beyond Students focus primarily on thesis research, publishing their results, and presenting their work at scientific meetings. Students also finish fulfilling their teaching requirement. The median time to degree across the twelve BBS-affiliated Ph.D. programs is 5.7 years.

Financial support for BBS students comes from a variety of sources including Yale University fellowships, Gruber Science fellowships, Wu Tsai fellowships, National Institutes of Health (NIH) training grants, external fellowships awarded to students, departmental funds, and research grants from the NIH, NSF, foundations, and companies.

MEDICAL RESEARCH SCHOLARS PROGRAM (MRSP)

Students applying to any BBS track may also apply to participate in the MRSP. See the MRSP description under Non-Degree-Granting Programs, Councils, and Research Institutes. For more information about the program and application process visit https://medicine.yale.edu/bbs/training/nih-programs/mrsp.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the BQBS, CBB, MCGD, TMMPP, or Neuroscience tracks may also apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes. For more information about the program and application process visit https://peb.yale.edu.

COURSES

B&BS 640a / PATH 640a, Developing and Writing a Scientific Research Proposal Katerina Politi

The course covers the intricacies of scientific writing and guides students in the development of a scientific research proposal on the topic of their research. All elements of an NIH fellowship application are covered, and eligible students submit their applications for funding. Enrollment limited to twelve. Required of second-year graduate students in Pathology and Molecular Medicine. Registration allowed by prior authorization from course directors only.

B&BS 68ob / IMED 68ob, Topics in Human Investigation Joseph Craft and Karen Anderson

The course teaches students about the process through which novel therapeutics are designed, clinically tested, and approved for human use. It is divided into two main components, with the first devoted to moving a chemical agent from the bench to the clinic, and the second to outlining the objectives and methods of conducting clinical trials according to the FDA approval process. The first component describes aspects of structure-based drug design and offers insight into how the drug discovery process is conducted in the pharmaceutical industry. The format includes background lectures with discussions, labs, and computer tutorials. The background lectures include a historical perspective on drug discovery, the current paradigm, and important considerations for future success. The second component of the course provides students with knowledge of the basic tools of clinical investigation and how new drugs are tested in humans. A series of lectures and discussions provides an overview of the objectives, research strategies, and methods of conducting patient-oriented research, with a focus on design of trials to test therapeutics. Each student is required to participate (as an observer) in an HIC review, in addition to active participation in class. Consent of instructor required.

College Teaching Preparation

https://poorvucenter.yale.edu/graduate-students/teaching-programs-and-grants/ certificate-college-teaching-preparation-cctp/graduate-and-professional-cctp

Associate Director Gina Hurley

GRADUATE CERTIFICATE OF COLLEGE TEACHING PREPARATION

The Poorvu Center for Teaching and Learning sponsors the Graduate Certificate of College Teaching Preparation (CCTP), which students can pursue in conjunction with graduate-degree programs in the Graduate Schools of Arts and Sciences. The goal of this certificate program is to equip students with transferrable skills that are valuable on the job market and for careers involving teaching and mentoring. There is no formal application procedure for this certificate, and the program is open to all graduate students at Yale University.

Upon completion of the CCTP, graduate students will understand and be able to do the following:

- Articulate learning goals for students, the nature of learning, and effective teaching strategies that can support specific learning goals
- · Design processes to assess what students have learned
- · Use relevant secondary literature, including research about high-impact teaching
- · Describe learning theories
- Create opportunities for learning communities
- Use and promote strategies that value diversity and positively impact classroom equity
- · Develop scholarship in teaching and learning within the context of higher education
- Leverage communities, including classrooms, institutions, departments, and the general public to impact teaching and learning

GENERAL REQUIREMENTS

Completion of the CCTP requires a total time commitment of approximately forty-five hours and can occur over the course of months or years. Options for completion are flexible and self-paced. The program requires:

1. Two terms of teaching in the Yale Teaching Fellow Program (as a teaching fellow or part-time acting instructor)

2. Completion of training and development workshops/courses (see Workshop Requirements below)

- 3. Two observations of teaching by others with written reflections
- 4. Two occasions of being observed teaching with written reflections
- 5. Participation in two learning communities

a. CCTP participants are required to participate in two learning communities that focus on teaching, as opposed to research. These groups can be as small as three to five people or much larger. They should meet at least four times.

b. Potential focuses for a learning community might include:

i. job market working groups, which can workshop teaching materials in preparation for academic job searches;

ii. disciplinary pedagogy, focused on teaching within a given field; or

iii. interdisciplinary pedagogy, focused on broad topics such as anti-racist teaching, accessibility, active learning, or STEM education.

6. Compilation of a teaching portfolio and completion of an exit interview with CTL Staff (see Teaching Portfolio below)

WORKSHOP REQUIREMENTS

Participants will complete a range of introductory and intermediate or advanced teaching workshops:

1. Introduction to Teaching, either:

a. one Fundamentals of Teaching series (participants may select the topic) or

b. one Scientific Teaching Fellows course (BBS 879 or PHYS 530)

2. Completion of eight Poorvu Center advanced/intermediate workshops (or CIRTL Network Workshops/Short Courses). Please note that the requirement regarding intermediate vs. advanced workshops was revised in fall 2022. Participants who joined the program before that term may disregard it.

a. Up to six workshops can be "intermediate" teaching workshops. Intermediate teaching workshops do not presuppose any previous engagement with the topic but will draw on topics covered in the CIRTL MOOC/Scientific Teaching Fellows Course.

b. At least two of these teaching workshops should be designated as "advanced." Participants may take as many advanced workshops as they wish.

TEACHING PORTFOLIO

The teaching portfolio requires graduate students to document the sum of their college teaching experience and articulate the unique perspective on teaching that they have acquired from it. The Portfolio also allows them to articulate their teaching experience and ability for presentation to prospective academic employers. The format we have chosen is consistent with portfolios that are often part of an application for an academic position.

The portfolio should include a range of teaching-related materials, along with annotations for each one that describe context for the course, insight into how the materials were or will be used, and any additional information that would help the reader more fully understand the decisions made in designing this course.

The portfolio should include the following materials:

- 1. Teaching statement (no annotation required)
- 2. Sample course materials, e.g., policy sheet, syllabus, test questions, handouts, rubrics, review materials, in-class activities, or lesson plans
- 3. Two newly developed syllabi
- 4. Student evaluations, if applicable
- 5. Optional: Letters of support or consultation reports from observers who may be faculty or students. This category may include letters solicited from faculty or students as well as informal emails from students or others commenting on the participant's teaching.

The portfolio should also include an account of the requirements fulfilled as part of the CCTP along with a reflective narrative. These items require no annotation.

- · A list of teaching experiences at Yale or elsewhere
- · A list of Poorvu Center workshops attended
- · A brief, one-line description of learning communities
- Documentation from observations
- A brief reflective narrative about the participant's experience in the CCTP program (one to two double-spaced pages).

FILING FOR THE AWARD OF THE CERTIFICATE

When they have fulfilled all relevant requirements, participants will complete their experience by submitting the teaching portfolio and undergoing an exit interview. The exit interview is a fifty-minute meeting with a Poorvu Center staff member. Participants spend twenty-five minutes offering reflections on the program and in the final twenty-five minutes, receive feedback on one or two items of their choice in the portfolio.

THE MCDOUGAL GRADUATE TEACHING FELLOWSHIP

Through the McDougal Graduate Teaching Fellowship, graduate students lead programs on teaching, promoting effective practices informed by pedagogical scholarship, while growing and deepening their own expertise. They work with graduate students and postdoctoral scholars from across the disciplines, while undergoing a yearlong program designed to enhance their professional development as scholars and pedagogues. Fellows who successfully complete a full year in the program receive a Certificate of College Teaching Preparation by fulfilling the following requirements:

- · attending mandatory training in May and August,
- · co-facilitating ten workshops (or the equivalent),
- · attending team meeting every two weeks (or the equivalent),
- participating in fall and spring teaching at Yale Day and the Spring Teaching Forum (or the equivalent), and
- completing classroom observations as assigned (or the equivalent).

Cowles Foundation

30 Hillhouse Avenue http://cowles.yale.edu

Director

Marina Halac

The Cowles Foundation for Research in Economics at Yale University has as its purpose the conduct and encouragement of research in economics. The Cowles Foundation seeks to foster the development and application of rigorous logical, mathematical, and statistical methods of analysis. Members of the Cowles research staff are faculty members with appointments and teaching responsibilities in the Department of Economics and other departments. Among its activities, the Cowles Foundation provides financial support for research, visiting faculty, postdoctoral fellowships, workshops, and graduate students. Cowles regularly sponsors conferences and publishes a working paper series and research monographs.

Economic Growth Center

27 Hillhouse Avenue, 203.432.3610, egc@yale.edu https://egc.yale.edu

Director

Rohini Pande

A research center based in the Yale Department of Economics, the Economic Growth Center (EGC) is Yale's hub for economics research and teaching on issues concerning lower-income countries and the advancement of their populations. It was founded in 1961 as the first research center in a major U.S. university focused on the quantitative study of lower-income economies. Additionally, it sought to provide a training ground for future development researchers and policy practitioners.

Today, EGC continues this agenda, examining not only the links between economic growth and poverty, but also how rising inequality and a changing climate affect individual well-being, especially among marginalized groups. Many research projects at EGC are conducted in collaboration with governments and other policy counterparts in developing countries, creating a direct channel through which research insights benefit the lives of millions of people. The center supports the wider research community by enabling open access to large-scale surveys conducted by its researchers. EGC aims to create channels for economic research and data-driven insights to inform and enable equitable development. It also hosts the master's degree program in International and Development Economics (IDE), which brings together a focus on development and policy that offers a pipeline to top economics Ph.D. programs and quantitative policy and research positions.

EGC's programming includes the annual Simon Kuznets Memorial Lecture, featuring prominent economists speaking on issues in economic development. The center holds weekly research seminars and co-hosts Yale Development Dialogues, a series of panel discussions that convene economists, historians, journalists, and policy makers to apply insights from history and economics to some of the most pressing policy issues confronting developing countries.

The center's faculty affiliates hold appointments in the Department of Economics and other departments and schools at Yale. Current research areas include political economy of development, economic justice and issues of gender, migration, early childhood development, environment and climate change, and the relationship between trade and development. EGC provides fellowships and research grants to graduate students and faculty, and its internship program engages Yale students in events, communications, and data analysis.

Environmental Humanities

https://environmentalhumanities.yale.edu Graduate Certificate in Environmental Humanities

Program Director Paul Sabin (316 McClellan Hall; paul.sabin@yale.edu)

Director of Graduate Studies

Kalyanakrishnan Sivaramakrishnan (10 Sachem St., Rm. 128; kalyanakrishnan.sivaramakrishnan@yale.edu)

Affiliated Faculty Sunil Amrith (History), Laura Barraclough (American Studies), Paola Bertucci (History; History of Science and Medicine), Ned Blackhawk (History; American Studies), Jill Campbell (English), Carol Carpenter (School of the Environment), Oksana Chefranova (Film and Media Studies), Susan Clark (School of the Environment), Deborah Coen (History of Science and Medicine), Edward Cooke, Jr. (History of Art), Ivano Dal Prete (History), Amity Doolittle (School of the Environment), Michael Dove (School of the Environment; Anthropology), Fabian Drixler (History), Justin Farrell (School of the Environment), Paul Freedman (History), Reinaldo Funes Monzote (Visiting; MacMillan Center), Jay Gitlin (History), John Grim (School of the Environment), Robert Harms (History), Alanna Hickey (English), Cajetan Iheka (English), Matthew Jacobson (American Studies; African American Studies; History), Paul Kennedy (History), Benedict Kiernan (History), Verlyn Klinkenborg (English; School of the Environment), Jonathan Kramnick (English), Douglas Kysar (Law School), Anthony Leiserowitz (School of the Environment), Katja Lindskog (English), J.G. Manning (Classics; History), Lisa Messeri (Anthropology), Alan Mikhail (History), Charles Musser (American Studies; Film and Media Studies; Theater Studies), John Peters (English; Film and Media Studies), Richard Prum (Ecology and Evolutionary Biology), Jennifer Raab (History of Art), Joanna Radin (History of Science and Medicine; Anthropology; History), William Rankin (History), Kristin Reynolds (School of the Environment), Carolyn Roberts (History of Science and Medicine; African American Studies), Douglas Rogers (Anthropology), Elihu Rubin (School of Architecture; American Studies), Paul Sabin (History; American Studies), Oswald Schmitz (School of the Environment; Ecology and Environmental Biology), Stuart Schwartz (History), Kalyanakrishnan Sivaramakrishnan (Anthropology; School of the Environment), Gary Tomlinson (Music; Humanities), Mary Evelyn Tucker (School of the Environment; Divinity School; Religious Studies), John Wargo (School of the Environment), Michael Warner (English; American Studies), Harvey Weiss (Near Eastern Languages and Civilizations; School of the Environment), Kenneth Winkler (Philosophy), Carl Zimmer (Adjunct; School of Medicine)

GRADUATE CERTIFICATE IN ENVIRONMENTAL HUMANITIES

Yale Environmental Humanities aims to deepen our understanding of the ways that culture is intertwined with nature and to contribute to a broad interdisciplinary conversation about humanity and the fate of the planet. Humanities scholars have an opportunity to reshape how we think about environmental problems and "the environment" itself. In turn, interdisciplinary dialogue with scientists and social scientists can stimulate the humanities in productive ways, raising new research questions and providing fresh ways to approach long-standing issues. As an interdisciplinary initiative, Yale Environmental Humanities draws particularly on faculty and courses from across the humanities departments, including American Studies, Anthropology, Comparative Literature and other literature departments, English, Film and Media Studies, History, History of Art, and Philosophy, as well as from professional schools, including Architecture, Divinity, Drama, Environment, and Public Health.

The Graduate Certificate in Environmental Humanities is available to students already enrolled in a Ph.D. program at Yale who seek to establish a strong foundation in environmental humanities topics and methodologies across the humanities disciplines. Students who complete the graduate certificate will gain skills working in interdisciplinary environmental settings and representing humanities perspectives on a broad range of environmental topics. Interested students are strongly encouraged to register for the certificate by meeting with the director of graduate studies (DGS) during their first year.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE IN ENVIRONMENTAL HUMANITIES

Students who wish to receive the certificate must complete the following course work, research, and teaching requirements:

- 1. Three approved graduate or professional school courses focusing entirely or substantially on environmental themes, broadly defined. At least one of the courses should involve approximately 50 percent of its material from outside a student's home department or discipline. In consultation with the DGS and the student's Environmental Humanities adviser (who can also be their departmental adviser), each student is expected to organize their elective courses around a concentration related to their departmental course work and doctoral research. Elective courses will be chosen from a list of the environmental humanities graduate courses that are being offered each term.
- 2. Two terms of the Environmental Humanities certificate workshop, Topics in the Environmental Humanities (HIST 963 and HIST 964). Students must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. Topics in the Environmental Humanities is a half-credit course that will be offered in both the fall and spring terms (one credit total). Academic credit from the workshop course typically does not count toward departmental course work requirements.
- 3. Students must demonstrate the capacity to pursue independent, interdisciplinary research in environmental humanities by presenting a qualifying paper at a meeting of the Environmental Humanities workshop, Graduate Research Symposium, or other approved venue.
- 4. Students must fulfill a teaching requirement by serving as a teaching fellow for an approved environmental humanities course or by completing an approved public humanities project. Other options are possible if appropriate teaching opportunities are not available.

Each of these requirements will require approval from the DGS of Environmental Humanities. Additional certificate program information, including the application

and requirements checklist for the certificate, is available on the Environmental Humanities website (https://environmentalhumanities.yale.edu) or by contacting environmentalhumanities@yale.edu.

CERTIFICATE WORKSHOP

HIST 963a and HIST 964b / ANTH 963a and ANTH 964b / HSAR 841a and HSAR 842b / HSHM 691a and HSHM 692b, Topics in the Environmental Humanities Staff

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. This course does not count toward the corrsework requirement in history. Open only to students pursuing the Graduate Certificate in Environmental Humanities. ¹/₂ Course cr per term

HIST 964b / ANTH 964b / HSAR 842b / HSHM 692b, Topics in the Environmental Humanities Paul Sabin

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. This course does not count toward the coursework requirement in history. ½ Course cr

Ethnicity, Race, and Migration

35 Broadway, Room 203, 203.432.5116 https://erm.yale.edu

Chair Ana Ramos-Zayas

Director of Graduate Studies Fatima El-Tayeb

Faculty Tarren Andrews (Ethnicity, Race, and Migration), Laura Barraclough (American Studies), Ned Blackhawk (History; American Studies), Michael Denning (American Studies; English), Fatima El-Tayeb (Ethnicity, Race and Migration; Women's, Gender, and Sexuality Studies), Roderick Ferguson (American Studies; Women's, Gender, and Sexuality Studies), Zareena Grewal (American Studies; Ethnicity Race and Migration), Leigh-Anna Hidalgo (Ethnicity, Race, and Migration), Hi'ilei Hobart (Ethnicity, Race, and Migration), Daniel Martínez HoSang (American Studies; Ethnicity, Race, and Migration), Matthew Jacobson (American Studies; African American Studies; History), Grace Kao (Sociology), Albert Laguna (American Studies; Ethnicity, Race, and Migration), Ximena López Carillo (Ethnicity, Race, and Migration), Lisa Lowe (American Studies), Mary Lui (American Studies; History), Leah Mirakhor (American Studies; Ethnicity, Race, and Migration), Gary Okihiro (Ethnicity, Race, and Migration; American Studies), Stephen Pitti (History; American Studies), Ana Ramos-Zayas (American Studies; Ethnicity, Race, and Migration; Women's, Gender, and Sexuality Studies), Alicia Schmidt Camacho (American Studies; Ethnicity, Race, and Migration), David Simon (Political Science), Quan Tran (American Studies; Ethnicity, Race, and Migration), Kalindi Vora (Ethnicity, Race and Migration; Women's, Gender, and Sexuality Studies)

GRADUATE CERTIFICATE IN ETHNICITY, RACE, AND MIGRATION

The program of Ethnicity, Race, and Migration (ER&M)provides a framework for interdisciplinary inquiry related to global race formations, indigeneity, human mobility, culture, and politics. The program draws from the long-standing fields of U.S. ethnic and Native studies, postcolonial, and subaltern studies but also represents emergent areas like queer of color critique, comparative diaspora studies, critical Muslim and critical refugee studies, race and media studies, feminist science studies, and the environmental humanities. Our concerns are both historical and of the present, and we work at various scales of analysis: (trans)local, (trans)national, (trans)regional, and global. Our approach departs from nation-centered area studies by crossing geographic and linguistic boundaries. We ask fundamental questions that have long defined the humanities and social sciences but often from the vantage point of non-state peoples, diasporas, and the minoritized. We value the social and political imaginaries of global subjects and use them to investigate sovereign power, social conflict, labor formations, and cultural production from a critical, integrative approach. We actively support public-facing and socially engaged scholarship and cultural work.

The certificate is open to doctoral students (currently FAS Ph.D. students) with a research focus related to ethnicity, race, indigeneity, and migration in line with the program's interdisciplinary and transnational framework. Students are encouraged to

apply to the certificate by meeting with the ER&M director of graduate studies (DGS) during their first year. The application form can be found on the program website.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE IN ETHNICITY, RACE, AND MIGRATION

Students who wish to receive the certificate must complete the following course work, research, and teaching requirements:

1. ER&M 700: The core seminar in Ethnicity, Race, and Migration (offered every spring term). This seminar provides an in-depth survey of historical and current research and methods in the study of race, ethnicity, indigeneity, and migration within a global and interdisciplinary framework.

2. Three electives from existing graduate-level courses. The ER&M certificate program draws from graduate courses taught by faculty members with primary or secondary appointments in ER&M. The course list may be found at the ER&M website. Courses offered by faculty without an ER&M affiliation but with relevant content must be approved by the DGS. The same elective courses may count for the student's home department's requirements and the ER&M certificate.

3. ER&M 701, Advanced Practicum in Ethnicity, Race, and Migration: This course is open to students in their third year and beyond. The seminar provides support for designing or writing the dissertation and for other professionalization matters (including publication, pedagogy, and conference presentation). Students choose to complete one of the following within the practicum:

- a. A thirty-five page essay based on original research. This paper can develop from an assignment in one of their elective courses. It can take the form of a research paper, dissertation prospectus, draft dissertation chapter, or journallength article. Students will present their paper to the ER&M community as part of this requirement.
- b. A research project that departs from the format of the traditional academic essay or thesis. This project should be based on original research and may culminate in an annotated syllabus, exhibit, webpage, documentary, or other multimedia project. Students will present their project to the ER&M community as part of this requirement.

4. Teaching: Students will complete one semester of teaching in ER&M. This can include a teaching fellowship for an ER&M course, or students may apply for the Associates in Teaching program to serve as co-instructor of a seminar with a member of the ER&M faculty. When appropriate, students may elect to complete an Opportunity for Professional Development, offered through the Graduate School of Arts and Sciences, in lieu of a standard teaching assignment. Teaching and alternate assignments will be approved by the DGS.

5. Advising: Students are expected to name a member of the ER&M faculty to their doctoral committee. This faculty member will serve as a primary adviser in ER&M at the end of coursework. Students should designate this adviser by the end of their final qualifying exam and prior to presenting the dissertation prospectus.

Further details about the certificate requirements, courses, and the application process can be found at the ER&M Program website, at https://erm.yale.edu.

Film and Media Studies

Humanities Quadrangle, 1st floor, 203.436.4668 http://filmstudies.yale.edu Graduate Certificate in Film and Media Studies

Chair Fatima Naqvi

Director of Graduate Studies John MacKay

Faculty

For faculty listings, see Film and Media Studies under Degree-Granting Departments and Programs in this bulletin.

GRADUATE CERTIFICATE IN FILM AND MEDIA STUDIES

With the world awash in moving images, the Film and Media Studies Program gives students the tools necessary to grapple with the decisive media of the past one hundred years: from film to television to the platform-agnostic digital images of today. That knowledge is critical and practical, analytic and experimental, historical and theoretical. As an interdisciplinary program, Film and Media Studies draws on a wide range of course offerings – from history of art to comparative literature, from Slavic to American studies, from music to theater studies – taught by a dedicated group of world-renowned faculty.

The Certificate in Film and Media Studies is open to students already enrolled in a Ph.D. program, a professional school, or a terminal master's degree at Yale. The aim is to provide graduate and professional students in other programs, departments, divisions, and schools with the opportunity to develop and demonstrate a degree of competence in the history and theory of film and media technologies.

Interested students are strongly encouraged to register for the certificate by meeting with the director of graduate studies (DGS) during their first year.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE IN FILM AND MEDIA STUDIES

Students who wish to receive the certificate must complete the following:

- FILM 601, Foundations of Film and Media.
- Two electives, one of which must be drawn from the FMS curriculum; the second may focus on media relevant to the student's own research interests but must be approved by the DGS of FMS.
- The FMS Certificate Workshop (FILM 605 and FILM 606), courses only offered to certificate students which will meet bi-weekly over two terms and count as one regular course credit. Students are required to present a qualifying paper demonstrating their capacity to do interdisciplinary work.
- In approved cases, FMS Certificate students may TF courses in FMS. However, there is no formal teaching requirement for the certificate program.

Each of these requirements will require approval from the DGS of FMS, the DGS of the student's degree department or school, and an FMS adviser. A plan for fulfilling the requirements will be worked out in advance, in consultation with all three of the above. A student can apply to count a course they took during their first year.

During two years of work with an interdisciplinary program of Film and Media Studies, students will develop competence in the history and theory of film and media. This may be necessary to the completion of their dissertations and to academic careers beyond Yale.

Film and Media Studies Program invites applications for the graduate certificate from students already enrolled in a Ph.D. program, professional school, or terminal master's at Yale. The number of students admitted each year will not exceed five. Applications to the certificate are due by May 15, 2024. Prospective students should send on a letter of interest to the DGS of Film and Media Studies. Information on the certificate, requirements, and application process can be found at https://filmstudies.yale.edu/graduate-certificate-film-andmedia-studies. Please send inquiries and applications to: Francesco Casetti (francesco.casetti@yale.edu), Oksana Chefranova (oksana.chefranova@yale.edu), and Katherine Kowalczyk (katherine.germano@yale.edu)

Additional certificate program information is available on the Film and Media Studies website (http://filmstudies.yale.edu). For information on the Ph.D. program in Film and Media Studies, see Film and Media Studies under Degree-Granting Departments and Programs in this bulletin.

Graduate School of Arts and Sciences (GSAS) Summer Programs

http://gsas.yale.edu

Dean

Lynn Cooley

The graduate school offers two courses to support summer training through practical internships. For the summer of 2024, students will register for these courses as part of the internship approval process and not through the usual class registration processes.

COURSES

GSAS 901c, Pre-candidacy Applied Research Experience Allegra di Bonaventura The purpose of this course is to provide students with the opportunity to gain practical experience in research. This experience provides a basis for developing a dissertation prospectus that addresses significant research questions. Students work with a faculty mentor to select a suitable placement for the summer internship. As part of the application/registration, a one-page description of the student's research plan is submitted to the DGS at least three weeks prior to starting the internship, for approval within two weeks. Upon completion of the internship, a written report of the work must be submitted to the DGS no later than October 1. Prerequisites: completion of one year of the Ph.D. program and approval of the DGS. 1 credit; graded Satisfactory/ Unsatisfactory.

GSAS 902C, Post-candidacy Applied Research Experience Allegra di Bonaventura The purpose of this course is to provide students with the opportunity to perform dissertation research or to gain practical experience using the methodology or results of their dissertation research. Students work with a faculty mentor to select a suitable placement for the summer internship. As part of the application/registration, a onepage description of the student's research plan is submitted to the student's dissertation adviser and DGS at least three weeks prior to starting the program, for approval within two weeks. Upon completion of the internship, a written report of the work must be submitted to the adviser and DGS no later than October 1. Prerequisites: completion of one year of the Ph.D. program, admission to candidacy, and approval of the dissertation adviser and DGS. 1 credit; graded Satisfactory/Unsatisfactory.

Institution for Social and Policy Studies

77 Prospect Street, 203.432.3234 http://isps.yale.edu

Director Alan Gerber

Executive Committee Steven Berry, Kerwin Charles, Ana De La O, Heather Gerken, Grace Kao, John Lafferty, Steven Wilkinson

The Institution for Social and Policy Studies (ISPS) is an interdisciplinary research center dedicated to furthering our understanding of society and sharing that knowledge to improve policy and practice.

Recognizing that important social problems cannot be studied adequately by a single discipline, the Yale Corporation established ISPS in 1968 to stimulate interdisciplinary collaboration within the university, both across the social sciences and between the social sciences and other disciplines. Over the decades, ISPS has conducted research on elections, education, criminal justice, health care, government regulation, labor, taxation, immigration, and much more. Today, ISPS maintains a broad research portfolio among its many interdisciplinary faculty affiliates.

In addition to conducting research, ISPS organizes faculty seminars, hosts and promotes collaborations among faculty fellows and postdoctoral researchers, runs fellowships to mentor undergraduate and graduate students, convenes scholars and practitioners from across the country to learn from one another, and helps sponsor an interdisciplinary undergraduate major: the Program in Ethics, Politics and Economics (EP&E).

ISPS also supports specialized study centers: the Center for the Study of American Politics (CSAP), the Interdisciplinary Center for Bioethics, the Center for the Study of Inequality, and the Data-Intensive Social Science Center. And ISPS recently launched its Democratic Innovations program, designed to identify and test new ideas for improving the quality of democratic representation and governance.

Our commitment to training students for future leadership centers around our four fellowship programs: Dahl Research Scholars, Director's Fellows, Millstone Fellows (for undergraduates), and the Graduate Policy Fellows (for graduate and professional school students). These fellowships offer students the opportunity to apply rigorous research to real-world social policy issues. In these yearlong programs, we offer the scholars biweekly workshops, mentorship, media training, and a series of policy-related skill training sessions. ISPS also runs a two-year predoctoral fellowship through CSAP and the Tobin Center for Economic Policy.

As the hub for problem-oriented interdisciplinary research at Yale, ISPS provides intellectual leadership in the social sciences; fosters sound and creative research on public policies of local, state, and national significance; and informs both teaching at Yale and academic and public debates beyond Yale.

Jewish Studies

Humanities Quadrangle, Rm. 423, 203.432.0843 http://jewishstudies.yale.edu

Chair and Director of Graduate Studies Elli Stern

Professors Joel Baden (*Divinity*), Steven Fraade (*Emeritus, Religious Studies*), Paul Franks (*Philosophy*), Christine Hayes (*Emeritus, Religious Studies*), Hannan Hever (*Comparative Literature*), Ivan Marcus (*History*; *Religious Studies*), Paul North (*German*), Maurice Samuels (*French*), David Sorkin (*History*), Elli Stern (*Religious Studies*; *History*)

Associate Professors Marci Shore (History), Jacqueline Vayntrub (Divinity)

Senior Lecturer Peter Cole (Comparative Literature)

Senior Lectors Shiri Goren (*Near Eastern Languages and Civilizations*), Dina Roginsky (*Near Eastern Languages and Civilizations*)

Lectors Josh Price (German)

Jewish Studies offers an interdisciplinary approach to the critical study of the culture, history, languages, literature, religion, and thought of the Jews. Jewish institutions, philosophies, societies, and texts are studied critically and in comparative historical perspective in relation to the surrounding societies and cultures.

Graduate-level programs are available through the following departments: Comparative Literature (Hebrew and Comparative Literature), History (Ancient, Medieval, and Modern Jewish History), Religious Studies (History and Literature of Ancient Judaism, Medieval and Modern Jewish History, Philosophy of Religion), Near Eastern Languages and Civilizations (Northwest Semitic, Hebrew Language and Literature), and Philosophy. Applications are made to a specific department, and programs of study are governed by the degree requirements of that department.

Other resources include the Judaica collection of Sterling Memorial Library and its Judaica bibliographer, the Fortunoff Archive for Holocaust Testimonies, the biweekly faculty/graduate student Jewish Studies Seminar, several lecture series, postdoctoral fellowships, and graduate fellowships in Jewish Studies.

Additional information is available on request to the director of graduate studies of the department of intended specialization, or to the Chair, Program of Jewish Studies, Yale University, PO Box 208282, New Haven CT 06520-8282, and at http://jewishstudies.yale.edu.

COURSES

For course offerings in the Hebrew language and in Israeli society and culture, see Near Eastern Languages and Civilizations.

JDST 653a / ANTH 531a / CLSS 815a / EALL 773a / HIST 502a / HSAR 564a / NELC 533a / RLST 803a, Archaia Seminar: Law and Society in China and Rome Noel Lenski and Valerie Hansen

An introduction to the legal systems of the Roman and post-Roman states and Hanand Tang-dynasty China. Emphasis on developing collaborative partnerships that foster comparative history research. Readings in surviving law codes (in the original or English translation) and secondary studies on topics including slavery, trade, crime, and family. This course serves as an Archaia Core Seminar. It is connected with Archaia's Ancient Societies Workshop (ASW), which runs a series of events throughout the academic year related to the theme of the seminar. Students enrolled in the seminar must attend all ASW events during the semester in which the seminar is offered.

JDST 695b / HEBR 563b, From Biblical to Modern Hebrew Dina Roginsky This course aims to support students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. The course concentrates on reading and aims at enabling students to use Modern Hebrew for research purposes. The texts chosen are tailored to students' particular areas of interest. Prerequisite: two years of Biblical or Modern Hebrew studies, or permission of the instructor. Conducted in English.

JDST 761a / HIST 596a / MDVL 596a / RLST 773a, Jews and the World: From the Bible through Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings.

JDST 845a / RLST 643a, The Global Right: From the French Revolution to the American Insurrection Elli Stern

This seminar explores the history of right-wing political thought from the late eighteenth century to the present, with an emphasis on the role played by religious and pagan traditions. This course seeks to answer the question, what constitutes the right? What are the central philosophical, religious, and pagan, principles of those groups associated with this designation? How have the core ideas of the right changed over time? We do this by examining primary tracts written by theologians, political philosophers, and social theorists as well as secondary literature written by scholars interrogating movements associated with the right in America, Europe, Middle East, and Asia. Though touching on specific national political parties, institutions, and think tanks, its focus is on mapping the intellectual overlap and differences between various right-wing ideologies. While the course is limited to the modern period, it adopts a global perspective to better understand the full scope of right-wing politics.

Leadership and Research Management for Physician-Scientists

M.D.-Ph.D. Program Edward S. Harkness Hall, Rm. D317, 203.737.5613 https://medicine.yale.edu/mdphd/education/cert-physician-scientists

Director

Barbara Kazmierczak

GRADUATE CERTIFICATE IN LEADERSHIP AND RESEARCH MANAGEMENT FOR PHYSICIAN-SCIENTISTS

One part of the Yale M.D./Ph.D. joint-degree program's mission is to develop skills in our trainees that are associated with success in a broad range of physician-scientist research careers through experiential learning. The Certificate in Leadership and Research Management for Physician-Scientists was developed to provide formal training in the skills necessary for effective leadership and management of research and clinical teams. We realize that many of these skills also help our students during their M.D. and Ph.D. training period, and we therefore think it is critical that our students learn and practice these skills early in training. Although many of our students already engage in some of these training and experiential activities, the certificate allows us to evaluate and recognize their mastery of these specific skills.

REQUIREMENTS OF THE CERTIFICATE PROGRAM

Modules 1–4 are required of all M.D./Ph.D. students. Module 1: Mentoring will be offered in late spring/early summer and should be taken by students prior to the experience of mentoring a junior trainee. Module 2: Proposal Development will be offered in the summer/fall and should be taken by students in year three, when they are also qualifying. Module 3: Teaching should be taken by students prior to their Teaching Fellow service. Module 4: Anti-Racism and Inclusivity is offered every spring and should be taken by students in year four or five during their Ph.D. training.

Students will also be required to complete at least one of the four optional modules (Module 5: Communication; Module 6: Leadership and Teamwork; Module 7: Self-Management; Module 8: Nuts and Bolts of Research Management) during the course of their training. The optional modules will be offered every other year, allowing students to complete the workshops during their M.D./Ph.D. training period.

Each module includes an experiential project that must be completed as part of the certificate program. Students who complete all eight modules will receive a Certificate in Leadership and Research Management for Physician-Scientists.

Additional certificate program information is available on the M.D./Ph.D. program website: https://medicine.yale.edu/mdphd/education/cert-physician-scientists.

The Whitney and Betty MacMillan Center for International and Area Studies at Yale

Luce Hall, 203.432.0694 http://macmillan.yale.edu

Director

Steven Wilkinson (Political Science)

For more than eighty-five years, the Whitney and Betty MacMillan Center for International and Area Studies at Yale and its precursors have served as the university's focal point for teaching and research on cultures, languages, societies, institutions, and practices around the world. The MacMillan Center seeks to make understanding the world outside the borders of the United States an integral part of liberal education and professional training at the university. It brings together scholars from all relevant schools and departments to provide insightful interdisciplinary, comparative, and problem-oriented teaching and research on regional, international, and global issues.

The MacMillan Center administers nine degree programs. The six undergraduate majors include African Studies; East Asian Studies; Latin American Studies; Modern Middle East Studies; Russian and East European Studies; and South Asian Studies. The three graduate degree programs award master's degrees in African Studies, East Asian Studies, and European and Russian Studies. There are joint-degree graduate programs with the schools of the Environment, Law, Management, and Public Health. Additionally, the programs offer four graduate certificates of concentration: in African Studies, European Studies, Latin American and Iberian Studies, and Modern Middle East Studies.

The many councils, committees, and programs at the MacMillan Center support research and teaching across departments and professions, support doctoral training, advise students at all levels, and provide extracurricular learning opportunities, as well as funding resources for student and faculty research related to their regions and subject areas. Regional studies programs include African Studies; Arabic Program; Baltic Studies; Buddhist Studies; Canadian Studies; East Asian Studies; European Studies; Stavros Niarchos Foundation Center for Hellenic Studies; Iranian Studies; Japan at the Crossroads Project; Latin American and Iberian Studies; Middle East Studies; Project on Religious Freedom and Society in Africa; Russian, East European, and Eurasian Studies; South Asian Studies; and Southeast Asia Studies. Comparative and international programs include Agrarian Studies; Center for the Study of Globalization; Center for the Study of Representative Institutions; Conflict, Resilience, and Health Program; European Union Studies; Genocide Studies; Geographically based Economic Data Project (G-Econ); Gilder Lehrman Center for the Study of Slavery, Resistance, and Abolition; Center for Historical Enquiry and the Social Sciences (CHESS); Yale Research Initiative on Innovation and Scale (Y-RISE); InterAsia Initiative; Georg Walter Leitner Program in International and Comparative Political Economy; Program on Peace and Development; Program on Refugees, Forced Displacement, and Humanitarian Responses; and Translation Initiative.

The MacMillan Center's regional councils regularly teach all levels of eight foreign languages (Modern Greek, Hindi, Indonesian, Sanskrit, Swahili, Vietnamese, Yorùbá, Zulu). Additionally, the MacMillan Center collaborates with the Center for Language Study (CLS) in supporting Directed Independent Language Study of more than sixty languages for undergraduate, graduate, and professional school students. Regional councils and language faculty participate actively in the Cornell, Columbia, and Yale Shared Course Initiative led by CLS, using distance learning technology for less commonly taught languages.

The MacMillan Center provides opportunities for scholarly research and intellectual innovation; awards nearly 500 fellowships and grants each year to students and faculty; encourages faculty/student interchange; sponsors some 800 lectures, conferences, workshops, seminars, and films each year (most of which are free and open to the public); produces a range of working papers and other academic publications; and contributes to library collections comprising 1.4 million volumes in the languages of various areas. The MacMillan Center is home to the Fox International Fellowship, a graduate student exchange program between Yale University and twenty world-renowned academic partners. The MacMillan Center supports *The MacMillan Report*, an online show that features Yale faculty in international and area studies and their research in a one-on-one interview format. Shows can be viewed at http://macmillanreport.yale.edu.

For details on degrees, programs, and faculty leadership, please consult http://macmillan.yale.edu.

- · Council on African Studies
- Council on East Asian Studies
- European Studies Council
- · Council on Latin American and Iberian Studies
- · Council on Middle East Studies
- · South Asian Studies Council
- Council on Southeast Asia Studies

GRADUATE CERTIFICATES OF CONCENTRATION IN AREA STUDIES

General Guidelines – Program Description

The Whitney and Betty MacMillan Center for International and Area Studies at Yale, through the regional councils on African Studies, European Studies, Latin American and Iberian Studies, and Middle East Studies, sponsors graduate certificates of concentration that students may pursue in conjunction with graduate-degree programs in the Graduate School of Arts and Sciences and the professional schools. The certificate is intended for students seeking to demonstrate substantial preparation in the study of one of four areas of concentration: Africa, Europe, Latin America, and the Middle East.

Candidates for the certificate must demonstrate expertise in the area of concentration through their major graduate or professional field, as well as show command of the diverse interdisciplinary, geographic, and cultural-linguistic approaches associated with expertise in the area of concentration. Admission to the graduate certificate is contingent on the candidate's acceptance into a Yale graduate-degree program. Award of the graduate certificate, beyond fulfilling the relevant requirements, is contingent on the successful completion of the candidate's Yale University degree program.

Application Procedure

Specific requirements of each council are reflected in its application, monitoring, and award procedures. Application forms can be picked up at the relevant council or downloaded from its website. Prospective students should submit a completed application form to the relevant council.

Applications may be submitted by students admitted to a graduate program at Yale or during their program of study but no later than the beginning of the penultimate term of study. Each council may set limits on the number of candidates for its program in any given year. For further information, see the council administrator.

General Requirements

While the general requirements are consistent across all councils of the MacMillan Center, the specific requirements of each council may vary according to the different expertise required for its area of concentration. In addition to the specific requirements, students pursuing the certificate are expected to be actively engaged in the relevant council's intellectual community and to be regular participants at its events, speaker series, and other activities. Serious study, research, and/or work experience overseas in the relevant region is highly valued.

COURSEWORK

Students must complete a total of six courses focused on the area from at least two different fields, including a Foundations Course if designated by the council. Of the remaining five courses, only two may be "directed readings" or "independent study." Please note:

- No more than four courses may count from any one discipline or school.
- Courses from the home field of the student are eligible. Courses may count toward the student's degree as well as toward the certificate.
- Literature courses at the graduate level may count toward the six-course requirement, but elementary or intermediate language courses may not. At the discretion of the faculty adviser, an advanced language course at the graduate level may be counted if it is taught with substantial use of field materials such as literature, history, or social science texts and journals relevant to the area.
- Coursework must demonstrate broad comparative knowledge of the region rather than focus on a specific country.
- Coursework must demonstrate a grasp of the larger thematic concerns affecting the region, such as environment, migration, or global financial movements.
- Only those courses listed on the Graduate Course Listings provided by the area council may be used to fulfill course requirements. For courses not listed there, please consult the certificate adviser. Non-listed courses may only be counted with prior approval of the council adviser, not after the fact.
- A minimum grade of HP must be obtained or the course will not be counted toward the certificate.

• Only coursework taken during the degree program at Yale may be counted toward the certificate.

LANGUAGE PROFICIENCY

Language proficiency in at least one language relevant to the area of concentration beyond proficiency in English is required. (For some councils and for some individual circumstances, proficiency in two languages beyond English is required.) In the major-area language targeted for meeting the proficiency requirement, students must demonstrate the equivalent ability of two years of language study at Yale with a grade of B+ or better. Language proficiency must encompass reading, writing, speaking, and listening skills plus grammar. Students may demonstrate proficiency by completing coursework, by testing at Yale, or by other means as approved by the council adviser. When a second major language of the region beyond English is required, the relevant council will specify the target level. The typical departmental graduate reading exam is not sufficient for certifying the four-skill language requirement of the certificate.

Normally, a candidate who is a native speaker of one of the area's major languages will be expected to develop language proficiency in a second major-area language.

INTERDISCIPLINARY RESEARCH PAPER

A qualifying research paper is required to demonstrate field-specific research ability focused on the area of concentration. After they have completed substantial coursework in the area of concentration, students must seek approval from the council faculty adviser for the research project they propose as the qualifying paper. Normally, students will submit their request no later than the fourth week of the term in which they plan to submit the qualifying paper.

The interdisciplinary research paper may be the result of original research conducted under the supervision of a faculty member in a graduate seminar or independent readings course or in field research related to the student's studies. An M.A. thesis, Ph.D. prospectus, or dissertation may also be acceptable if it is interdisciplinary as well as focused on the area of concentration. The qualifying paper should examine questions concerning the area of concentration in a comparative and/or interdisciplinary context. It should also use relevant international and area-focused resource materials from a relevant region and/or resource materials in the language(s) of a relevant region or regions. Normally the paper should incorporate at least two of the following elements:

- · Address more than one country relevant to the area of concentration
- Draw on more than one disciplinary field for questions or analytic approaches
- · Address a transregional or transnational theme relevant to the area of concentration

The paper will be read by two faculty members selected in agreement with the council adviser. The readers will be evaluating the paper for the quality of research, knowledge of the relevant literature, and depth of analysis of the topic. The qualifying paper must be fully footnoted and have a complete bibliography. The council adviser may call for a third reader as circumstances warrant.

Progress Reports and Filing for the Award of the Certificate

Students should submit a progress report along with a copy of their unofficial transcript to the council faculty adviser at the end of each term. Ideally, this will include a brief

narrative describing the student's engagement in the relevant council's intellectual community and participation in its events, speaker series, and the like, as well as any planned or newly completed experience overseas.

A student who intends to file for the final award of the certificate should contact the council no later than the end of the term prior to award. No later than the fourth week of the term of the expected award, candidates should demonstrate how they have or will have completed all the requirements on time.

At the end of the term as grades are finalized, the council will confirm that the candidate is cleared to receive the home degree and has fulfilled all the requirements of the certificate. The final award will require review and clearance by the deputy director of the MacMillan Center.

Pursuit of Two Certificates

No courses may overlap between the two certificates. Any application for two certificates by a single student must robustly fulfill all of the requirements for each of the two certificates. Each certificate must be approved independently by each respective council's certificate adviser.

In addition to the approval of both council advisers, any award of two certificates will require review and approval by the deputy director of the MacMillan Center.

Council on African Studies

The MacMillan Center 137 Rosenkranz Hall, 203.432.1425 http://african.macmillan.yale.edu Graduate Certificate of Concentration in African Studies

Chair

Stephanie Newell (English)

Faculty

For faculty listings, see African Studies under Degree-Granting Departments and Programs in this bulletin.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE OF CONCENTRATION IN AFRICAN STUDIES

The Graduate Certificate of Concentration in African Studies enables graduate and professional school students in fields other than African Studies to demonstrate interdisciplinary area expertise, language proficiency, and research competence in African Studies. The certificate program is intended to complement existing fields of studies in other M.A. and Ph.D. programs and to provide the equivalent of such specialization for students in departments and schools without Africa-related fields of study. The certificate program is designed to be completed within the time span of a normal Ph.D. residence. Professional school students and M.A. students in the graduate school may require an additional term of registration to complete the certificate requirements depending on the requirements of specific programs.

The certificate program includes interdisciplinary course work, language study, and research components. The specific requirements are:

- Successful completion of at least six courses in African Studies from at least two departments or schools, one of which is a core course in African Studies (AFST 505, Gateway to Africa; AFST 764, Topics in African Studies; or other foundational course approved by the director of graduate studies [DGS] for African Studies).
- 2. Demonstration of proficiency in an African language.
- 3. Evidence of research expertise in African Studies. Research expertise may be demonstrated by completion of an interdisciplinary thesis, dissertation prospectus, or dissertation, or by completion of a substantive research seminar paper or the equivalent as approved by the faculty adviser.

The certificate courses and research work should be planned to demonstrate clearly fulfillment of the goals of the certificate. Certificate candidates should design their course schedules in consultation with the DGS for African Studies. Ideally, students should declare their intention to complete the certificate requirements early in their program at Yale. Graduate- and professional-school students who intend to complete the certificate program must declare their intention to do so no later than during their penultimate term of enrollment.

COURSES

For course listings, see African Studies under Degree-Granting Departments and Programs in this bulletin.

Council on East Asian Studies

The MacMillan Center 320 Luce Hall, 203.432.3426 http://ceas.yale.edu

Faculty

For faculty listings, see East Asian Studies under Degree-Granting Departments and Programs in this bulletin.

The Council on East Asian Studies (CEAS) was founded in 1961 and continues a long tradition of East Asian Studies at Yale. CEAS provides an important forum for academic exploration and support related to the study of China, Japan, and Korea. Its mission is to facilitate the training of undergraduate and graduate students and to foster outstanding education, research, and intellectual exchange about East Asia. For over sixty years, it has promoted education about East Asia both in the Yale curriculum and through lectures, workshops, conferences, film series, cultural events, and other activities open to students, faculty, and the general public. With more than twentyfive core faculty and twenty language instructors spanning twelve departments on campus, East Asian Studies remains one of Yale's most extensive area studies programs. Its interdisciplinary emphasis encourages collaborative linkages across fields and departments and contributes to diversity across the curriculum and in the classroom. Approximately one hundred fifty courses on East Asia in the humanities and social sciences are offered each year.

CEAS administers Bachelor of Arts (B.A.) and Master of Arts (M.A.) programs. While the B.A. program focuses on the study of either a country or an area within East Asia, the M.A. program focuses on the study of China, Japan, Korea, or a transnational region in East Asia. Graduates of the East Asian Studies B.A. and M.A. programs have gone on to distinguished careers in the fields of academia, business, nonprofit organizations, and government service. For details on the M.A. program, see East Asian Studies under Degree-Granting Departments and Programs in this bulletin.

East Asian Studies endowments make it possible for CEAS to offer grants and fellowships for Yale students conducting East Asian-related research and language study, as well as to support student organization programming and conferences.

Every year, CEAS welcomes domestic and international scholars to campus as guest lecturers, visiting fellows, research scholars, and professors. In 1999 the council initiated the CEAS Postdoctoral Associates Program, bringing talented individuals into the community of scholars at Yale to conduct research and teach advanced undergraduate seminars.

Study and research in East Asian Studies at Yale are supported by one of the finest library collections in the country. The Chinese-, Japanese-, and Korean-language print resources in the East Asia Library at Sterling Memorial Library constitute one of the oldest and largest collections found outside of East Asia. The Asian art collections at the Yale University Art Gallery also support classroom instruction, faculty research, and community outreach activities.

COURSES

For course listings, see East Asian Studies under Degree-Granting Departments and Programs in this bulletin.

European Studies Council

The MacMillan Center 242 Luce Hall, 203.432.3107 http://europeanstudies.macmillan.yale.edu Graduate Certificate of Concentration in European and Russian Studies

Acting Chair Fatima Naqvi (German; Film and Media Studies)

Director of Graduate Studies Claire Roosien (*Slavic Languages and Literatures*)

Faculty and Participating Staff

For faculty listings, see European and Russian Studies under Degree-Granting Departments and Programs in this bulletin.

The European Studies Council at the MacMillan Center promotes innovative research on Europe's past and present in the context of regional and global interactions. The council collaborates with schools and departments throughout Yale to support faculty, students, and visiting scholars by sharing their interdisciplinary expertise on European affairs with the broader public. The council aims to foster a wider understanding of Europe as both a place and an idea, reflecting the evolving nature of the region and its network of connections throughout the world.

The European Studies Council formulates and implements new curricular and research programs reflective of current developments in Europe. The geographical scope of the council's activities extends from Ireland to the lands of the former Soviet Union (Russia, Ukraine, Belarus, the Caucasus, and central Asia). Its definition represents a concept of Europe that transcends the conventional divisions into Western, Central, and Eastern Europe, and is understood to include the Balkans and Russia. The U.S. Department of Education has repeatedly designated the council a National Resource Center and a FLAS Center under its HEA Title VI program.

The European Studies Council builds on existing programmatic strengths at Yale, while serving as a catalyst for the development of new initiatives. Yale's current resources in European studies are vast and include the activities of many members of the faculty who have teaching and research specialties in the area. Such departments as Comparative Literature, Economics, History, History of Art, Political Science, and Sociology regularly offer courses with a European focus. These are complemented by the rich offerings and faculty strength of the French, German, Italian Studies, Slavic Languages and Literatures, and Spanish and Portuguese departments, as well as the European resources available in the professional schools and other programs, such as Film and Media Studies. By coordinating Yale's existing resources, including those in the professional schools, encouraging individual and group research, and promoting an integrated comparative curriculum and degree programs, the council strongly supports the disciplinary and interdisciplinary study of European regions and their interactions. The council is also home to special programs in European Union Studies; Baltic Studies; Hellenic Studies, offering instruction in Modern Greek language, literature, history, and culture; and Russian, East European, and Eurasian Studies.

In addition to the M.A. degree program, the council offers students in the University's doctoral and other professional degree programs the chance to obtain a Graduate Certificate of Concentration in European and Russian Studies by fulfilling a supplementary curriculum. The undergraduate major in Russian, East European, and Eurasian Studies is administered by the Department of Slavic Languages and Literatures.

The benefits provided to the Yale community by the European Studies Council include its affiliation with interuniversity and international organizations that can offer specialized training programs and research grants for graduate students (see https://yale.communityforce.com/Funds/Search.aspx), support conferences among European and North American scholars, and subsidize European visitors to Yale. The Fox International Fellowship Program, for example, offers generous fellowship support to qualified students who undertake research at specified institutions in the United Kingdom, Germany, France, and Russia; and the Geneva Exchange supports Yale doctoral students who wish to study at the Graduate Institute of International and Development Studies in Geneva, Switzerland. Furthermore, the council supplements the regular Yale curriculum with film series, lectures, and seminars by eminent scholars, artists, diplomats, and political officials. The European Studies Council constantly expands its formal connections with a variety of European institutions and regularly hosts a European Union Fellow sponsored by the European Commission.

FIELDS OF STUDY

European and Eurasian languages and literatures; economics; history; journalism; policy; political science; law; music; sociology and other social sciences.

GRADUATE CERTIFICATE OF CONCENTRATION IN EUROPEAN AND RUSSIAN STUDIES

Yale graduate students may pursue the Graduate Certificate of Concentration in European and Russian Studies in conjunction with graduate-degree programs in the Graduate School of Arts and Sciences and the professional schools. Candidates will choose to focus on one of two areas of concentration, either (1) Russia, East Europe, Eurasia or (2) West and Central Europe. Admission is contingent on the candidate's acceptance and matriculation into a Yale graduate-degree program. To complete the certificate, candidates must demonstrate expertise in the area through their major graduate or professional field, as well as show command of the diverse interdisciplinary, geographic, and cultural-linguistic approaches associated with expertise in the area of concentration. In order to be awarded the certificate, candidates need to fulfill all requirements detailed below, as well as complete their Yale University graduate degree program.

Certificate candidates must comply with the general requirements for all MacMillan Center graduate certificates, as described at http://macmillan.yale.edu/academic-programs/graduate-certificate-concentration.

Additional Requirements Specific to European and Russian Studies

1. Minimum L4 language proficiency in one modern European or Eurasian language, in addition to English. Students wishing to focus on Russia, East Europe, and
Eurasia must demonstrate knowledge of Russian, an East European, or an Eurasian language; those focusing on West and Central Europe must demonstrate knowledge of one of the appropriate languages. Students must demonstrate proficiency in oral (speaking/listening), reading, and writing skills.

- 2. Six graduate-level courses in the area of concentration, of which:
 - a. Three courses must offer transnational approaches to Europe and Eurasianrelated issues
 - b. For students focusing on Russia, East Europe and Eurasia, at least one of the remaining three courses must concern the nations of West and Central Europe. For those focusing on West and Central Europe, at least one of the remaining three courses must concern Russia, East Europe, and Eurasia.
- 3. Research paper: Evidence of research expertise in European and Russian studies. Research expertise may be demonstrated by completion of an interdisciplinary thesis, dissertation prospectus, or dissertation, or by completion of a substantive research seminar paper or the equivalent as approved by the faculty advisor.
- 4. Progress reports: Students should submit a progress report along with a copy of their unofficial transcript to the council faculty adviser at the end of each term. Ideally, this will include a brief narrative on engagement in the relevant council's activities and planned or newly completed experience overseas in the relevant region.
- 5. Filing for the award of the graduate certificate of concentration: Students who intend to file for the final award of the certificate should contact the council no later than the end of the term prior to award. No later than the fourth week of the term of the expected award, students should demonstrate how they have or will have completed all the requirements in a timely fashion. At the end of the term as grades are finalized, the council will confirm that the student is cleared to receive the home degree and has fulfilled all the requirements of the certificate. Students may elect to retrieve the certificate award in person from the council after commencement. Otherwise, the council will email the certificate award to the student after commencement.

COURSES

For course listings, see European and Russian Studies under Degree-Granting Departments and Programs in this bulletin.

For more information, contact the European Studies Council, Yale University, PO Box 208206, New Haven CT 06520-8206; european.studies@yale.edu; 203.432.3107.

Council on Latin American and Iberian Studies

The MacMillan Center 232 Luce Hall, 203.432.3420 http://clais.macmillan.yale.edu Graduate Certificate of Concentration in Latin American and Iberian Studies

Chair

Claudia Valeggia (Anthropology)

Professors Ned Blackhawk (History; American Studies), Richard Burger (Anthropology), Enrique De La Cruz (Molecular Biophysics & Biochemistry), Robert Dubrow (Epidemiology), Carlos Eire (History; Religious Studies), Eduardo Fernandez-Duque (Anthropology), Paul Freedman (History), Aníbal González-Pérez (Spanish & Portuguese), Greg Grandin (History), K. David Jackson (Spanish & Portuguese), Alan Kazdin (Psychology), Albert Ko (Epidemiology; Internal Medicine), Daniel Markovits (Law), Catherine Panter-Brick (Anthropology; Global Affairs), Stephen Pitti (History), Claire Priest (Law), Cristina Rodríguez (Law), Carla Rothlin (Immunobiology; Pharmacology), Alicia Schmidt Camacho (American Studies), Stuart Schwartz (History), Claudia Valeggia (Anthropology), Noël Valis (Spanish and Portuguese), Elisabeth Wood (Political Science), Gilbert Joseph (History)

Associate Professors Oswaldo Chinchilla Mazariegos (*Anthropology*), Ana De La O Torres (*Political Science*), Marcela Echeverri Muñoz (*History*), Anne Eller (*History*), Moira Fradinger (*Comparative Literature*), Cécile Fromont (*History of Art*), Albert Laguna (*American Studies*), Michael Murrell (*Biomedical Engineering*), Patricia Ryan-Krause (*Nursing*)

Assistant Professors Didac Queralt (*Political Science*), Emily Sellars (*Political Science*), Erika Valdivieso (*Classics*)

Senior Lectors and Lectors (Spanish and Portuguese) Sybil Alexandrov, María Pilar Asensio-Manrique, Mercedes Carreras, Ame Cividanes, Sebastián Díaz, María Jordán, Rosamaría León, Juliana Ramos-Ruano, Lissette Reymundi, Lourdes Sabé Colom, Terry Seymour, Margherita Tortora

Affiliated Faculty Jane Edwards (Yale College), María José Hierro Hernández (Political Science), Jana Krentz (Yale University Library), Florencia Montagnini (School of the Environment), Maria Saez Marti (Economics)

A variety of Latin American Studies options are available for graduate students in history and other humanities disciplines, the social sciences, and the professional schools. Latin American area course offerings are available in twenty-five disciplines with distinct strengths in Anthropology, History, Political Science, and Spanish and Portuguese. Latin Americanist faculty specialize in the Andes (Burger, Valdivieso), Argentina (Valeggia), Brazil (Jackson, Ko, Ryan-Krause, Schwartz), the Caribbean (Echeverri Muñoz, Eller), Central America (Chinchilla, Grandin, Ryan-Krause, Wood), Colombia (Echeverri Muñoz), Cuba (Laguna), Mexico (Canales, De La O Torres, Pitti, Schmidt Camacho, Sellars), and the Southern Cone (Fradinger). School of the Environment faculty (Ashton, Bell, Berlyn, Clark, Dove, Geballe, Gentry, Mendelsohn, Montagnini) have tropical research interests or participate in educational exchanges with Argentina, Brazil, Chile, Costa Rica, Dominica, Ecuador, Haiti, Honduras, Mexico, Nicaragua, Panama, Peru, and Venezuela. Latin American content courses are also offered in the Schools of Law, Management, and Public Health.

Students may pursue the Graduate Certificate of Concentration in Latin American and Iberian Studies in conjunction with graduate degree programs in the Graduate School of Arts and Sciences and the professional schools. To complete the certificate, candidates must demonstrate expertise in the area through their major graduate or professional field, as well as show command of the diverse interdisciplinary, geographic, cultural, and linguistic approaches associated with expertise in Latin America or Iberia.

Admission is contingent on the candidate's acceptance into a Yale graduate degree program, and award of the certificate, beyond fulfilling the relevant requirements, requires the successful completion of the candidate's Yale University degree program. Active participation in the council's extracurricular and research programs and seminars is also strongly encouraged.

Financial resources, such as CLAIS Summer Research grants, are available to graduate and professional school students for summer research. Information on grants is available at https://yale.communityforce.com/Funds/Search.aspx.

SPECIFIC REQUIREMENTS FOR THE GRADUATE CERTIFICATE OF CONCENTRATION

Language Proficiency The equivalent of two years' study of one language and one year of the other, normally Spanish and Portuguese. Less frequently taught languages, such as Nahuatl, Quechua, or Haitian Creole, may also be considered for meeting this requirement.

Coursework Six graduate courses in at least two different disciplines. No more than four courses may count in any one discipline.

Geographical and Disciplinary Coverage At least two countries and two languages must be included in the course work or thesis.

Research A major graduate course research paper or thesis that demonstrates the ability to use field resources, ideally in one or more languages of the region, normally with a focus on a comparative or regional topic rather than a single country.

The certificate adviser of the Council on Latin American and Iberian Studies will assist graduate students in designing a balanced and coordinated curriculum. The council will provide course lists and other useful materials.

ACADEMIC RESOURCES OF THE COUNCIL

The council supplements the graduate curriculum with annual speaker and film series, special seminars, and conferences that bring visiting scholars and experts to campus. The council also serves as a communications and information center for a vast variety of enriching events in Latin American studies sponsored by other departments, schools, and independent groups at Yale. It is a link between Yale and Latin American centers in other universities, and between Yale and educational programs in Latin America and Iberia.

The Latin American Collection of the university library has approximately 630,000 volumes printed in Latin America, plus newspapers and microfilms, CD-ROMs, films, sound recordings, and maps. The library's Latin American Manuscript Collection is one of the finest in the United States for unpublished documents for the study of Latin American history. Having the oldest among the major Latin American collections in the United States, Yale offers research opportunities unavailable elsewhere.

For more information on the Graduate Certificate, contact the Council on Latin American and Iberian Studies, Yale University, PO Box 208206, New Haven CT 06520-8206; latin.america@yale.edu; 203.432.3420.

Council on Middle East Studies

The MacMillan Center 346 Rosenkranz Hall, 203.436.2553 http://cmes.macmillan.yale.edu Graduate Certificate of Concentration in Modern Middle East Studies

Chair

Marcia Inhorn (Anthropology)

Professors Abbas Amanat (Emeritus; History), Harold Attridge (Emeritus; Divinity), Gerhard Bowering (Emeritus; Religious Studies), John J. Collins (Emeritus; Divinity), John Darnell (Near Eastern Languages and Civilizations), Stephen Davis (Religious Studies), Owen Fiss (Emeritus; Law), Steven Fraade (Religious Studies), Eckart Frahm (Near Eastern Languages and Civilizations), Frank Griffel (Religious Studies), Dimitri Gutas (Emeritus; Near Eastern Languages and Civilizations), Christine Hayes (Religious Studies), Hannan Hever (Comparative Literature), Frank Hole (Emeritus; Anthropology), Marcia Inhorn (Anthropology), Anthony Kronman (Law), J.G. Manning (Classics), Ivan Marcus (History), Alan Mikhail (History), A. Mushfiq Mobarak (School of Management), Nadine Moeller (Near Eastern Languages and Civilizations), Robert Nelson (Emeritus; History of Art), Catherine Panter-Brick (Anthropology), Kishwar Rizvi (History of Art), Maurice Samuels (French), Shawkat Toorawa (Near Eastern Languages and Civilizations), Kevin van Bladel (Near Eastern Languages and Civilizations), Harvey Weiss (Near Eastern Languages and Civilizations), Robert Wilson (Emeritus; Religious Studies)

Associate Professors Thomas Connolly (French), Robyn Creswell (Comparative Literature), Hussein Fancy (History), Zareena Grewal (American Studies), Kaveh Khoshnood (Public Health), Hani Mowafi (Emergency Medicine), Jonathan Wyrtzen (Sociology), Travis Zadeh (Religious Studies)

Assistant Professors Supriya Gandhi (*Religious Studies*), Samuel Hodgkin (*Comparative Literature*), Jill Jarvis (*French*), Salma Mousa (*Political Science*), Elizabeth Nugent (*Political Science*), Eda Pepi (*Women's, Gender, and Sexuality Studies*), Claire Roosien (*Slavic Languages and Literatures*), Evren Savci (*Women's, Gender, and Sexuality Studies*)

Senior Lecturers and Lecturers Leslie Gross-Wyrtzen, Tolga Köker (*Economics*), Nicholas Lotito (*Political Science*), Emma Sky (*Global Affairs*), Kathryn Slanski (*Near Eastern Languages and Civilizations*)

Senior Lectors (I, II) and Lectors Sarab Al Ani (*Arabic*), Muhammad Aziz (*Arabic*), Jonas Elbousty (*Arabic*), Ozgen Felek (*Turkish*), Shiri Goren (*Hebrew*), Randa Muhammed (*Arabic*), Dina Roginsky (*Hebrew*), Farkhondeh Shayesteh (*Persian*), Ezgi Yalcin (*Turkish*), Orit Yeret (*Hebrew*)

Librarians and Curators Roberta Dougherty (*Near East Collection*), Konstanze Kunst (*Judaica Collection*), Agnete Wisti Lassen (*Babylonian Collection*), Susan Matheson (*Ancient Art, Yale Art Gallery*)

The Council on Middle East Studies is part of the Whitney and Betty MacMillan Center for International and Area Studies. The council brings together faculty and students sharing an interest in the Middle East by sponsoring conferences, discussions, films, and lecture series by scholars from Yale as well as visiting scholars. It provides information concerning grants, fellowships, research programs, and foreign study opportunities. It also administers research projects in a variety of Middle East-related areas.

In addition to the resources of the individual departments, Yale's library system has much to offer the student interested in Middle East studies. Of particular note are the collections of Arabic and Persian manuscripts, as well as large holdings on the medieval and modern Middle East.

The Council on Middle East Studies administers the Middle East Studies National Resource Center at Yale, which is funded by the U.S. Department of Education under HEA Title VI. As a National Resource Center, the council supports a number of projects and activities and an extensive outreach program.

The council also offers a Graduate Certificate of Concentration in Modern Middle East Studies. Students with an interest in the Middle East should first apply to one of the University's degree-granting departments, such as Anthropology, History, Linguistics, Near Eastern Languages and Civilizations, Political Science, Religious Studies, or Sociology, and then apply for the graduate certificate of concentration no later than the beginning of their penultimate term of study.

GRADUATE CERTIFICATE OF CONCENTRATION IN MODERN MIDDLE EAST STUDIES

The certificate represents acknowledgment of substantial preparation in Middle East studies, both in the student's major graduate or professional field and also in terms of the disciplinary and geographical diversity required by the council for recognized competency in the field of Middle East studies. As language and culture are the core of the area studies concept, students are required to attain or demonstrate language proficiency.

Requirements

- 1. Language proficiency: At least two years of successful study at the college level (or the equivalent) in one of the four major modern languages of the Middle East: Arabic, Hebrew, Persian, and Turkish.
- 2. Course work: A total of six courses in at least two disciplines on the Middle East and related issues. All courses must be completed with a passing grade.
- 3. Interdisciplinary research paper: A qualifying research paper that demonstrates field-specific research ability focused on the area of concentration. After having completed substantial course work in the area of concentration, students must seek approval from the council faculty adviser for the research project they propose as the qualifying paper. Normally, students submit their request no later than the fourth week of the term in which they plan to submit the qualifying paper.

For more information on the Graduate Certificate and inquiries about Middle East Studies, contact the Council on Middle East Studies, Yale University, PO Box 208206, New Haven CT 06520-8206; cristin.siebert@yale.edu.

South Asian Studies Council

The MacMillan Center 210 Luce Hall, 203.436.3517 http://southasia.macmillan.yale.edu

Chair Sunil Amrith (*History*)

Professors Sunil Amrith (*History*), Tim Barringer (*History of Art*), Veneeta Dayal (*Linguistics*), Michael Dove (*School of the Environment*), Robert Jensen (*School of Management*), Alan Mikhail (*History*), A. Mushfiq Mobarak (*School of Management*), Kaivan Munshi (*Economics*), Rohini Pande (*Economics*), Kishwar Rizvi (*History of Art*), Karen Seto (*School of the Environment*), Kalyanakrishnan Sivaramakrishnan (*Anthropology*), Kalindi Vohra (*Women's, Gender, and Sexuality Studies; Ethnicity, Race, and Migration*), Steven Wilkinson (*Political Science*)

Associate Professors Rohit De (History), Nihal DeLanerolle (School of Medicine), Mayur Desai (Public Health), Zareena Grewal (American Studies; Religious Studies)

Assistant Professors Anthony Acciavatti (Architecture), Supriya Gandhi (Religious Studies), Sonam Kachru (Religious Studies), Priyasha Mukhopadhyay (English), Ameera Nimjee (Music), Madiha Tahir (American Studies)

Senior Lecturer Carol Carpenter (School of the Environment)

Lecturer Jane Lynch (*Anthropology*), Jane Mikkelson (*Near Eastern Languages and Civilizations*)

Senior Lector Swapna Sharma (Hindi), Aleksandar Uskokov (Sanskrit)

Lector Mansi Bajaj (Hindi)

Students with an interest in South Asian Studies should apply to one of the university's degree-granting departments, such as Anthropology, History, Political Science, Economics, or Religious Studies. The South Asian Studies Council is part of the MacMillan Center for International and Area Studies. It has been organized to provide guidance to graduate students who desire to use the resources of the departments of the university that offer South Asia-related courses.

The South Asian Studies Council aims to bring together faculty and students sharing an interest in South Asia, and it supplements the curriculum with seminars, conferences, and special lectures by scholars from Yale as well as visiting scholars. It provides information concerning grants, fellowships, research programs, and foreign study opportunities.

Language instruction is offered in Hindi and Sanskrit. Students planning to undertake field research or language study in South Asia may apply to the council for summer fellowship support.

For information and program materials, contact the South Asian Studies Council, Yale University, PO Box 208206, New Haven CT 06520-8206; or visit our website, http://southasia.macmillan.yale.edu.

COURSES

HNDI 510a, Elementary Hindi Swapna Sharma

An in-depth introduction to modern Hindi, including the Devanagari script. Through a combination of graded texts, written assignments, audiovisual material, and computerbased exercises, the course provides cultural insights and increases proficiency in understanding, speaking, reading, and writing Hindi. Emphasis placed on spontaneous self-expression in the language. No prior background in Hindi assumed.

HNDI 530a, Intermediate Hindi I Mansi Bajaj

First half of a two-term sequence designed to develop proficiency in the four language skill areas. Extensive use of cultural documents including feature films, radio broadcasts, and literary and nonliterary texts to increase proficiency in understanding, speaking, reading, and writing Hindi. Focus on cultural nuances and various Hindi literary traditions. Emphasis on spontaneous self-expression in the language. Prerequisite: HNDI 520 or equivalent.

HNDI 532a, Accelerated Hindi I Mansi Bajaj

Development of increased proficiency in the four language skills. Focus on reading and higher language functions such as narration, description, and comparison. Reading strategies for parsing paragraph-length sentences in Hindi newspapers. Discussion of political, social, and cultural dimensions of Hindi culture as well as contemporary global issues.

HNDI 550a, Advanced Hindi Swapna Sharma

An advanced language course aimed at enabling students to engage in fluent discourse in Hindi and to achieve a comprehensive knowledge of formal grammar. Introduction to a variety of styles and levels of discourse and usage. Emphasis on the written language, with readings on general topics from newspapers, books, and magazines. Prerequisite: HNDI 540 or permission of instructor.

HNDI 598a, Advanced Tutorial Staff

For students with advanced Hindi language skills who wish to engage in concentrated reading and research on material not otherwise offered by the department. The work must be supervised by an adviser and must terminate in a term paper or its equivalent. Prerequisites: HNDI 540, and submission of a detailed project proposal and its approval by the language studies coordinator.

SKRT 510a / LING 515a, Introductory Sanskrit I Aleksandar Uskokov An introduction to Sanskrit language and grammar. Focus on learning to read and translate basic Sanskrit sentences in the Indian Devanagari script. No prior background in Sanskrit assumed. Credit only on completion of SKRT 520/LING 525.

SKRT 530a / LING 538a, Intermediate Sanskrit I Aleksandar Uskokov The first half of a two-term sequence aimed at helping students develop the skills necessary to read texts written in Sanskrit. Readings include selections from the *Hitopadesa, Kathasaritsagara, Mahabharata,* and *Bhagavadgita*. Prerequisite: SKRT 520/ LING 525 or equivalent.

SKRT 560a, Advanced Sanskrit: Readings in Poetry and Drama Aleksandar Uskokov The purpose of this course is to introduce the jargon of classical Sanskrit literature, specifically the interrelated genres of *mahā-kāvya* or court epic; *nāṭaka* or drama; and hagiography or *carita*. Special attention is given to matters of style and advanced morphology and syntax. Additionally, the course introduces scholastic techniques of text interpretation. Finally, the course looks at the phenomenon of retelling stories from Vedas, the epics, or the Buddhist *sūtras* in classical Sanskrit literature, thus combining advanced language instruction with learning cultural content. Prerequisites: previous terms of Sanskrit to L4 or equivalent.

Council on Southeast Asia Studies

The MacMillan Center 311 Luce Hall, 203.432.3431, seas@yale.edu http://cseas.yale.edu

Chair Erik Harms (*Anthropology*)

Professors Sunil Amrith (*History*), Michael Dove (*School of the Environment*), Erik Harms (*Anthropology*), Mimi Hall Yiengpruksawan (*History of Art*)

Assistant Professor Alka Menon (Sociology)

Lecturers and Lectors (I, II) Dinny Risri Aletheiani (Indonesian Language Studies), Carol Carpenter (School of the Environment), Amity Doolittle (School of the Environment), Indriyo Sukmono (Indonesian Language Studies), Quan Tran (American Studies), Quang Phu Van (Vietnamese Language Studies)

Curators and Librarians Ruth Barnes (Indo-Pacific Art, Yale Art Gallery)

Yale does not offer higher degrees in Southeast Asia studies. Instead, students apply for admission to one of the university's degree-granting departments or professional schools and turn to the Council on Southeast Asia Studies for guidance regarding the development of their special area interest, courses outside their department, and instruction in Southeast Asian languages related to their research interest. Faculty members of the SEAS council are available to serve as Ph.D. advisers and committee members. The council aims to bring together faculty and students sharing an interest in Southeast Asia and contributes to the graduate and undergraduate curriculum with language courses, an annual seminar series, periodic conferences, cultural events, and special lectures.

Yale offers extensive library and research collections on Southeast Asia in Sterling Memorial Library, the Economic Growth Center, and the Peabody Museum. Further information on library resources is available from Sterling Memorial Library (203.432.9350).

Language instruction is offered to graduate and undergraduate students in two Southeast Asian languages, Indonesian and Vietnamese. The council supports language tables and independent study or tutoring in other Southeast Asian languages through the Directed Independent Language Study Program or by special arrangement. Students planning to undertake field research or language study in Southeast Asia may apply to the council for summer fellowship support; see http://cseas.yale.edu/grantsstudents.

For information on program activities and participating faculty, contact the Council on Southeast Asia Studies, Yale University, PO Box 208206, New Haven CT 06520-8206; seas@yale.edu; http://cseas.yale.edu.

COURSES

Courses in Indonesian and Vietnamese languages at the elementary, intermediate, and advanced levels are listed in *Yale College Programs of Study* and at http://courses.yale.edu.

INDN 570b, Readings in Indonesian Dinny Aletheiani

For students with advanced Indonesian language skills preparing for academic performance and/or research purposes. Prerequisites: advanced Indonesian and permission of the instructor.

Material Histories of the Human Record

https://materialhistories.yale.edu

Program Directors Lucy Mulroney, Ayesha Ramachandran

Directors of Graduate Studies Lucy Mulroney, Ayesha Ramachandran

Steering Committee Melissa Barton (*Beinecke Library*), Jacqueline Goldsby (*English*; *African American Studies*; *American Studies*), Melissa Grafe (*Medical Historical Library*), Agnete Lassen (*Yale Babylonian Collection*; *Yale Peabody Museum*), Brian Meacham (*Yale Film Archive*), Shawkat Toorawa (*Near Eastern Languages and Civilizations*; *Comparative Literature*), Erika Valdivieso (*Classics*)

Affiliated Faculty and Staff Melissa Barton (Beinecke Library), Marissa Bass (History of Art), Ray Clemens (Beinecke Library), Jacqueline Goldsby (English; African American Studies; American Studies), Melissa Grafe (Medical Historical Library), Alice Kaplan (French), Agnete Lassen (Yale Babylonian Collection; Yale Peabody Museum), Brian Meacham (Yale Film Archive), Priyasha Mukhopadyay (English), Lucy Mulroney (Yale Special Collections), John Durham Peters (English), Jennifer Raab (History of Art), Ayesha Ramachandran (Comparative Literature), Camille Thomasson (Film and Media Studies), Shawkat Toorawa (Near Eastern Languages and Civilizations; Comparative Literature), Erika Valdivieso (Classics)

GRADUATE CERTIFICATE IN MATERIAL HISTORIES OF THE HUMAN RECORD

The archive, the book: Our ability to bear witness, hold history to account, and imagine a more just future is at the core of the humanities as a scholarly project. The certificate in Material Histories of the Human Record is designed to expose students to multiple forms of expertise within Yale's special collections libraries, equip emerging scholars with new analytical skills, and teach them the methodologies that scholars, librarians, archivists, conservators, and curators employ as they preserve, interrogate, and steward the human record. Drawing on Yale Libraries' extraordinary collections and staff expertise, and the ongoing faculty interest in the histories and politics of archives, the material text, and metadata, the graduate certificate in Material Histories of the Human Record fosters innovation at the interstices and intersections of disciplines.

"Material histories" signals an expansive interest in a wide variety of materials and media – not only manuscripts, written documents and paper-based records, but also papyrus fragments, tablets, photographs, film, textile, audio, three-dimensional works, and other formats. The purview of the certificate also necessarily includes an engagement with the opportunities and challenges of new digital methods for preservation, cataloging, and research. Areas of particular focus for the certificate may include: archival studies and theories of archives; global histories of the book; material formats and their histories; the non-neutrality of metadata; privacy and questions of evidence; social injustice in/and/as the historical record; preservation and conservation science; international law, the book trade, and provenance.

Eligibility

The certificate is open to graduate students pursuing the Ph.D. or a professional school degree, with the approval of their director of graduate studies (DGS). Interested students should meet with one of the certificate's directors during their first two years of graduate study. Requirements for the certificate must be completed by the time that the student's dissertation (or equivalent program requirement) is filed.

Requirements for the Certificate in Material Histories of the Human Record

Students who wish to receive the certificate must complete the following course work, research, and teaching requirements:

Coursework Each student must take MHHR 700 and MHHR 701, Theory and Praxis of Material Histories. In addition, each student is required to take two elective courses, which also count towards the student's doctoral coursework in their department. At least one of these courses would need to be substantively taught with collections; the other course may be a directed reading or focus on archives, book history, or metadata as a theoretical or historical object of study. Each student is expected to organize their elective courses around a concentration related to their departmental coursework and doctoral research. Students should consult the co-directors about which courses might be eligible as electives.

Practicum In addition to the two elective courses, in order to facilitate specialization, students are expected to propose a capstone project with one of Yale's cultural heritage institutions (to be approved by the student's DGS and the co-directors of the Certificate). This project must be completed before the student's terminal graduation date. It must be structured as a directed reading/independent study for course credit (MHHR 990). From the start of their pursuit of the certificate, students consult with the co-directors on what kinds of projects would work best for them. Possible projects include assisting with: the curation of an exhibition, reparative archival description, the Black Bibliography Project, provenance research, scientific conservation analysis. The practicum should culminate in either a final paper and/or a public presentation (which might take the form of a symposium, a finding aid, a descriptive bibliography, an edition, an exhibit, a digital humanities project, etc.). The co-directors maintain an ongoing list of possible opportunities and also help to facilitate new ones based on students' and librarians' interest. Students are then be matched with an appropriate adviser/mentor who help guide the project.

Teaching Students commit to doing significant teaching in the collections through one of the following pathways: (a) serving as a teaching fellow in a course with a substantial collections-based curriculum (such as courses associated with the Six Pretty Good Ideas first-year program); (b) assisting with a Beinecke intensive course three to four times a semester; or (c) supporting collections-based courses on a oneoff basis four to six times over the course of a year. The co-directors also work on creating Graduate Professional Development opportunities for students within the Yale libraries which can be used as a substitute for the teaching requirement. Students should plan to consult early with the certificate co-directors and their DGS to plan for this requirement. Students must register for MHHR 950 in the semester when they plan to complete their teaching requirement for the certificate.

CERTIFICATE WORKSHOP

MHHR 700a, Theory and Praxis of Material Histories Priyasha Mukhopadhyay and Melissa Grafe

This year-long workshop focuses on the concepts, debates, methodologies, theories, and real-world constraints of the material histories of the human record across a range of formats and media. Organized around six rubrics - Collecting, Describing, Displaying, Embodying, Disembodying, and Representing-we aim to cut across longstanding divides between collections, archives and libraries, on the hand, and scholarly/ artistic spaces of the academic world; between preservation and consumption; between privacy and publicity; between the social sciences and the humanities. Through critical readings that engage with diverse geographic and temporal subjects; the close analysis and physical handling of rare books, maps, manuscripts, images, objects, and textiles; and an orientation to cultural heritage and library professional practices and procedures, students learn the critical interventions of the history of the book and the archival turn in the humanities; the key concepts and genealogies of archives and library special collections; and the generative collaborations currently underway between faculty and librarians to jointly address legacies of racism and white privilege, advance intellectual freedom and parity, and define the ethical stewardship of the material histories of the human record today. This workshop takes the form of a halfcredit course in each semester that meets six times a term (every other week). This course must be taken before or after MHHR 701 to earn 1 full credit. We welcome all curious students to the first class, but permission of the instructors is subsequently required for enrollment/registration. 1/2 Course cr

Medical Research Scholars Program

https://medicine.yale.edu/bbs/training/nih-programs/mrsp

Directors

Michael Caplan George Lister Megan C. King

MEDICAL RESEARCH SCHOLARS PROGRAM GRADUATE CERTIFICATE

The Medical Research Scholars Program (MRSP) bridges barriers between traditional predoctoral and medical training by providing students with both medically oriented coursework and a mentored clinical experience. The coursework provides a grounding in biomedicine, and the clinical experience enables students to interact with patients to learn firsthand about disease symptoms, treatment options, and the limitations of current therapies. This combination of medical knowledge and face-to-face interaction with patients and their doctors provides a new perspective and enhances the rigorous training students receive in the Yale Biological and Biomedical Sciences (BBS) Program.

Program Eligibility

Incoming BBS students are eligible to apply, and five to seven students are admitted per year. Students are invited to apply after accepting Yale's offer of admission to the Graduate School of Arts and Sciences. A separate MRSP application is required, and the MRSP core leadership team will review applications and select students for the program. If admitted, students remain within the BBS Program but participate in the additional MRSP curriculum.

The Curriculum

The MRSP curriculum consists of four full-term courses that focus first on normal human physiology and organ-based cell biology, followed by human pathobiology and then an introduction to drug discovery, validation and clinical trials. Students also take an intensive summer course in biostatistics. Some of these MRSP courses are open to all BBS students at the discretion of the course directors. The centerpiece of the MRSP is an additional two-year Mentored Clinical Experience course during years two and three of the program. This course integrates basic and clinical research while additionally granting students access to patients and patient settings. Exposure to patients and to the practice of medicine will enable graduates to work more confidently at the interface of research and medicine and facilitate future collaborations with clinical researchers. The Mentored Clinical Experience is open only to students formally enrolled as Medical Research Scholars and to students in the Translational Biomedicine Ph.D. program.

Year One		
Fall		
C&MP 550	Physiological Systems	1
Spring		

CBIO 604	Physiologic Function and Cellular Structure of Organ Systems	1	
Summer			
IMED 645	Introduction to Biostatistics in Clinical Investigation	1	
Year Two			
Fall			
PATH 690	Molecular Mechanisms of Disease ¹	1	
Spring			
B&BS 680	Topics in Human Investigation	1	
Years Two and Three			
C&MP 610	Medical Research Scholars Program: Mentored Clinical Experience	1	
¹ May be substituted	with C&MP 600 and C&MP 601 Medical Physiology Case		

¹ May be substituted with C&MP 600 and C&MP 601, Medical Physiology Case Conferences

Award of the Certificate

Students who complete the full curriculum and who remain in good academic standing in their graduate programs will be awarded the certificate.

Integrated Graduate Program in Physical and Engineering Biology (PEB)

http://peb.yale.edu peb@yale.edu

Director

Corey O'Hern (Mechanical Engineering and Materials Science; Physics; Applied Physics; Computational Biology and Bioinformatics)

Associate Director

Emma Carley

Executive Committee Julien Berro (Molecular Biophysics and Biochemistry; Cell Biology), Joerg Bewersdorf (Cell Biology; Biomedical Engineering), Enrique De La Cruz (Molecular Biophysics and Biochemistry), Thierry Emonet (Molecular, Cellular, and Developmental Biology; Physics; Computational Biology and Bioinformatics), Jonathon Howard (Molecular Biophysics and Biochemistry; Physics), Megan King (Cell Biology), Andre Levchenko (Biomedical Engineering), Kathryn Miller-Jensen (Biomedical Engineering; Molecular, Cellular, and Developmental Biology), Simon Mochrie (Physics; Applied Physics), Michael Murrell (Biomedical Engineering), Corey O'Hern (Mechanical Engineering and Materials Science; Physics; Applied Physics; Computational Biology and Bioinformatics), Thomas Pollard (Emeritus; Molecular, Cellular, and Developmental Biology)

The Yale PEB program brings together faculty from the physical, engineering, and biological sciences, who carry out collaborative, interdisciplinary research and teaching. Participation in the PEB program is open to any graduate student who is interested in applying quantitative, physical approaches to study important biological questions. PEB-participating departments, tracks (BBS), and degree-granting programs include Applied Mathematics; Applied Physics; Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BBS track); Biomedical Engineering; Chemical and Environmental Engineering; Chemistry; Computational Biology and Bioinformatics (BBS track and also degree-granting program); Mechanical Engineering and Materials Science; Molecular Cell Biology, Genetics, and Development (BBS track); Molecular Medicine, Pharmacology, and Physiology (BBS track); Neuroscience (BBS track); Plant Molecular Biology (BBS track); and Physics.

GRADUATE CERTIFICATE IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Upon advancement to candidacy in a home department and satisfaction of the PEB requirements, students receive a certificate from the Integrated Graduate Program in Physical and Engineering Biology.

Students interested in participating in the PEB program may indicate their interest on their graduate application for admission to a home department or track. Students may also join the PEB after they have matriculated at Yale. After arriving at Yale, students should e-mail peb@yale.edu to express their interest in the PEB, and the leadership will review their application materials.

PEB students acquire a depth of knowledge in their home department and also a breadth of knowledge across disciplines from PEB courses and activities. They will become skilled at applying physical and engineering methods and quantitative reasoning to biological problems, and at identifying and tackling cutting-edge problems in the life sciences, and they will be proficient at combining theory and computation with wet lab experiments. In addition, students will become comfortable working in an interdisciplinary and collaborative research environment and adept at communicating with scientists from a variety of disciplines as well as with nonscientists.

CURRICULUM

The PEB curriculum consists of four core courses, which all students, regardless of their undergraduate background, take together:

Core Courses

Typically taken in the	first year:		
MB&B 517	Methods and Logic in Interdisciplinary Research	1	
MB&B 591	Integrated Workshop	1	
Should be completed by the second year:			
ENAS 541	Biological Physics	1	
MCDB 562	Modeling Biological Systems II	1	

With permission of the PEB leadership, one of the following courses may be substituted to satisfy the third or fourth course of the PEB requirement:

Neuromuscular Biomechanics	1
Systems Biology of Cell Signaling	1
Genomic Methods for Genetic Analysis	1
Modeling Biological Systems I	0
Biomedical Data Science: Mining and Modeling	1
	Neuromuscular Biomechanics Systems Biology of Cell Signaling Genomic Methods for Genetic Analysis Modeling Biological Systems I Biomedical Data Science: Mining and Modeling

Two primer courses are also offered (but not required). Boot Camp Biology (MB&B 520) is a primer course for students entering PEB with little or no background in biology, and Quantitative Approaches in Biophysics and Biochemistry (MB&B 635/ENAS 518) is a primer course for students entering PEB with little or no background in mathematics and computation.

CERTIFICATE REQUIREMENTS

To receive the certificate, students must:

- Complete the PEB curriculum
- · Present their research during the PEB Discussion Group in May of their second year
- · Participate in at least one PEB-hosted outreach event
- Participate in at least two professional development opportunities. Eligible
 professional development opportunities include: attending an external workshop
 on a PEB-related topic, presenting research at a non-Yale conference or meeting,
 attending a PEB-hosted professional development event, helping organize a
 PEB outreach event or the PEB discussion group, inviting and hosting a PEB
 Distinguished Seminar Series speaker, meeting with Yale alumni working in a PEB-

related field, or having a one-on-one career advising appointment with the Yale Office of Career Strategy.

· Be admitted to candidacy in their home department or degree granting program

For more information about the programming, coursework, and other enrichment activities available to PEB students; see http://peb.yale.edu.

Public Humanities

https://ph.yale.edu Graduate Certificate in Public Humanities

Program Directors Matthew Jacobson Laura Wexler

Director of Graduate Studies Matthew Jacobson

Assistant Program Director and Assistant Director of Graduate Studies Karin Roffman

Faculty and Staff Associated with the Program Laura Barraclough (American Studies; Ethnicity, Race, and Migration), Tim Barringer (History of Art), Melissa Barton (Beinecke Library; English), Ned Blackhawk (History; American Studies), David Blight (History), Ryan Brasseaux (American Studies), David Bromwich (English; Humanities), Daphne Brooks (American Studies; African American Studies; Women's, Gender, and Sexuality Studies), Emily Coates (American Studies), Aimee Meredith Cox (African American Studies; Anthropology), Carolyn Dean (History; French), Richard Deming (English), Michael Denning (American Studies), Wai Chee Dimock (Emerita; English; American Studies), Crystal Feimster (American Studies; African American Studies; Women's, Gender, and Sexuality Studies), Nicholas Forster (African American Studies; Film and Media Studies), Joanne Freeman (History), Beverly Gage (History), Bryan Garsten (Political Science), Jacqueline Goldsby (English; American Studies; African American Studies; Women's, Gender, and Sexuality Studies), Zareena Grewal (American Studies; Ethnicity, Race, and Migration), Jacob Hacker (Political Science), Langdon Hammer (English), Daniel HoSang (American Studies; Ethnicity, Race, and Migration), Matthew Jacobson (American Studies; Ethnicity, Race, and Migration; History; African American Studies), Kathryn James (Beinecke Library), Grace Kao (Sociology; Ethnicity, Race, and Migration), Alice Kaplan (French; Women's, Gender, and Sexuality Studies), Jennifer Klein (History; Women's, Gender, and Sexuality Studies), Nancy Kuhl (Beinecke Library), Albert Laguna (American Studies; Ethnicity, Race, and Migration), Kathryn Lofton (Religious Studies; American Studies; Women's, Gender, and Sexuality Studies), Mary Lui (History; American Studies), John MacKay (Slavic Languages and Literatures; Film and Media Studies), Tracey Meares (Law School), George Miles (Beinecke Library), Lucy Mulroney (Beinecke Library), Charles Musser (Film and Media Studies; American Studies), Meghan O'Rourke (Yale Review), Stephen Pitti (History; American Studies), Sally Promey (History of Art), Anna Reisman (School of Medicine), Carolyn Roberts (History of Science and Medicine; American Studies), Marc Robinson (Theater and Performance Studies; American Studies; English), Karin Roffman (Humanities; American Studies; English), Douglas Rogers (Anthropology), Elihu Rubin (Architecture; American Studies), Sebastian Ruth (School of Music), Paul Sabin (History), Alicia Schmidt Camacho (American Studies; Ethnicity, Race, and Migration), Caleb Smith (English; American Studies), Timothy Snyder (History), Jason Stanley (Philosophy), Gary Tomlinson (Music; Humanities), John Wargo (School of the Environment; Political Science), Michael Warner (English;

American Studies), Laura Wexler (American Studies; Women's, Gender, and Sexuality Studies), Timothy Young (Beinecke Library)

GRADUATE CERTIFICATE IN PUBLIC HUMANITIES

Public Humanities at Yale trains graduate students by expanding academic discourse beyond the confines of the classroom, academic publishing, and the academic conference circuit. By cultivating a dialogue with specialists in non-academic areas, students earning a Certificate in Public Humanities are prepared for public intellectual work such as museum and gallery installation, documentary film and photography, and oral/community history. Our mission is to expand the concept of "audience" by building bridges to a wide range of local and regional institutions and their respective publics.

Public Humanities at Yale represents an interdisciplinary certificate that is open to graduate students pursuing the Ph.D., a professional school degree, or a master's degree in any department, with the approval of their director of graduate studies (DGS). Requirements for the certificate must be completed by the time that the student's dissertation (or equivalent program requirement) is filed.

The mission of Public Humanities is fivefold:

- 1. To offer students an expanded curriculum in the methods, practices, and skill sets associated with the Public Humanities,
- 2. To cultivate and articulate best practices for collaborative and creative scholarly work,
- 3. To create new venues for intellectual work, both within Yale and across the city and the region,
- 4. To create new venues for *non*-academic expertise within Yale, and thus,
- 5. To create new conversations and to cultivate new relationships with contiguous institutions throughout the region (museums, libraries, archives, galleries, media outlets, historical societies, performance troupes, etc.) and with non-academic individuals who have much to offer in an academic setting (artists, photographers, curators, broadcast journalists, filmmakers, writers, etc.).

Distinct areas of focus within Public Humanities at Yale include Museums and Collections, Documentary Studies, Digital Humanities, Space and Place, History and the Public, Arts Research, and Public Writing.

REQUIREMENTS OF THE CERTIFICATE PROGRAM

- 1. Introduction to Public Humanities, PHUM 903.
- 2. Methods and Theory. Students complete for a grade at least one course selected from preapproved courses offered across the university that include topical specializations such as public memory, documentary studies, documentary film, ethnography, material culture, architecture, research-based performance, art history, public history, public writing, etc. As needed, this requirement can also be fulfilled in an independent study course with one of the affiliated faculty members and with the approval of the DGS or assistant DGS.
- 3. Practicum (PHUM 904). In addition to course work, public humanities students are required to complete a one-term internship with one of our partnered affiliates

(to be approved by the Public Humanities DGS or assistant DGS) for practical experience in the field. Potential internships include in-house opportunities at the Beinecke Library, Sterling Memorial Library, or one of Yale's museums, or work at a regional or national institution such as a media outlet, museum, or historical society. In lieu of the internship, students may choose to complete a "micro-credential." Micro-credentials are structured as workshop series (three to five daylong meetings over the course of a year) rather than as term courses, and include revolving offerings in topics such as oral history, collections and curation, writing for exhibits, podcast production, website design, scriptwriting from the archive, or grant writing for public intellectual work.

- 4. Public Humanities Capstone Project (PHUM 905). The course work and practicum/micro-credential will lead to a significant project to be approved by the DGS or assistant DGS (an exhibition, documentary, research paper, etc.) and to be presented in a public forum on its completion.
- 5. Teaching Component. The final requisite for the certificate is a one-term teaching component. This assignment may be fulfilled by co-teaching one of our current public humanities courses, such as Introduction to Public Humanities, Introduction to Documentary Studies, the Documentary Film Workshop, or Introduction to Digital Humanities; or by teaching a special Digital Humanities or Public Humanities section for an existing course (e.g., The History of Right Now); or by fulfilling duties needed by education curators of the Yale Center for British Art, Yale Art Gallery, Peabody Museum, Beinecke Library, or Schwarzman Center.

Quantum Materials Science and Engineering

Directors

Sohrab Ismail-Beigi (Applied Physics) Corey O'Hern (Mechanical Engineering and Materials Science)

GRADUATE CERTIFICATE IN QUANTUM MATERIALS SCIENCE AND ENGINEERING

Quantum materials have played a key role in technologies with broad societal impacts (e.g., semiconductors, lasers, LEDs, and medical imaging). Their importance will increase with the growing research on harnessing quantum effects for computation and sensing (e.g., quantum computation and information research programs at leading technology companies). In addition, the role of data science and machine learning methods continue to grow in importance in all fields of science and engineering. The aim of this certificate program is to train Ph.D. students in the multidisciplinary field of quantum materials and associated data science methods to allow them to be at the cutting edge of research and engineering on understanding and using quantum matter that can lead to scientific and engineering breakthroughs.

This certificate program is open to Ph.D. students in several graduate-degree granting programs in the Graduate School of Arts and Sciences, including the Departments of Applied Physics, Chemistry, Computer Science, Mechanical Engineering and Materials Science, and Physics. Students can either choose to participate in the certificate program during the application process to the Graduate School or, if already enrolled in the graduate program of one of the above departments, apply to the certificate program by contacting its directors.

Requirements

In addition to the department-specific requirements for completing a Ph.D., this certificate program has the following requirements. For coursework, each student must successfully complete the six courses below (within the first two years of matriculating at Yale):

- 1. Quantum Materials Science and Engineering
- 2. CPSC 553/CB&B 555/GENE 555 Unsupervised Learning for Big Data
- 3. APHY 448/PHYS 448/ENAS 850/PHYS 548 Sold State Physics I
- 4. One of three choices for quantum mechanics: APHY 506, Basic Quantum Mechanics; PHYS 508, Quantum Mechanics I; or CHEM 570, Quantum Chemistry
- 5. An elective course in materials science and engineering, statistical and many-body physics, or machine learning and data science. Examples include PHYS 650, Theory of Solids I; ENAS 787, Forces on the Nanoscale; CPSC 552, Deep Learning Theory and Applications; and ENAS 752, Solidification and Phase Transitions
- 6. Responsible Conduct of Research course (offered by each home department)

Some exceptions and replacements for these course requirements are permitted with prior approval of the QMSE Directors.

Ph.D. students in the certificate program meet with a mentoring committee convened by the directors at least once each year to monitor progress and provide career guidance for each student. Students also present their research work in a public setting twice:once at Yale (research in progress, chalk talk, or departmental seminar) and once at a non-Yale conference. Students also participate in two QMSE outreach events organized by the directors. Finally, students must complete four of the following professional development activities:

- External Internship of at least ten weeks (fulfills 50 percent of the professional development requirement)
- · Attend a workshop on a QMSE-related topic
- Attend a QMSE-hosted professional development event (held at least once per semester)
- · Participate in the QMSE hackathon
- · Help organize the QMSE symposium or hackathon
- Invite and host an external seminar speaker at Yale to present on QMSE-related research through student's home department
- Meet with Yale alumni working in a QMSE-related field to learn about their career path
- Have a career-advising appointment with the Yale Office of Career Strategy (OCS)

Students receive their certificate upon completion of the above requirements and after admission to candidacy from their home department on a project related to QMSE.

Second Language Acquisition

https://cls.yale.edu

Director

Fernando Rubio

GRADUATE CERTIFICATE IN SECOND LANGUAGE ACQUISITION

The Center for Language Study (CLS) offers the Certificate in Second Language Acquisition (SLA Certificate) which is specifically designed for Ph.D. students in language and literature departments and provides a comprehensive training program in second language acquisition and language teaching methodology. The SLA Certificate offers students a solid foundation in second language acquisition, language teaching methodology, and applied linguistics. It covers both the theoretical principles and the practical pedagogy training essential for a career in a language-related field.

Upon completing the SLA Certificate, students will:

- be familiar with current theories in Second Language Acquisition;
- understand key theoretical, methodological, and pedagogical concepts;
- apply current pedagogical principles to their teaching practice;
- · be familiar with current approaches to language teaching; and
- have completed a language teaching e-portfolio documenting their college teaching experience and philosophy in a format that can be used in the academic job application process.

Only students enrolled in Ph.D. programs in the Graduate School of Arts and Sciences are eligible to receive the SLA Certificate, which is noted on students' transcripts. The program is best undertaken by students starting their teaching years, although Ph.D. students in later years may be able to be accommodated.

APPLICATION PROCEDURE

To apply to the program, visit https://cls.yale.edu/certificate-second-languageacquisition-registration-page, which allows students to submit an application directly to the CLS. The CLS will then contact the student to schedule an entry interview.

PROGRAM REQUIREMENTS

- Eportfolio (to be scheduled following your entry interview)
- Training and professional development (numbers 1, 2, and 4 should be taken in sequence, when possible)
 - 1. CLS Pedagogy Workshop offered in August the week before fall semester starts
 - 2. Fundamentals of Language Teaching (fall semester five sessions)

3. Advanced Fundamentals of Language Teaching (spring semester – five sessions)

4. LING 564, Principles of Language Teaching and Learning

5. Professional development activities; for example, Brown Bags, language pedagogy-related conferences, workshops (note: a departmental methods course would be equal to two professional development activities)

Teaching observations

1. A minimum of four language class observations of others, with a report on your observations:

- Two peer observations (one of which in a language you do not understand)
- · Two observations of a senior language instructor

2. A minimum of two observations of your language class, with a report from the observer (one from a senior language instructor and one from a peer). If you are not teaching a language class, there are alternative ways to complete this requirement.

- Teaching at Yale University (minimum of two semesters)
- · Completed Teaching ePortfolio
 - 1. Teaching statement
 - 2. Portfolio workshop
 - 3. Annotated syllabi (one for a beginning and intermediate-level language course)
 - 4. Annotated sample course materials, such as task-based and communicative activities
 - 5. Annotated lesson plan
 - 6. Annotated student evaluations
 - 7. Teaching video sample
 - 8. Reflective narrative on your experiences
- Exit Interview (to be scheduled upon completion of all requirements or at least one month before graduation)

Note: Documentation of all requirements must be updated at the end of each semester using the form you will be given access to upon registration.

For further details, see the SLA Certificate Completion Instructions (https:// cls.yale.edu/certificate-second-language-acquisition-sla-completion-instructions).

FILING FOR THE AWARD OF THE CERTIFICATE

A student who intends to file for the final granting of the SLA Certificate *must* schedule an exit interview with the CLS Director and submit in advance their e-portfolio and their reflective narrative no later than the end of the term prior to the award. Students should allow two to four weeks for materials review and to schedule an interview. Upon successful completion of the exit interview, the CLS Director will confirm that the student has fulfilled all the requirements of the certificate with the University Registrar's Office so that the SLA certificate will appear as a notation on the student's transcript.

Translation Studies

https://translation.macmillan.yale.edu Graduate Certificate in Translation Studies

Program Director Alice Kaplan

Certificate Coordinator Marijeta Bozovic

Steering Committee Ned Blackhawk (History; American Studies), Marijeta Bozovic (Slavic Languages and Literatures; Film and Media Studies; Women's, Gender, and Sexuality Studies), Paul Bracken (Management; Political Science), Peter Cole (Jewish Studies; Comparative Literature), Robyn Creswell (Comparative Literature), Robert Frank (Linguistics), Supriya Gandhi (Religious Studies), Alice Kaplan (French), Shawkat Toorawa (Near Eastern Languages and Civilizations), Jane Tylus (Italian Studies), Alyson Waters (French)

GRADUATE CERTIFICATE IN TRANSLATION STUDIES

The goal of the Graduate Certificate in Translation Studies is to promote the interdisciplinary study of translation, encompassing its literary, social, political, economic, legal, technological, and medical dimensions. As human migration and globalization alter the manner and speed of language change, translation has become increasingly central to the workings of the contemporary world. We believe now is the time to capture the new energies and map out the new fields this expanded horizon offers to us. The aim is to provide graduate students across a number of programs, departments, and divisions the opportunity to develop and demonstrate a degree of competence in translation theory, practice, and technologies. A central focus of the program will be to bring together a maximally intellectually and culturally diverse cohort of participating students each year. The certificate program will serve the interests of graduate students looking for a competitive edge in the academic job market as well as open doors to careers outside of academia for others.

Eligibility

The Certificate in Translation Studies (TS) is open to students currently enrolled in a Ph.D. program at Yale or those entering a graduate program in the fall term. Application to the TS program is due May 1 for the following academic year's cohort; for more information and the online application, visit https:// translation.macmillan.yale.edu.

Course work for the certificate will primarily be completed in the second year of graduate study and will supplement (and in some cases, overlap with) required course work in the student's home department. All course work for the TS certificate will need to be approved by the director of graduate studies (DGS) of the student's home department and the TS coordinator, to ensure that TS requirements do not slow down time to degree.

Requirements for the Certificate

Students who wish to receive the TS certificate are required to complete three courses and a capstone activity:

Core Course All TS certificate students will take the Proseminar in Translation Studies (CPLT 504) as their shared foundational course. The proseminar will balance a historically minded introduction to Translation Studies as a growing field with a multidisciplinary survey of its relationships to various fields and academic practices. This core course will be developed and taught by the TS coordinator in consultation with the Executive Committee. The course will necessarily vary with the different background and approaches of the TS coordinator, but the fundamental structure will remain in place each year. The coordinator will incorporate a number of guest lectures by Yale faculty and other invited speakers to expose students to maximally diverse research and practice in the many areas surveyed by the course.

Two Electives Each student will take two elective courses approved by the TS coordinator as relevant to the student's own research interests. One directed reading course may count as one of the electives; undergraduate courses may be modified through the addition of graduate-level work. Electives will generally consist of courses focusing substantially on topics that inform the student's research interests within Translation Studies. Examples include: Postcolonial World Literature and Theory (ENGL 936/AFST 746); Proseminar in Comparative Literature (CPLT 515); Philosophy of Language (LING 671/PHIL 742); Language, Culture, and Identity (ANTH 568); Law and History, Law in History (RLST 619/CLSS 872/HIST 513/MDVL 513/NELC 683). The expectation is that students will select at least one elective outside of their home department or program.

Yale offers many courses that qualify as Translation Studies electives at both the undergraduate and graduate level. See https://translation.macmillan.yale.edu/courses-translation-and-related-topics-yale for information on this year's offerings.

Capstone Project Students will be required to complete one of the following tasks for the final project in Translation Studies: (1) an article suitable for publication; (2) an original translation of a text approved by the TS coordinator; or (3) a minimum of forty hours of community service in translation. Examples include interpreting with a health or social service organization or an internship with a publisher or other organization dedicated to translation, to be approved by the TS coordinator. For internship opportunities for graduate students with both nonprofit and profit-making organizations, see https://translation.macmillan.yale.edu/grants-fellowships and https://translation.macmillan.yale.edu/resource-links on the Translation Initiative website.

In addition, and if such teaching is available, students will be strongly encouraged to serve as teaching fellows for one term in any course approved by the TS coordinator.

The completion of all requirements will need approval from the TS coordinator and the DGS of the student's degree department. By the end of their third term at Yale, participating students will need to outline a plan for fulfilling all TS requirements in consultation with both the TS coordinator and their home department DGS. Students will track their completion of requirements in an online worksheet and update the form each term, as instructed. A written proposal for their capstone project, a midproject progress report, and a final report are required, as well as brief written reports on any relevant translation work and collaborative projects to be included as part of their work for the certificate.

Students in the certificate program will be expected to attend and participate in a diverse range of talks, conferences, screenings, and other intellectual programming connected to translation throughout the year, using the reporting mechanism to note their participation.

For more information or if you have any questions, email translation@yale.edu.

CORE COURSE

CPLT 504a, Proseminar in Translation Studies Serena Bassi

This graduate proseminar combines a historically minded introduction to Translation Studies as a field with a survey of its interdisciplinary possibilities. The proseminar is composed of several units (Histories of Translation; Geographies of Translation; Scandals of Translation), each with a different approach or set of concerns, affording the students multiple points of entry to the field. The Translation Studies coordinator provides the intellectual through-line from week to week, while incorporating a number of guest lectures by Yale faculty and other invited speakers to expose students to current research and practice in different disciplines. The capstone project is a conference paper-length contribution of original academic research. Additional assignments throughout the term include active participation in and contributions to intellectual programming in the Translation Initiative.

Women's, Gender, and Sexuality Studies

315 William L. Harkness Hall, 203.432.0845 http://wgss.yale.edu Graduate Certificate in Women's, Gender, and Sexuality Studies

Chair

Rod Ferguson

Director of Graduate Studies Dara Strolovitch

Faculty

For faculty listings, see Women's, Gender, and Sexuality Studies under Degree-Granting Departments and Programs in this bulletin.

GRADUATE CERTIFICATE IN WOMEN'S, GENDER, AND SEXUALITY STUDIES

Women's, Gender, & Sexuality Studies (WGSS) is an interdisciplinary program that critically interrogates gender and sexuality as categories of inequality, difference, subjectivity, and identification. Gender (the social and historical meanings of distinctions across sexes) and sexuality (the domain of sexual practices, identities, discourses, and institutions) are studied as they intersect with class, race, nationality, citizenship, religion, ability, and other axes of power, difference, and zones of experience. The introduction of these perspectives into all fields of knowledge necessitates new research paradigms, organizing concepts and analytics, and critique.

The Certificate in Women's, Gender, and Sexuality Studies is open to doctoral students currently enrolled in a Ph.D. program at Yale whose research engages the foregoing questions and approaches. Interested students are encouraged to (1) email the WGSS director of graduate studies (DGS) to indicate their intention to pursue the certificate and (2) submit the application linked on the website, ideally during their first year in their Ph.D. program. The application may be updated as requirements are completed.

Students who wish to receive the certificate must fulfill the following requirements:

- 1. complete WGSS 600, Introduction to Women's, Gender, and Sexuality Studies;
- 2. complete two WGSS-titled or substantively themed electives;
- 3. enroll in and attend WGSS 900, the WGSS Working Group and Colloquium, for two sequential semesters (preferably in the same academic year);
- present a research paper at a meeting of the WGSS Colloquium or a similar venue; and
- 5. fulfill a pedagogy requirement. The pedagogy requirement can be fulfilled by teaching or serving as Teaching Fellow for a WGSS-titled course; because opportunities to do so are limited, however, certificate students may also fulfill the pedagogy requirement by designing a syllabus for a WGSS-related course that they hope to teach in the future. Certificate students may also petition to fulfill this requirement if they serve as Teaching Fellow for a non-WGSS course that contains a substantial amount of WGSS-related content. Certificate students electing this last option should submit the syllabus and a brief justification (three

to five sentences) that explains how gender and/or sexuality or WGSS-related frameworks were featured in the class and/or how they foregrounded it in their discussions sections.

These requirements should be met in consultation with the DGS. Students who fulfill these expectations will receive a letter from the DGS indicating that they have completed the work for the certificate.

COURSES

For course listings, see Women's, Gender, and Sexuality Studies under Degree-Granting Departments and Programs in this bulletin.

Yale Center for the Study of Globalization

Betts House, 203.432.1900 http://ycsg.yale.edu

Director

Ernesto Zedillo

The Yale Center for the Study of Globalization (YCSG) is devoted to examining the impact of our increasingly integrated world on individuals, communities, and nations. The center's purpose is to support the creation and dissemination of ideas for seizing the opportunities and overcoming the challenges resulting from globalization's impact on the world's people and places. The center also explores solutions to problems that, even if they do not result directly from globalization, are global in nature and can therefore be effectively addressed only through international cooperation. In accordance with this mission, the YCSG enriches the debate about globalization on campus and promotes the flow of ideas between Yale and the policy world.

One of the center's strengths, and an important area of focus, is its ability to engage with multilateral institutions and global organizations in activities pertinent to its mission through an activity well known in international and policy circles: Commission Diplomacy. Over a ten-year period from 2002 to 2012, the YCSG was involved in over 50 percent of the international commissions convened worldwide, and the center continues this effective work today, bringing its efforts here to the Yale community in a variety of public forums. Among current such work is our involvement in the Independent Panel on Pandemic Preparedness and Response (IPPPR), mandated by the World Health Assembly to review critically how international and national institutions have prepared for and reacted to COVID-19 and to recommend ways to strengthen the world's preparedness and response for future pandemics.

The YCSG's current projects include the Rockefeller Foundation Economic Council on Planetary Health, which focuses on the interconnectedness between planetary health and human well-being; a project to produce a Charter on Universal Health Coverage; and work on global drug policy reform. These highlighted activities are in addition to the center's consistent focus on global development, global trade, financial globalization, peace and security, nuclear disarmament, and climate change mitigation.

On campus, the center hosts international conferences, organizes brainstorming sessions and panels, and works constantly to bring to the Yale community individuals who have input on international policy. The center's project International Cooperation in the National Interest: In Defense of the Multilateral System is an ongoing series of lectures and public presentations at Yale by leaders of the world's multilateral institutions and the experts and scholars who have studied and analyzed them.

POLICIES AND REGULATIONS

Admissions

http://gsas.yale.edu/admission

Application for admission to any of the graduate school's programs should begin in the summer or fall of the academic year prior to the one in which the applicant seeks to matriculate. Application can be made to only one department, program, or combined program. The graduate school utilizes an online application. Access to this application as well as application procedures, guidelines, requirements, fees, deadline dates, and all other information that an applicant will need are available at the website listed above.

Holders of American Ph.D. or Sc.D. degrees, or their international equivalents, are not eligible for admission to the graduate school in the field in which they have already earned their degree. They may, however, apply in other fields and are also eligible to apply for admission to the Division of Special Registration as Visiting Students for nondegree study. (See Nondegree Study under Programs of Study for more information, or visit the website listed above.) With the approval of the appropriate associate dean, holders of master's degrees are eligible for admission to a terminal master's degree program in the same field at the graduate school provided that there is significant curricular distinction between the previous and proposed programs of study.

Individual program descriptions, prerequisites, special admissions requirements, and links to these programs are available via the graduate school's website. Although programs may have varying prerequisites and special requirements for admission, all programs will require, in addition to an application and the application fee, three letters of recommendation, a résumé/CV, and transcripts from each academic institution previously attended. Some degree programs require the submission of scores from the Graduate Record Examinations (GRE) General Test, which is administered in the United States and abroad by the Educational Testing Service (ETS). This examination, in addition to any GRE Subject Tests that may be required by the student's program of study, should be taken as early as possible to ensure that official scores are released and received no later than the stated deadline of the program for which the student is applying. Applicants to combined degree programs should consult both programs' admissions requirements and submit scores if either of the two programs require the GRE General Test and/or Subject Tests. For all programs where the GRE General Test is not accepted, any scores submitted will not be considered for the purposes of admission. For programs where the GRE General Test is optional, any scores submitted will be taken into consideration for the purposes of admission, and any self-reported scores must be verified with official scores.

Applicants whose native language is not English must present evidence of proficiency in English by satisfactorily completing the Test of English as a Foreign Language (TOEFL), which is administered by ETS, or the International English Language Testing System (IELTS). Applicants who have received or will receive an undergraduate degree from a college or university where English is the primary language of instruction are exempt from the English Language Test requirement and are not required to submit the TOEFL or IELTS. Applicants must have studied in residence at the undergraduate institution for at least three years to qualify. The TOEFL or IELTS, if required, should be taken as early as possible to ensure that official scores are released and received no later than the stated deadline of the program for which the student is applying.

Students who do not demonstrate sufficient proficiency in English may be retested or asked to take courses in English for speakers of other languages. A higher level of proficiency will be required in order for students to serve as teaching fellows.

Non-U.S. applicants who accept offers of admission will be required to give appropriate evidence of necessary financial support before the university will be able to issue visa documents.

The application contains questions regarding prior or pending criminal charges, disciplinary sanctions, and breaks or leaves of absence in educational/professional experience. Responses regarding prior or pending criminal charges are not shared with the program to which an applicant seeks admission, nor are they a bar to admission in the graduate school. When an applicant answers affirmatively to any of these questions, however, the graduate school will evaluate the circumstances outlined by the applicant to determine if they are potentially relevant to the applicant's participation in the Yale community as a graduate student. In cases where such charges are pending, the graduate school may decide to admit the applicant contingent upon the charges being resolved or to defer the decision on admission until the charges are resolved. If new criminal or disciplinary charges are filed against an applicant after submission of the application but prior to matriculation, applicants are required to notify the graduate school admissions office of this fact in writing. Failure to do so may result in rejection of an application or rescission of an offer of admission.

It is the policy of the graduate school to verify all credentials submitted in support of an application. All transcripts, recommendations, publications, standardized test scores, and supplemental materials may be traced to their sources in order to confirm their authenticity. Written materials submitted by an applicant are subject to review for the purpose of identifying plagiarism. Any falsification or misrepresentation contained in the application and supplied by an applicant may be cause for denying or rescinding admission to the Graduate School of Arts and Sciences.

Applicants are typically notified of decisions regarding their applications during the months of February and March. Official notification is sent from the Graduate School of Arts and Sciences only.

All entering students must have obtained the bachelor's degree or its international equivalent. Offers of admission are contingent on a student's providing an official transcript indicating that the student has been awarded a baccalaureate degree (or its international equivalent) prior to matriculation. Students who are not able to provide such evidence will not be permitted to register. Those who have been engaged in graduate work at Yale or another university must also present an official transcript giving evidence of degree(s) awarded and/or satisfactory completion of the previous year's work.

Applicants who have been previously denied admission to the Graduate School of Arts and Sciences three times may not apply again.

The Office of Graduate Admissions will not release application materials, including standardized test scores, letters of recommendation, or transcripts, to the applicant or other institutions or agencies for any purpose. Students will need to contact ETS, recommenders, or educational institutions they have previously attended in order to furnish such materials to a third party.

Programs of Study

FULL-TIME DEGREE CANDIDACY

Most students enrolled in the graduate school are registered for full-time study as they pursue a Ph.D. or master's degree program. These students devote their full effort to coursework, preparing for qualifying examinations, gaining teaching experience, and researching and writing a thesis or dissertation.

PART-TIME STUDY

In rare circumstances, qualified individuals who are unable to devote their full time to graduate study may apply and be admitted as part-time students in terminal master's programs. For more complete information, see Part-Time Study under Academic Regulations.

NONDEGREE STUDY

Qualified individuals who wish to study at the graduate level as nondegree candidates may be admitted to the Division of Special Registration (DSR). Admission to the DSR is for one term or one year only and carries with it no commitment by the graduate school for further study. Students admitted for the academic year must demonstrate satisfactory academic performance in the first term in order to register for the second term. Students in the DSR may obtain transcripts indicating the appropriate credit for work completed. Students enrolled full-time in the DSR may pursue internship opportunities only after they complete their program. They may not concurrently participate in an internship while enrolled in the DSR. International students who are in the United States on a J-1 visa should consult with the Office of International Students and Scholars (OISS) about their eligibility to extend their visa in order to participate in an internship opportunity after their program.

DSR students engaged solely in course work are identified as *visiting students*. Although normally admitted for full-time study, visiting students who are U.S. citizens or permanent residents may be admitted for part-time study and are charged tuition on a per-course basis, whether for credit or audit. International visiting students must maintain a record of full-time enrollment (four courses for credit per term) for the duration of their program due to visa requirements. Please refer to Financing Graduate School for a schedule of tuition and fee charges. Students admitted to the DSR as vsiting students are not eligible for financial aid, including federal and most nonfederal student loans.

Advanced graduate students who are degree candidates (at the master's or Ph.D. level) at another university and who have made arrangements with a specific graduate school faculty member for a research project under that faculty member's direct supervision may be admitted to the DSR as *visiting assistants in research*. Undergraduate students in combined or simultaneous B.S./M.S., B.A./M.A., or similar programs are not

considered advanced graduate students. Visiting assistants in research are not eligible to take courses and are limited to a maximum of two years of study. Student research conducted at Yale must be part of the visiting student's thesis or dissertation. The extent and location of the research completed at Yale must be cited in the completed thesis or dissertation. The graduate school does not provide financial support to visiting assistants in research. Such students either hold standard graduate-student assistantship in research appointments that are funded by the faculty adviser or provide their own funding through external awards or personal resources. Please refer to Financing Graduate School for a schedule of tuition and fee charges.

Detailed information, requirements, and access to the online DSR application are available at https://gsas.yale.edu/admissions/non-degree-application-process. DSR applicants must provide evidence of insurance coverage for the duration of their studies at Yale at the time of application.

Some departments at Yale have formal exchange agreements with universities in other countries that have been approved by the graduate school. Graduate students who are admitted to Yale under such approved exchange agreements may be registered as *Exchange Scholars*. Exchange scholars are not normally charged tuition. They may enroll in up to four courses per term for a maximum of two terms (one year). International exchange scholars must maintain a record of full-time enrollment for the duration of their program due to visa requirements, either by enrolling in four courses for credit if engaging solely in coursework, by engaging in a full-time program of research, or by engaging in a combination of coursework and research.

In rare circumstances, students may apply for a second year of registration in the DSR; however, cumulative enrollment is limited to two years. Students enrolled in the DSR who are subsequently admitted to degree programs in the graduate school may receive academic and tuition credit for no more than four courses completed while enrolled in the DSR, provided that the department recommends such credit and the appropriate academic dean approves.

INTERDISCIPLINARY STUDY

All graduate students are formally associated with one department or program, and in the case of students in combined-degree programs, with two. Students may, however, be encouraged to take one or more courses in related departments. Students are often advised by faculty members from more than one department during their dissertation research. Students in the graduate school, with permission of the director of graduate studies and the relevant school, may take advantage of particular course or research opportunities in Yale College and Yale's professional schools.

COMBINED- AND JOINT-DEGREE PROGRAMS

Students interested in African American Studies, Early Modern Studies, Film and Media Studies, and Women's, Gender, and Sexuality Studies pursue a combined Ph.D. with departments in related fields. In addition to these academic programs, there are several formal interdisciplinary Ph.D. programs in the graduate school listed under the appropriate departmental entries of this bulletin. Current students may not transfer to a combined Ph.D. program after they have advanced to candidacy. *Ad hoc* programs may also be approved. A student who is interested in an *ad hoc* program should prepare a written proposal for review and approval by the relevant departments
and academic dean before the student has advanced to candidacy. The proposal must include an agreed-upon listing of course and other requirements, along with a timeline for completion of the degree.

Students are encouraged to contact the appropriate directors of graduate studies about specific opportunities for interdisciplinary study throughout the graduate school and university.

The graduate school also participates in formal joint-degree programs with certain professional schools, including the J.D./M.A. and J.D./Ph.D. programs in cooperation with the Law School; the M.D./Ph.D. program in cooperation with the School of Medicine; and the Ph.D./M.B.A. program in cooperation with the School of Management. In addition, joint-degree programs with professional schools have been approved for master's students in Chemical & Environmental Engineering, European and Russian Studies, and International and Development Economics. These programs are described in the individual departmental listings.

For all joint-degree programs except the M.D./Ph.D., students are required to submit formal applications to both the professional school and the graduate school indicating their interest in enrolling in the joint program. Individuals interested in the M.D./ Ph.D. program apply directly to the M.D./Ph.D. program. (See Requirements for Joint-Degree Programs, under Degree Requirements.)

COOPERATIVE DEGREE PROGRAM

Yale-University of Puerto Rico M.D./Ph.D. Cooperative Program

The Yale-UPR M.D./Ph.D Cooperative Program allows students to obtain an M.D. from the University of Puerto Rico-Medical Science Campus (UPR-MSC) and a Ph.D. from the Yale Combined Program in the Biological and Biomedical Sciences (BBS) in approximately eight years. This program is targeted to those students who are committed to a research career in biomedical, translational, or health sciences, and who meet the requirements for admission to both the Ph.D. program at Yale and the M.D. program at UPR-MSC.

APPLICATION AND ADMISSIONS PROCESS

Prospective students apply simultaneously to UPR-MSC and to Yale through each institution's respective online application process. The admission process for UPR-MSC School of Medicine starts in December and ends by mid-March, by which time Yale usually provides its decision on admissions to the Ph.D. program. Students must be accepted by both programs to participate in the M.D./Ph.D. Cooperative Program. Admission to UPR-MSC or to Yale does not guarantee admission to the M.D./Ph.D. Cooperative Program.

PROGRAM DETAILS

Years one to three: UPR-MSC

Students are required to complete the first three years of the Medicine Program at UPR-MSC. Students travel to Yale for eight weeks in the summer after their first year of medical school to complete one to two laboratory rotations.

Years four to seven: Yale

Years four through seven of the program are spent at Yale. Students complete lab rotations and advanced coursework, take the qualifying exam, and conduct dissertation research. They also complete one term of teaching and attend seminars, journal clubs, departmental retreats, and social/networking activities. The students' progress on the dissertation research and advanced coursework are guided by the DGS of the Ph.D. Program, thesis adviser, and thesis committee.

The UPR-MSC Ph.D. candidates must meet all of the academic requirements of their doctoral programs, including one term of teaching and completion of required Ph.D. courses. Any exceptions to coursework requirements will be addressed on a case-by-case basis by the director of graduate studies and associate dean of the graduate school. Completion of the Ph.D. requirements is estimated at four years. Writing, defense, and submission of the thesis is subject to approval by the Ph.D. thesis committee.

Year eight: Return to UPR-MSC and Graduation

Upon successful completion of the dissertation research and required coursework, the Ph.D. will be awarded by Yale University. After receiving the Ph.D., students return to UPR-MSC for the remainder of their medical training and to receive their M.D. degree from UPR-MSC. The expectation is that the M.D. degree will not be awarded prior to the completion of the Ph.D. requirements.

EXCHANGE SCHOLAR PROGRAM

http://gsas.yale.edu/domestic-exchange-programs

Graduate students in Yale Ph.D. programs may petition to enroll full- or part-time for a term or an academic year as exchange scholars at the University of California at Berkeley, Brown, the University of Chicago, Columbia, Cornell, Dartmouth, Harvard, the Massachusetts Institute of Technology, the University of Pennsylvania, Princeton, and Stanford. The Exchange Scholar Program enables students to take advantage of educational opportunities not available at their home institutions. Applications are available at the website listed above. Please direct questions to Assistant Dean Sarah Insley (sarah.insley@yale.edu). Applications must be received at least eight weeks prior to the beginning of the term for which the student is applying.

INTERNATIONAL GRADUATE STUDENT EXCHANGE AGREEMENTS

http://gsas.yale.edu/domestic-exchange-programs

The graduate school has established and continues to develop formal exchanges with a number of institutions internationally in cases where there are reciprocal academic benefits for faculty and graduate students. Yale doctoral students may participate in the international exchanges listed below. Most of them last one term or a full academic year, and a small number of exchanges are available for summers only.

All international exchange agreements must be approved in advance by the graduate school to ensure that they meet university policies and graduate school guidelines. Departments interested in establishing an exchange program must prepare a statement that demonstrates that there is a clear academic and reciprocal need for the program, and that the program will conform to the established guidelines for exchange

agreements. Students and faculty interested in pursuing these exchanges should contact Assistant Dean Sarah Insley (sarah.insley@yale.edu).

International Exchange Programs

Chemistry

Universität Göttingen, Germany

Earth and Planetary Sciences

University of Helsinki, Finland

Economics

Aalto University, Helsinki, Finland; Institut d'Études Politiques de Paris ["Sciences Po"], France; Università Bocconi, Milan, Italy; Universität Bonn, Germany; Universität Mannheim, Germany

French

École Normale Supérieure-PSL, Paris, France; Institut d'Études Politiques de Paris ["Sciences Po"], France

Graduate School

Baden-Württemberg Exchange, Germany; Center for the Study of Medicine and the Body in the Renaissance (CSMBR), Pisa, Italy; Graduate Institute of International and Development Studies, Geneva, Switzerland; German Academic Exchange Service (DAAD), Germany; Hebrew University, Jerusalem, Israel; Kyoto Consortium for Japanese Studies (KCJS), Kyoto, Japan; Royal Holloway College, University of London, England; Università di Trento, Italy; University College London, England

History

Institut d'Études Politiques de Paris ["Sciences Po"], France

Italian Studies

Scuola Normale Superiore (SNS), Pisa, Italy

Political Science

Department of Politics and International Relations (DPIR), University of Oxford, England; Institut d'Études Politiques de Paris, France ["Sciences Po"]; Nuffield College, University of Oxford, England

Public Health

National and Kapodistrian University of Athens, Greece

Sociology

Institut d'Études Politiques de Paris ["Sciences Po"], France; University of Copenhagen, Denmark

SUMMER STUDY

http://summer.yale.edu

Doctoral students are funded year-round and are expected to make progress toward the completion of their degrees during the summer months. (See Summer Registration under Registration Status and Leaves of Absence, under Academic Regulations.) See individual departmental policies in this bulletin regarding specific expectations for degree programs during the summer. Although the graduate school does not offer

academic courses in the summer, language for reading instruction is available through the Yale Summer Session, and doctoral students may wish to take advantage of these programs.

Degree Requirements

The requirements set forth in the pages that follow are the minimum graduate school degree requirements that apply to all degree candidates. Students should consult the listings of individual departments and programs for additional program-specific requirements.

- · Requirements for the Degree of Doctor of Philosophy
- · Requirements for the Degree of Master of Philosophy
- · Requirements for the Degree of Master of Arts or Master of Science
- · Requirements for Joint-Degree Programs
- Responsible and Ethical Conduct in Research
- Petitioning for Degrees

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Length of Study

In most fields of study, six years is normally sufficient for the completion of the Ph.D. Departments and programs make every effort to design a course of study and to provide advice and guidance to enable students to complete their work within six years. Normally three, or at most three and one-half, years are devoted to the completion of predissertation requirements (courses, examinations, and the selection of a dissertation topic). The remaining time, typically two to three years, is devoted to conducting research and writing the dissertation.

Residence Requirement

Students seeking the Ph.D. degree are required to be in residence in the New Haven area during at least three academic years. This is an academic requirement, distinct from and independent of the tuition requirement described below. The residence requirement must normally be met within the first four years of study. Any exception to the residence requirement must be approved by the department and by the appropriate academic dean.

Tuition Requirement and the Continuous Registration Fee

All Ph.D. candidates are charged four years (eight terms) of full tuition, or proportionately less if all degree requirements, including submission of the dissertation, are completed in fewer than four continuous years of full-time study from the date of matriculation in the Ph.D. program.

Once the full-tuition obligation has been completed, registered students are charged the Continuous Registration Fee (CRF).

Transfer Credit/Course Waivers

The graduate school does not award transfer credit for graduate work completed before matriculation at Yale.

Non-Yale Courses A department may, with the approval of the graduate school, waive a portion of the Ph.D. course requirement (typically three courses) in recognition of previous non-Yale graduate-level work completed after receipt of the bachelor's or bachelor's-equivalent degree. Such a waiver does not affect the tuition requirement. Courses taken prior to matriculation at Yale will not appear on the student's graduate school transcript. The Yale courses waived will be recorded on the student's transcript and in the degree audit system as waived.

Yale Courses With the approval of the department, a doctoral student who is currently enrolled may petition to count up to one year of relevant coursework completed in a Yale master's or professional doctoral program as partial fulfillment of the Ph.D. course requirements. This petition must be received by the appropriate associate dean in the graduate school before the end of the student's first year of study in the Ph.D. program. The dean may reduce the four-year tuition requirement by either one or two terms, based on the number of courses accepted. The courses accepted will be listed on the student's transcript.

Waived courses are not counted in determining a student's eligibility for either terminal or en route M.A. or M.S. degrees.

Foreign Language Requirement

Language requirements are set by individual departments and programs and are explained in the individual department listings. All departmental requirements are subject to initial approval by the Executive Committee of the Graduate School and are monitored by the Degree Committee. A department cannot make exceptions to its own requirements without authorization by the Degree Committee.

Graduate students taking undergraduate language courses are graded according to the Yale College grading scale. Where applicable, language courses may count toward graduate degree requirements in some programs (see program descriptions). Undergraduate language courses do not count toward the Honors requirement.

The required level of proficiency in foreign languages, and the method for demonstrating it, are determined by the individual departments. Students are urged to be prepared to meet language requirements at the beginning of their first year of study.

Course, HP-Average, and Honors Requirements

The course requirements for the Ph.D. degree are set individually by each department or program. Each course offered in the graduate school counts for a single credit or, in rare cases, one-half credit. Only courses offered by the graduate school and officially numbered on the graduate level (i.e., 500 or higher), and receiving a qualitative grade of Honors, High Pass, or Pass, can fulfill requirements for the doctoral degree, with the exception of certain undergraduate language courses or where specified in advance by the department or program. Although departments may set more stringent requirements, to meet the minimum graduate school quality requirement for the Ph.D., students must achieve the grade of Honors in at least two one-credit graduate courses taken after matriculation in the graduate school and during the nine-month academic year and achieve an HP average in coursework required towards the Ph.D. The HPaverage and Honors requirements must be met in courses other than those concerned exclusively with dissertation research and preparation.

A student who has not met the HP-average and Honors requirements at the end of the fourth term of full-time study will not be permitted to register for the fifth term. A student who is not in academic good standing with regard to course work or research, as defined by the minimum standards established by the graduate school and the expectations outlined by the student's department or program, may be dismissed from the graduate school. Such dismissal will be recorded on the student's transcript.

Qualifying Examination

Each Ph.D. student must pass a general examination, separate from course examinations, in a major subject and in such subordinate subjects as may be required by the department or program. Such examinations are described in the individual program listings. Students must assemble a qualifying examination committee in consultation with their program. Students unable to constitute a committee that satisfies the academic requirements of their program will normally be withdrawn from the graduate school at the end of year three. Students should consult with their director of graduate studies for further information about this requirement.

Committee Constitution Requirement

Each Ph.D. student must have a dissertation committee, including an adviser who is a member of the graduate school faculty and at least one additional committee member who is a tenure-track Yale faculty member, approved by the student's department in order to register for the fourth year of study. Students without an approved committee will normally be withdrawn from their program.

Prospectus

The dissertation topic, in the form of a prospectus, must be approved by the department or program. Certification of this approval, together with a copy of the prospectus, must be filed with the graduate school registrar at least six months prior to the submission of the dissertation. By the time a prospectus is submitted, the program must approve a member of the graduate faculty to serve as the primary adviser for the dissertation. Students who plan to submit the dissertation before the end of the fourth year of study should be sure to reserve time to satisfy this requirement.

The prospectus should be viewed as a preliminary statement of what the student proposes to do in the dissertation and not as an unalterable commitment. However, substantive deviation from the dissertation project outlined in a prospectus (as determined by the director of graduate studies and associate dean) will require that the student draft a new prospectus to be approved by the dissertation committee at least six months prior to the submission of the dissertation.

In consultation with their faculty advisers and directors of graduate studies, students should give serious thought to the scale of proposed dissertation topics. There should

be a reasonable expectation that the project can be completed during the stipulated duration of the degree program.

The appropriate form and typical content of a prospectus inevitably vary from field to field. In most cases, however, a prospectus should contain the following information:

- 1. The name of the dissertation adviser.
- 2. A statement of the topic of the dissertation and an explanation of its importance. What in general might one expect to learn from the dissertation that is not now known, understood, or appreciated?
- 3. A concise review of what has been done on the topic in the past. Specifically, how will the proposed dissertation differ from or expand upon previous work? A basic bibliography should normally be appended to this section.
- 4. A statement of where most of the work will be carried out for example, in a Yale library or another library or archive, in the laboratory of a particular faculty member, or as part of a program of fieldwork at specific sites in the United States or abroad.
- 5. If the subject matter permits, a tentative proposal for the internal organization of the dissertation for example, major sections, subsections, sequence of chapters.
- 6. A provisional timetable for completion of the dissertation.

Dissertations are normally submitted in English. If there is a strong academic reason to submit all or a portion of the dissertation in a foreign language, students must petition to do so at the time of the submission of their prospectus. The petition should be submitted in the form of a letter explaining the academic reasons for using a foreign language and will be evaluated by the director of graduate studies and the appropriate dean. Petitions for writing and submitting a dissertation in a foreign language will not be accepted after students have advanced to candidacy.

Admission to Candidacy

Admission to candidacy indicates that the department and the graduate school consider the student prepared to do original and independent research. Students will be admitted to candidacy when they have completed all predissertation requirements, including the dissertation prospectus and excluding any required teaching. Admission to candidacy will normally take place by the end of the third year of study. Any programmatic variations from this pattern that have been approved by the Executive Committee of the Graduate School are described in the individual program statements. Training in teaching can occur both before and after a student is admitted to candidacy. A student who has not been admitted to candidacy at the expected time will not be permitted to register for the following term and will be withdrawn from their program. At the time of advancement to candidacy, eligible students who have not petitioned for or received en route degrees (e.g., M.A., M.S., M.Phil.) will automatically be considered for such degrees. If a student advances to candidacy after the deadline to submit a petition for a degree in that term, the student will be considered for a degree in the following term.

Training in Teaching

The Teaching Fellow Program (TFP) is the principal framework at Yale in which graduate students learn to become effective teachers. Learning to teach and to evaluate student work is fundamental to the education of graduate students. Teaching is required in many departments and is an expectation for all doctoral students. All graduate students teaching for the first time at Yale are required to attend a "Teaching at Yale Day" (T@YD) orientation. The TFP provides opportunities for graduate students, under faculty guidance, to develop teaching skills through active participation in the teaching of Yale undergraduates. Teaching fellows who encounter problems or difficulties related to their teaching appointments are encouraged to meet with the appropriate dean. Only students registered for at least half-time study may serve as a teaching fellow (TF) or as a part-time acting instructor (PTAI). For a more detailed description of these types of appointments, see Teaching Fellow Levels in the Financial Aid section under Financing Graduate School. Students must complete the entire semester (or other relevant period) of teaching in order to receive academic credit for teaching and for a teaching experience in the TFP to appear on the transcript.

Faculty should clearly communicate to students and teaching fellows their expectations about the evaluation of work, feedback to students, and grading policies. Faculty are expected to prepare course syllabi, assignments, and examinations. Typically, they should not ask teaching fellows to give lectures when they are unable to attend class, although they are encouraged to offer occasional opportunities for student lectures when they can attend and advise. Teaching fellows may be asked to assist with administrative activities (such as placing course material on library reserve or online, making photocopies for class, ensuring that audiovisual resources are available and working, and the like). In general, however, the faculty member is responsible for such activities.

Graduate students may occasionally serve as graders for graduate-level courses, but only in highly quantitative courses with frequent, graded assignments. To avoid conflicts of interest, teaching fellows should not normally be assigned to evaluate the work of graduate student peers. However, in courses requiring extensive quantitative work, teaching fellows may score quantitative homework and exams submitted by graduate students, using nondiscretionary scoring keys approved by the faculty instructor. In these instances, the faculty member should review the teaching fellow's scoring and must assign the final grade. In courses that are double-titled with both graduate and undergraduate numbers, the same guidelines hold for the grading of assignments; all other grading of graduate students should be done by the faculty member.

The graduate school requires that all students who teach be in academic good standing. In addition, they must be fluent in English. Graduate students whose native language is not English are required to meet the oral English proficiency standard before they may begin teaching. This includes teaching in foreign language courses. The standard may be met by (1) passing the Center for Language Study oral exam, (2) passing the speaking section of the iBT TOEFL, (3) passing the speaking portion of the IELTS exam, or (4) having received an undergraduate baccalaureate degree or its equivalent from an institution where the principal language of instruction is English and the student was in residence for at least three years. In some instances, a student's academic dean or director of graduate studies may require that students with an undergraduate degree from English-speaking institutions also pass an oral English exam to satisfy the language requirement. Doctoral students who have not met the oral English proficiency standard must enroll in at least one course offered by the Center for Language Study's English Language Program each term.

Dissertation

The dissertation should demonstrate the student's mastery of relevant resources and methods and should make an original contribution to knowledge in the field. Normally, it is expected that a dissertation will have a single topic, however broadly defined, and that all parts of the dissertation will be interrelated but can constitute essentially discrete units. Beyond this principle, the faculty will apply the prevailing intellectual standards and scholarly practices within their fields in advising students with regard to the suitable scope, length, and structure of the dissertation, including what constitutes an original contribution to that field.

In accord with the traditional scholarly ideal that the candidate for a doctorate must make a contribution to knowledge, all dissertations that have been accepted by the graduate school are published electronically through ProQuest and are deposited in the collection of the Sterling Memorial Library. As such, classified or restricted research is not acceptable as part of the dissertation. Exceptions must be approved in advance by the Degree Committee.

Dissertations must be written in and submitted in English except in some disciplines in which there are strong academic reasons for the submission of a dissertation in a foreign language. A dissertation may not be translated into English by someone other than the student.

Dissertations must be submitted to the graduate school by the respective deadlines in the academic calendar to be considered for December or May degrees. No exceptions are made to these deadlines, which have been established to allow sufficient time for departments to receive evaluations from readers and recommend students to the Degree Committee. Once the adviser and committee have approved a dissertation for submission and the director of graduate studies has been notified, the student submits the dissertation along with the degree petition and other forms based on the requirements set forth on the Dissertation Progress Reporting and Submission (DPRS) site (https://dissertation.yale.edu/dprs). The director of graduate studies must approve a complete list of dissertation readers for each dissertation on the Notification of Readers (NOR) link on the DPRS site.

Registered doctoral candidates must have a principal adviser with an appointment on the graduate school faculty. The graduate school requires that each dissertation be read by at least three people but not more than five, at least two of whom hold faculty appointments in the graduate school. All readers must hold the Ph.D. degree as well as a faculty position or be considered otherwise qualified to evaluate the dissertation. The process for assigning readers is determined by the department, which is responsible for confirming the qualifications, contact information, and availability of all readers before notifying the graduate school of these appointments. All appointments of readers are subject to review by the associate dean. The department is responsible for reassigning readers as necessary, and this process will not extend the deadline for readers' reports to be returned to the graduate school. Once all readers' reports have been submitted, students may view them in the DPRS system. Readers' reports become part of the student's permanent academic record.

Award of the Ph.D. will be considered by the Degree Committee only if all readers' evaluations have been received by the graduate school and are positive, all other degree requirements have been met, and the department has recommended the awarding of the degree. Should a reader indicate that a dissertation contains significant errors in typing, grammar, spelling, reference citations, or other textual matters, the student will be required to revise the dissertation by a date provided by the registrar. A new pdf of the dissertation must be uploaded in the DPRS system. The graduate school must receive approval from the director of graduate studies indicating that the student has addressed the readers' concerns, before the dissertation can be recommended for a degree. In the event that a dissertation is evaluated by any reader as Not Acceptable, the dissertation will be administratively withdrawn from submission. Departmental practice determines the number of reevaluations normally permitted. If reevaluation is permitted, the student must resubmit the dissertation in a subsequent degree cycle.

The graduate school does not require departments to evaluate the dissertations of degree candidates who are no longer registered. The decision to review such dissertations rests entirely with the respective department or program.

REQUIREMENTS FOR THE DEGREE OF MASTER OF PHILOSOPHY

The Master of Philosophy is awarded en route to the Ph.D. in many departments and programs. The minimum general requirements for this degree are that a student shall have completed all requirements for the Ph.D. except required teaching, the prospectus, and dissertation. Students will not generally have satisfied the requirements for the Master of Philosophy until after two years of study, except where graduate work done before admission to Yale has reduced the student's graduate course work at Yale. In no case will the degree be awarded for less than one year of residence in the Yale graduate school.

Not all programs offer the M.Phil. degree. Information regarding special requirements for the degree, if any, are stated in the individual program listings.

REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS OR MASTER OF SCIENCE

Except in the case of programs listed below under Terminal M.A./M.S. Degrees, students are not admitted as candidates for the Master of Arts or Master of Science degree. However, students in doctoral program may be awarded the M.A. or M.S. en route to the Ph.D. degree if offered by their program.

Although departments may set more stringent requirements, the minimum general requirements must comply with the credit hour standards set by the U.S. Department of Education and include the (1) completion of a minimum of seven one-credit graduate courses leading to the Ph.D. or the equivalent of such courses, with grades that satisfy departmental requirements; (2) completion of one academic year in full-time residence or the equivalent at Yale; (3) recommendation by the department for award of the degree, subject to final review and approval by the Degree Committee.

In no case may courses taken prior to matriculation in the graduate school, or in Yale College or other summer programs, be applied toward the requirements for the M.A. or M.S. degree.

Some departments do not offer the M.A. or M.S. en route to the Ph.D., or award it only to students who are withdrawing from the Ph.D. program. For information about this or any other special requirements additional to the general requirements stated above, see the program listings.

Students enrolled in a Ph.D. program may receive a master's degree from another program provided that it is in a related field of study and deemed necessary for the completion of the proposed dissertation research, but may only earn one en route M.A. or M.S. degree during their doctoral studies. The student's proposed program of study must receive formal approval in writing from the directors of graduate studies in both programs and the appropriate associate dean prior to enrollment in courses that will fulfill master's degree requirements in another program. Courses taken toward a master's degree in another program must be part of the student's course requirement for the Ph.D., as approved by the directors of graduate studies in both programs. However, such course work cannot also be counted toward a master's degree in the program to which the student was admitted. A student may not advance to candidacy until all requirements have been completed for both the en route master's degree in the program to which the student was admitted and the proposed master's degree in a related field. Students who wish to obtain a master's degree in a field that is not directly related to the doctoral degree must apply for a personal leave from the Ph.D. program and submit an application for admission to the master's program. Any financial aid offered to the student for a Ph.D. program may not be transferred to a master's degree course of study. Students enrolled in combined programs normally receive combined en route degrees, if the en route is offered individually by both programs.

Terminal M.A./M.S. Degrees

The M.A. and M.S. degrees are offered as terminal degrees in eighteen departments and programs: African Studies, American Studies, Applied Physics, Archaeological Studies, Computational Biology and Biomedical Informatics, Computer Science, East Asian Studies, Engineering & Applied Science, English, European and Russian Studies, History, History of Science and Medicine, International and Development Economics (IDE), Medieval Studies, Music, Near Eastern Languages and Civilizations, Public Health, and Statistics and Data Science.

The residence and tuition requirements for a terminal M.A./M.S. degree are a minimum of one year of full tuition and course work in residence in one-year programs, or a minimum of two years of full tuition and course work in residence in two-year programs. For information about departments that offer one-year or two-year programs, see the program listings. Students who extend their program solely to retake a class or finish a master's thesis in order to be eligible to graduate and who have met the tuition requirement will be charged the Continuous Registration Fee.

With the approval of the program and the appropriate academic dean, a student may be admitted for part-time study toward a master's degree. In that case, tuition will be charged on a per-course basis. Part-time study does not change the one- or two-year full-tuition obligation described above. Part-time students must complete all degree requirements within five years of matriculation. Part-time status may affect a student's eligibility for Yale Health coverage.

Individual programs establish the specific course and language requirements for these degrees. Although programs may set more stringent requirements, the minimum graduate school requirement for students admitted for M.A./M.S. degrees is an overall grade average of High Pass, including a grade of Honors in at least one one-credit graduate course (for students enrolled in one-year programs), or in at least two one-credit graduate courses (for students enrolled in two-year programs). In order to maintain the minimum average of High Pass, each grade of Pass on the student's transcript must be balanced by one grade of Honors. Each grade of Fail must be balanced by two grades of Honors. If a student retakes a course in which the student has received a failing grade, only the newer grade will be considered in calculating this average. The initial grade of Fail, however, will remain on the student's transcript. A grade awarded at the conclusion of a full-year course in which no grade is awarded at the end of the first term would be counted twice in calculating this average.

Each course offered in the graduate school counts for one or one-half credit. Only courses offered by the graduate school and officially numbered on the graduate level can fulfill requirements for the master's degree, with the exception of certain language courses or when specified in advance by the department or program. A student who has not fulfilled the course requirements for the degree at the conclusion of the standard duration of the program can, at the discretion of the department and associate dean, be granted one additional term to fulfill degree requirements. If the student has not taken the requisite number of courses but has fulfilled the tuition requirement, the student will be charged the Continuous Registration Fee. If the student must take additional courses beyond the number required, the student will be charged tuition on a percourse basis.

No credit will be awarded toward the M.A./M.S. degree for courses taken prior to matriculation in the graduate school or taken in Yale or other summer programs. Students in one of Yale's professional schools who matriculate in the graduate school to complete a joint master's degree may, however, with the permission of their director of graduate studies, count courses already completed in their professional school program toward the joint degree. See the individual program or department listings.

The master's degree may also be earned jointly with the B.A./B.S. in certain departments by students enrolled in Yale College. For further information, see *Yale College Programs of Study*, available from the Office of the Dean of Yale College.

REQUIREMENTS FOR JOINT-DEGREE PROGRAMS

Students who are candidates for degrees in any of the joint programs sponsored by the graduate school and Yale's professional schools must meet the requirements established by each school for the degree they are seeking. Degree requirements in the graduate school include both the graduate school's general requirements and any special requirements set by the relevant department or program. In all cases the Honors requirement must be fulfilled in non-research courses offered primarily for graduate school students, taken after matriculation in the graduate school.

In addition to the J.D./Ph.D., J.D./M.A., M.D./Ph.D., and Ph.D./M.B.A. programs described below, joint-degree programs with other professional schools have been

approved for students in Chemical & Environmental Engineering, European and Russian Studies, and International and Development Economics. These programs are described in the individual department listings.

J.D./Ph.D. and J.D./M.A. Programs

Admission to the graduate school joint-degree programs with the Law School, described below, requires separate admission to both schools as well as approval by the appropriate associate dean in each school, and by the director of graduate studies in the student's graduate school department. Students must apply for admission to a joint program no later than their first year of study in a J.D., Ph.D., or two-year M.A. program, and must matriculate in the joint program no later than the beginning of their second year. Students wishing to pursue a J.D./M.A. in a one-year M.A. program must matriculate in the M.A. program as a joint-degree candidate.

In the J.D./Ph.D. program, the first year of study is spent principally in the Law School. The second and third years are combined according to the interest of the student. As many as six term courses, designated by the student at the beginning of the term, may be counted toward both degrees. During this time all course work and language requirements for the Ph.D. program are normally completed. The J.D. should be completed by the end of the fourth year. During the fifth year the student is expected to complete all remaining predissertation requirements and be admitted to candidacy. The teaching requirement for the Ph.D. will normally be completed by this time. Any exception to this pattern of study must be approved by the appropriate associate dean.

The minimum residence requirement in the J.D./Ph.D. program is four years. The tuition requirement is two and one-half years in the Law School and three and one-half years in the graduate school. Financial aid for tuition is provided by each school according to its own criteria, typically for two and one-half years in the Law School and three and one-half years in the graduate school, and is awarded by each school during the terms in which the student pays tuition in that school. Students are not eligible for financial aid from the graduate school during terms in which they are registered at another school.

In the J.D./M.A. program, the J.D. and M.A. degrees are awarded simultaneously at the end of the fourth year of study in one-year M.A. programs and at the end of four and one-half years of study in two-year M.A. programs. The graduate school residence and tuition requirement for J.D./M.A. students in one-year M.A. programs is one year; students in two-year M.A. programs have a one and one-half year tuition and residence requirement in the graduate school. In all cases students pay three years of tuition in the Law School. Students in J.D./M.A. programs, like other students in M.A. programs, are not ordinarily eligible for University Fellowship aid through the graduate school. Students usually enroll in the Law School during the first year of study. The pattern of enrollment in subsequent years depends on whether the M.A. program is a one-year or a two-year program.

M.D.-Ph.D. Program

This program is sponsored jointly by the graduate school and the School of Medicine. Applications for admission to the joint program are reviewed by a committee composed of faculty members and deans from both schools. Normally, admission to the program includes simultaneous admission to both schools. However, students may apply to the joint program normally by October 15 of their second year of study in either the M.D. or Ph.D. program, and they must matriculate in the joint program no later than the beginning of the following year.

Students request affiliation with a particular department or program in the graduate school by the beginning of their third year of study in the joint program, after their course and research interests have been defined. Although students usually pursue their research in one of the biological sciences, those interested in earning the Ph.D. through work in another department may do so under certain circumstances, with the approval of the M.D.-Ph.D. committee and of the relevant department or program. At the time of the student's affiliation with a non-biological/biomedical science department or program, permission for any adjustment to the teaching requirement must be obtained from the graduate school. Requests for adjustments to the program's teaching requirement should be submitted by the director of graduate studies and by the director of the M.D.-Ph.D. program, as part of a student's proposed plan of study, to the associate dean for graduate student advising and academic support.

The residence requirement in this program is seven years. The tuition requirement is three and one-half years in the School of Medicine and two and one-half years in the graduate school. To qualify for the M.D. and Ph.D. degrees, students must satisfy all degree requirements of both schools. Normally, a student admitted to this joint program must satisfy the graduate school Honors requirement and all predissertation requirements within four terms of affiliation with the Ph.D. department. This schedule may be adjusted for students who have been enrolled in either the School of Medicine or the graduate school before admission to the M.D.-Ph.D. program.

Ph.D./M.B.A. Program

The joint-degree program combines the two-year M.B.A. degree from the School of Management (SOM) with the six-year Ph.D. It allows students to complete requirements for both degrees in roughly seven years rather than the eight or more years that would be required if the degrees were pursued separately. Both degrees will be awarded simultaneously once the student has fulfilled the degree requirements of both programs. Like all graduate students, joint-degree students receive a full financial aid package from the graduate school during the terms registered there. For students in the humanities and social sciences, this includes four years of tuition fellowship, five years of stipend, and health fellowship for Yale Health coverage for each term registered. Funding for students in the sciences reflects standard, departmental packages. Students will pay one and one-half years of tuition for the three terms registered at SOM.

The SOM and the graduate school use independent admissions processes and make independent admissions decisions. Applicants must submit the results of the GMAT and, if required by the prospective Ph.D. program, the results of the GRE. Prospective students who are not currently enrolled in either the graduate school or SOM may apply to both schools simultaneously. Students already enrolled in the graduate school normally apply to SOM after taking one course at SOM and apply to matriculate at SOM any time after they have passed their Ph.D. qualifying examinations at the graduate school but prior to beginning the fifth year of study. This pattern, however, is flexible, and students interested in the joint degree should consult the websites of their departments or programs for further information. Students enrolled at SOM may apply to the graduate school during the first year of study at SOM. Following admission to both programs, each student must complete a form requesting joint-degree status. The form must be signed by the appropriate associate dean at the graduate school and at SOM and the student's director of graduate studies.

A student in the graduate school who wishes to pursue the joint degree will normally be required to take one course at SOM before applying there. To enroll in the course, the student will need to obtain the permission of the SOM instructor and state the intention to apply to the joint-degree program. The graduate school will waive one course during the term in which the student takes this preliminary course at SOM. For students in some disciplines, this prerequisite to admission will be waived. The student is expected to complete the qualifying exams and prospectus according to the standard schedule set by the graduate school. The student will normally begin study at SOM after completing the departmental Ph.D. qualifying examinations at the graduate school, but there are exceptions to this pattern described on the departmental websites. Upon admission to SOM, the joint-degree student will register at SOM for the first-year core of courses. Students may not fulfill any graduate school requirements during this time, nor may they serve as teaching fellows in the graduate school in any capacity. The student must register for a third term at SOM and complete four additional courses, normally prior to the beginning of the sixth year of study at the graduate school. Depending on the schedule of individual students, they may or may not complete all four of these remaining courses within a single term at SOM. If they do not, they may complete outstanding courses while registered at the graduate school, but in all circumstances, students are required to pay a third term of tuition to SOM.

A student who has been admitted to the graduate school while completing the first-year core at SOM may begin course work in the graduate school the following year. Once a joint-degree student has matriculated at the graduate school, it is expected that the student remain registered continuously until completing the qualifying exams. During this time, the student may undertake limited course work at SOM, but may not register there for the third and final term until the student has passed qualifying exams at the graduate school. Prospective students who apply simultaneously may start the joint degree at either school and follow the schedules outlined above.

All joint-degree students are subject to the codes of conduct published in the bulletins of their respective programs. Joint-degree students will receive separate transcripts from SOM and the graduate school. Each transcript will list the courses required for the respective school's portion of the joint degree. Each course taken may be counted toward one degree only. Students' transcripts will reflect the joint-degree status. A joint-degree student who decides not to complete both degrees may petition both schools to receive a single degree if the requirements for the single degree, including the two-year tuition requirement at SOM, are met.

RESPONSIBLE AND ETHICAL CONDUCT IN RESEARCH

Responsible and Ethical Conduct in Research (RECR) training is intended to establish a basis of understanding among graduate students concerning their rights and obligations as scholars and researchers, as noted below.

Master's and Ph.D. Students

At the start of their first year of study, all master's and Ph.D. students are required to attend sessions on professional ethics, including academic integrity, prevention of sexual misconduct, and discrimination and harassment reporting. Students must also complete an approved online RECR training module in professional ethics before they can register for the second term of their first year.

Additional requirements: (1) Students in the natural sciences must complete a department-based RECR course by the end of their first year of study. Master's students in the natural sciences will not be charged tuition for this course; (2) Students in the humanities and social sciences who receive funding from a U.S. government grant or fellowship are required to complete an online RECR course offered by CITI within one month of the start of the funding.

Students in the Division of Special Registration (DSR)

All DSR students in the natural sciences, and DSR students in the humanities and social sciences who receive funding from a U.S. government grant or fellowship, are required to complete an online RECR course. This requirement must be fulfilled within one month of receiving a Yale NetID and even if RECR training was completed at another university.

Additional requirements: (1) All DSR students registered in the fall term must complete an approved online RECR training module before they can register for the spring term; (2) DSR students in the natural sciences who intend to study at Yale for one year or more are required to complete, at no charge, the department-based RECR course taken by degree-seeking students.

PETITIONING FOR DEGREES

Graduate school degrees are awarded twice each year, at Commencement in May and at the end of the fall term (normally in December, depending on the schedule of the Yale Corporation). Degrees are not granted automatically. Students must file a petition for each degree by the appropriate date. (See Schedule of Academic Dates and Deadlines.) Petitions that have received favorable recommendations from the student's department are reviewed by the Degree Committee. When the Degree Committee has given its approval, the petition is forwarded to the faculty of the graduate school and then to the Yale Corporation for approval.

Students enrolled in Ph.D. programs should not petition for en route degrees (e.g., M.A./M.S. and M.Phil.) until after the term in which requirements for the degree are completed (e.g., students completing degree requirements during the spring term should petition for award of the degree the following fall). Students who have not petitioned for or received en route degrees (e.g., M.A., M.S., M.Phil.) will automatically be considered for such degrees in the term following advancement to candidacy. Students in terminal M.A./M.S. programs may petition for their degrees in the term in which they expect to complete their degree requirements.

Academic Regulations

- Registration
- Course Enrollment
- Grades
- Registration Status and Leaves of Absence
- · Personal Conduct and Academic Integrity Standards
- · Freedom of Expression
- · Recordings by Faculty, Staff, Students and Invited Guests
- · Postering, Chalking, and Publicity Policy

REGISTRATION

Only registered students may attend classes, receive financial aid, or use the facilities of the university. Students must register every term for the duration of their degree program (normally six years or fewer for Ph.D. programs and one or two years for students in M.A./M.S. programs). This regulation applies to all students, whether engaged in course work, preparation for qualifying examinations, or dissertation research, and, in the case of students in Ph.D. programs, whether study is in residence or in absentia. Students who do not register for any term for which they have not been granted a leave of absence (see Leaves of Absence, under Registration Status and Leaves of Absence, below) will be considered to have withdrawn from the graduate school. Privileges associated with registered status (i.e., library privileges, health care coverage, and email accounts) will likewise be withdrawn.

Unless otherwise noted in the letter of admission, students are expected to register on a full-time basis. Part-time employment at the university or elsewhere should not conflict with the obligations of the degree program or interfere with academic progress. Part-time employment beyond an average of ten hours per week requires permission of a student's director of graduate studies in consultation with the appropriate associate dean. Part-time employment includes teaching outside of the graduate school's Teaching Fellow Program. International students must consult OISS regarding their eligibility for employment while in the United States.

No student may register for any term unless the student is making satisfactory progress toward the degree and has been cleared by the Office of Student Financial Services to register. Students who are not compliant with Yale's vaccination requirements will not be allowed to register; see Required Immunizations under Health Services in the chapter Yale University Resources and Services.

Satisfactory progress means that the student has met all graduate school and departmental requirements normally expected for each stage of the student's program. For Ph.D. students before admission to candidacy and for M.A./M.S. students, this includes satisfactory completion of courses from the preceding term(s). As indicated in the sections on Course and Honors Requirements and Admission to Candidacy, under Degree Requirements, students in Ph.D. programs must satisfy the Honors requirement before beginning the fifth term of study and must be admitted to candidacy by the appropriate time. In addition to satisfying these general graduate school requirements, students must meet any additional requirements specified by

their departments. Students who fail to make satisfactory progress may be placed on a probationary status pending satisfactory completion of requirements. Ph.D. students who have been admitted to candidacy must continue to demonstrate satisfactory progress toward the degree in the annual Dissertation Progress Report (DPR). Students who fail to meet departmental or graduate school requirements by the designated deadlines, and students who have been admitted to candidacy who fail to submit the annual DPR, will be administratively withdrawn.

Students must register each term until the dissertation is submitted or until six years (twelve terms) of study have been completed. Registered students who submit dissertations after the close of the add-drop period will remain registered until the end of the term (i.e., through December for those submitting during the fall term, through May for those submitting before the spring degree deadline, and through August for those submitting after the spring degree deadline) and will retain all privileges of registration (e.g., library privileges, health care coverage, and email accounts). Students who complete all Ph.D. requirements within four continuous years of full-time study in the Ph.D. program will be registered and charged full tuition only through the term in which the dissertation is submitted. Students who have registered part-time or taken a leave of absence must complete the four-year, full-tuition obligation, regardless of when they submit the dissertation.

Students are expected to complete the dissertation within six years of study or fewer. Students who have not submitted the dissertation by the end of the sixth year of study may do so subsequently, at the discretion of the department, without registering or may request a period of extended registration by petitioning for extended registration. Prior to petitioning, students must submit the standard DPR that is required annually by May 1 of all students admitted to candidacy. Before a seventh year of registration is approved, the student and the student's adviser, as well as the director of graduate studies, must complete the DPR specifying the progress the student has made in writing the dissertation and present a detailed plan for completing the dissertation in the seventh year. Seventh-year registration petitions are decided on by departments and programs. Very rarely, students may request an eighth year of registration due to serious circumstances beyond their control that have prevented them from completing the dissertation by the end of the seventh year of study. Eighth-year registration petitions are recommended by the program and must be approved by the graduate school deans. Students who are approved for extended registration must register each term and are normally expected to be in residence.

Dissertation Completion Status Alternatively, a doctoral student who is not eligible for full-time registration may request to enroll with the status "Dissertation Completion." This part-time status enables advanced students to maintain an active NetID in order to access electronic library resources and their Yale email accounts while completing their dissertations under the supervision of a member of the graduate school faculty. A student will be charged the Continuous Registration Fee (CRF) each term and may normally hold this status for a maximum of four consecutive terms. Students on this status are not eligible to teach in the Teaching Fellow Program or to purchase health coverage as Yale affiliates. Once a student enters this status, the student may not petition to register as a full-time student in a subsequent term.

Noncumulative Registration In certain areas of study, it may be necessary for a registered doctoral student to acquire an academic or methodological skill, such as knowledge of a foreign language, that is essential for a degree requirement or for research in a particular field and for the overall progress of the dissertation, but is not an inherent part of the dissertation itself. A student may request up to one year of "noncumulative registration." General study in a field related to or parallel with the topic of the dissertation is not appropriate for noncumulative registration.

A student who wishes to have a specific period of study designated as "noncumulative" must discuss the reasons for such a period of study with and secure prior approval from the appropriate associate dean. If prior authorization has been given by the graduate school, the period of time spent in acquiring the necessary academic skill will not be counted as part of the student's six-year period of registration. Noncumulative registration does not affect the four-year full-tuition obligation. The tuition charge and any university stipend will be postponed if a student registers noncumulatively before the four-year full-tuition obligation has been satisfied. While registered noncumulatively, students pay the CRF. Doctoral students who register noncumulatively will receive a fellowship to cover the cost of the CRF and will continue to receive a Health Award from the graduate school.

COURSE ENROLLMENT

Any student who wishes to enroll in courses during a term must register through the online course selection process. Students will register for a subsequent term in the term immediately preceding through Yale Course Search. The deadlines for registration each term are listed in the Schedule of Academic Dates and Deadlines. Students who submit course enrollment forms after the appropriate deadline will be assessed a fee.

No student may attend any class unless officially registered in the course. No credit will be given for work done in any course for which a student is not officially registered, even if the student entered the course with the approval of the instructor and the director of graduate studies. Graduate students who wish to register for courses that are offered on both the graduate and undergraduate levels must register with the graduatelevel course number (i.e., 500 or higher) in order to receive credit toward their degrees. In rare instances, a graduate student may be granted permission to register for an undergraduate course that will count toward the fulfillment of course requirements for the student's graduate degree. In such cases, the student must file an approved Graduate Credit Request form (https://registrar.yale.edu/forms-petitions) with the Registrar's Office by the end of the registration period. Graduate students may not utilize the "Credit/D/Fail" option within the Yale College grading scale. Students enrolling in courses offered by a Yale professional school are subject to all policies and deadlines of both the professional school and the graduate school. Graduate students taking a course at the SOM register through the SOM registration site. Graduate students registering for courses through the Law School must submit a Law School Permission Form. Permission must be obtained within two weeks of the close of the add/drop period at the graduate school.

A student who wishes to audit a course must receive permission from the instructor (as not all faculty permit auditors in their classes) and register for the course as an auditor. The minimum general requirement for auditing is attendance in two-thirds of the class sessions; instructors may set additional requirements for auditing their classes. Audited courses appear on the student's transcript.

Course Changes

Once the registration or add/drop process has closed for a given term, all subsequent changes must be made using the Course Schedule Change Notification Form, approved by the student's director of graduate studies, and filed with the registrar. At or near the beginning each term, the registration system will open for an add/drop period for all students to adjust and finalize their schedules. Registration deadlines are published in the Schedule of Academic Dates and Deadlines. If a student is enrolled in a professional school course, all changes in enrollment status must be reported to the registrar of that school as well as to the graduate school. Forms for reporting changes to the graduate school are available online at http://registrar.yale.edu/forms-petitions.

The dates for changing enrollment in a course from Credit to Audit or Audit to Credit and for withdrawing from a course are listed in the Schedule of Academic Dates and Deadlines. If a student officially withdraws from a course by the stated deadline, the course will be removed from the student's transcript. If a student ceases to participate in a course without officially withdrawing from that course by the stated deadline, it is at the instructor's discretion to assign an appropriate qualitative grade or a grade of "Incomplete."

GRADES

The grades assigned in the graduate school are:

Н	Honors
HP	High Pass
Р	Pass
F	Fail
TI	Temporary Incomplete
I	Incomplete

A mark of "Y" is assigned as the grade for the first term of a full-year course and will be converted to a standard grade once both terms are completed, depending on the number of credits the course fulfills.

Marks of Satisfactory/Unsatisfactory may be assigned only when the department sponsoring the course has designated such marks. In such cases, the grading mode is the same for all students enrolled in the course.

The graduate school does not calculate grade-point averages, nor does it assign numerical or letter equivalents to graduate school grades. Grades assigned according to grading scales other than those described above will be returned to the instructor for conversion. If a student retakes a course, both grades remain on the transcript, but only the higher grade is counted toward the program requirements. Students do not receive credit for courses in which they receive a grade of Failure (F).

The Schedule of Academic Dates and Deadlines indicates the dates on which grades are due for the current year. Instructors have the responsibility for assigning dates for submitting course work in order to meet grade deadlines. If a student and instructor have agreed that an extension is appropriate, the student must submit to the Registrar's Office a request for the Temporary Incomplete (TI) (See http://registrar.yale.edu/ forms-petitions) with the intended completion date, signed by the instructor and the director of graduate studies. Only one TI in a single term is permitted. Temporary Incompletes received in an academic year must be converted to final grades normally by October 1 of the following academic year. If a grade is not received by the registrar by this date, the TI will be converted to a permanent Incomplete (I) or Failure (F) on the student's record, as indicated in advance by the instructor on the TI form.

In certain extraordinary circumstances, such as serious illness or a family emergency, and on the recommendation of the student's department, the appropriate academic dean may grant an additional extension. A written request for such an extension must be made by the director of graduate studies on the student's behalf within two weeks of the grade submission deadline. The request should indicate the special circumstances and suggest a date by which the student will complete the work. If the request is approved, the academic dean will inform the student and instructor. If the grade is submitted to the registrar by the new deadline approved by the academic dean, it will replace the TI. If a grade is not received by the registrar by this date, a Temporary Incomplete (TI) will be converted to a permanent Incomplete (I) or Failure (F) on the student's record, as indicated in advance by the instructor on the TI form.

"Provisional" or "temporary" grades (as opposed to Incompletes) are not permitted. Once submitted to the Registrar's Office, a grade may be changed only in cases of arithmetical or clerical error on the part of the instructor and only with the approval of the appropriate associate dean. If the registrar has not received a given grade from an instructor within two weeks of the stated deadline for the submission of grades, the student will be assigned a grade of "Incomplete" for that course.

When students are charged with academic integrity violations, grades in any relevant courses will be withheld until a formal finding has been made or the case is otherwise closed.

Students are reminded that the policies stated above are the graduate school minimum general requirements. Departments or individual instructors may have more stringent policies, and students should consult their departmental handbooks and directors of graduate studies about such requirements.

REGISTRATION STATUS AND LEAVES OF ABSENCE Registration in Residence

Students who are studying on campus, attending classes, and using university facilities are considered to be in residence. All M.A./M.S. and nondegree (DSR) students must register in residence each term, as do most students in Ph.D. programs (see also Registration in Absentia and CRF, below, and the Schedule of Academic Dates and Deadlines). Students who will be in residence during any term are required to register by the beginning of that term. (See the Schedule of Academic Dates and Deadlines.) Ph.D. students who are not registered in absentia to perform required fieldwork, research, or study are expected to register in residence.

A fee will be charged to students who register in residence after the add/drop period in each term. Late fees may be waived only if the registrar receives written notification

from the student or director of graduate studies before the start of the registration period that the student will register late because of participation in an academic program, such as a summer language course or professional meeting that coincides with the registration period. A student who cannot register during the registration period because of a sudden serious illness or family emergency should contact the assistant university registrar at gsas.registrar@yale.edu as soon as possible.

Registration in Absentia

Ph.D. students whose program of study requires full-time dissertation research, fulltime fieldwork, or full-time study at another academic institution outside the New Haven area may request to be registered in absentia. Such registration requires the recommendation of the director of graduate studies. Forms for requesting registration in absentia can be found online at http://registrar.yale.edu/forms-petitions and should be filed at least one month before the beginning of the term during which the student expects to be studying away from New Haven. A student who has not completed the three-year residence requirement will be permitted to register in absentia for compelling academic reasons only, and normally only if the student has completed all other predissertation requirements. Registration in absentia does not reduce the fouryear full-tuition or three-year residence requirements. For additional information, see Eligibility for Fellowships under Financing Graduate School.

Students who are enrolled in Yale Health and are registering in absentia should consult the staff of the Member Services Department at Yale Health about the policies governing coverage while they are away from New Haven. Yale University provides ISOS Travel Assistance at no cost to all current students (https://ogc.yale.edu/erm/ISOS). ISOS provides international and domestic emergency medical, security, and travel assistance services anywhere in the world. Students traveling internationally should register their locations at https://world-toolkit.yale.edu/resources-topic/travel to facilitate communication with the university in case of an emergency.

Continuous Registration Fee

Ph.D. students who have completed the tuition and residence requirements described above must continue to register each term through the sixth year whether in residence or in absentia, or until they submit the dissertation, whichever occurs first. Students who have met the tuition requirement are charged a Continuous Registration Fee (CRF) for each term in which they remain registered. Students who are granted permission to register beyond the sixth year are also charged the CRF. The graduate school will provide a fellowship to cover the cost of the CRF for Ph.D. students registered full-time in year seven in any term in which they serve as Teaching Fellows in the TFP.

Summer Registration

Ph.D. students receive funding and are expected to continue full-time study or research during the summer. Continuing students who were registered during the preceding spring term remain registered through August 31. Ph.D. students who wish to interrupt their studies during the summer (e.g., to accept an internship) must notify the associate dean prior to May 1. Many M.A./M.S. students continue full- or half-time independent study or research during the summer. Continuing students who were registered during the preceding spring term remain registered through August 31.

Summer Internships

Normally, full-time students who take time off from their studies to work fulltime must take a leave of absence for the term or terms in which they are employed. However, certain summer internship opportunities may be beneficial to a student's academic development and career prospects. Therefore, under certain circumstances students may be permitted to remain registered at Yale while engaged in summer internships. To be eligible, the internship must meet several requirements:

- Continuous registration while participating in an internship requires the permission of the director of graduate studies.
- The internship should serve one of two functions: either the student is learning and developing techniques or acquiring data that will be used in the dissertation, or the internship is exposing the student to a potential field of employment following completion of the degree.
- The internship must start after the end of the spring term and be completed before the start of the fall term. If an internship opportunity overlaps with the fall or spring term, students must request a leave of absence. If a Ph.D. student begins an internship before June 1, they will forfeit the final pay period of their spring stipend (May 16–May 31). Stipend payments in the final pay period cannot be prorated.
- Doctoral students participating in a summer internship normally forgo their summer stipendiary funding from the graduate school. The sole exception is if the internship is unpaid and the student is generating data that will be used in the dissertation or obtaining technical or methodological skills necessary for the dissertation. In this case, the student may request to receive summer support from the graduate school. In most cases, doctoral funding will terminate at the end of May and resume on September 1.
- Students will be limited to two summer internship opportunities. If a student wishes to pursue additional internships, the student will normally apply for a leave of absence.
- Students on internships who remain registered full-time will continue to receive a Health Award (if applicable) and other benefits of registration. Internships do not stop a student's "academic clock."
- Doctoral students wishing to pursue internships undertaken primarily for exposure to potential fields of employment are eligible to do so only after they have advanced to candidacy.

To apply for a summer internship:

1. Complete the Request for Summer Internship form (available online at https:// registrar.yale.edu/forms-petitions). Submit this form with a letter to the director of graduate studies describing the nature of the internship and work to be done. Include the name of the employer, location and dates of employment, contact information, and salary or benefits provided by the internship. If the internship restricts the student's rights to use and publish information produced during the experience, a copy of the employer's intellectual property rights agreement or proprietary data agreement should also be submitted. Explain the goals of the internship and how the experience will advance the dissertation research or promote career goals.

- 2. With the form and letter, students should submit a research plan for the coming year that describes their goals, steps for achieving those goals, and the role of the internship in their plans. Students who have been admitted to candidacy and who have included the internship in their annual Dissertation Progress Report (DPR) may refer to the DPR instead of submitting a new research plan.
- 3. The student's adviser must include a letter of support explaining how the student will benefit from this internship.
- 4. The director of graduate studies should recommend or disapprove the plan. Recommended plans should be forwarded to the associate dean for final review. The director of graduate studies should certify that the type of experience gained is consistent with the educational goals of the department.
- 5. Students on U.S. visas wishing to pursue internships should contact OISS at least eight to ten weeks prior to the start of the proposed internship, as they will require permission for "practical training" from the U.S. government.

Leaves of Absence

Students who wish or need to interrupt their study temporarily may request a leave of absence. There are three types of leave – personal, medical, and parental – all of which are described below. The general policies that apply to all types of leave are:

- 1. All leaves of absence must be approved by the appropriate associate dean on the recommendation of the department. Medical leaves also require the written recommendation of a Yale Health medical director or their designee, as described below.
- 2. Students in Ph.D. programs may be granted a leave for one term or one academic year. A leave extends the eligibility for fellowship aid by a time equal to the duration of the leave, but not for partial terms. The expected last date of registration will be adjusted by one term for each term of the leave.

Students in one-year M.A./M.S. programs may be on leave for a maximum of one term. Students in two-year M.A./M.S. programs may be on leave for a maximum total of one year.

In exceptional circumstances, renewal of a one-term or one-year leave, to a cumulative maximum total of two years of personal and medical leave, may be granted for students in Ph.D. programs. Ph.D. students completing a degree program at another institution may petition for an exceptional third year of leave, subject to the approval of the director of graduate studies and the appropriate associate dean. Leaves of absence for students in M.A./M.S. programs are not renewable. The duration of a parental leave is typically one term or one year, renewable for each birth or adoption event.

3. Students on U.S. visas who apply for a leave of absence must consult with OISS regarding their immigration status.

- 4. While on leave, students are not expected to participate in the academic life of their program, including any teaching through the TFP. Students on leave may complete outstanding work in courses for which they have been granted approved Temporary Incompletes. They may not, however, fulfill any other degree requirements during the time on leave. (Students who intend to work toward the degree while away from the university must request registration in absentia.) Students who make progress toward the degree while on leave will have their registration changed retroactively to in absentia for the period of the leave.
- 5. A leave of absence does not exempt the student from meeting the tuition requirement (payment of eight terms of full tuition in Ph.D. programs, or the appropriate established tuition requirement in M.A./M.S. programs) or from paying the CRF (if appropriate), but merely postpones the required charges.
- 6. A student on leave of absence is not eligible for financial aid, including loans; and in most cases, student loans are not deferred during periods of non-enrollment.
- 7. A student on leave of absence is not eligible for the use of any university facilities available to enrolled students.
- 8. A student on leave of absence may continue to be enrolled in Yale Health by purchasing coverage through the Student Affiliate Coverage plan. To secure continuous coverage from Yale Health, enrollment in this plan must be requested prior to the beginning of the term in which the student will be on leave or, if the leave commences during the term, within thirty days of the date the registrar was notified of the leave. Coverage is not automatic; enrollment forms are available from the Member Services Department of Yale Health, 203.432.0246.
- 9. Students living in university housing units are encouraged to review their housing contract and the related policies of the Graduate Housing Office before applying to the graduate school for a leave of absence.
- 10. Students on leave of absence do not have to file a formal application for readmission. However, they must notify the associate dean for academic support in writing of their intention to return. Such notification should be provided at least eight weeks prior to the end of the approved leave.
- 11. Students who fail to register for the term following the end of the approved leave will be administratively withdrawn from the graduate school.

Personal Leave of Absence A student who wishes or needs to interrupt study temporarily because of personal exigencies may request a personal leave of absence. The general policies governing all leaves of absence are described above. A student who is current with degree requirements is eligible for a personal leave after satisfactory completion of at least one term of study. Normally, students in Ph.D. programs are not eligible for personal leaves after the fourth year of study. In certain exceptional cases, however, personal leaves may be granted to students beyond the fourth year of study. Personal leaves cannot be granted retroactively and normally will not be approved after the fifteenth day of a term.

To request a personal leave of absence, the student must complete the appropriate form (available online at http://gsas.yale.edu/forms) before the beginning of the term for which the leave is requested, explaining the reasons for the proposed leave and stating both the proposed start and end dates of the leave and the address at which the student can be reached during the period of the leave. If the dean finds the student to be eligible

and the department approves, the leave will be granted. In any case, the student will be informed in writing of the action taken. Students who do not apply for a personal leave of absence, or whose application for a personal leave is denied, and who do not register for any term, will be administratively withdrawn from the graduate school.

Medical Leave of Absence A student who must interrupt study temporarily because of illness or injury may be granted a medical leave of absence with the approval of the appropriate associate dean, on the written recommendation of a Yale Health medical director or their designee. A student who wishes to take a medical leave of absence may request it from a clinician at Yale Health and from the office of the associate dean for academic support. The general policies governing all leaves of absence are described above. A student who is making satisfactory progress toward degree requirements is eligible for a medical leave of absence will be communicated in writing by the appropriate associate dean. To return from an approved medical leave, at least six weeks prior to the proposed return, students must (1) complete an academic assignment tailored to the student's stage of study as assigned by the student's DGS in consultation with the appropriate academic dean and (2) receive approval from an appropriate medical director or their designee at Yale Health.

The graduate school reserves the right to place a student on a mandatory medical leave of absence when, on recommendation of the director of Yale Health or the chief of the Mental Health and Counseling department, the dean of the School determines that, because of a medical condition, the student is a danger to self or others, the student has seriously disrupted others in the student's residential or academic communities, or the student has refused to cooperate with efforts deemed necessary by Yale Health and the dean to make such determinations. Each case will be assessed individually based on all relevant factors, including, but not limited to, the level of risk presented and the availability of reasonable modifications. Reasonable modifications do not include fundamental alterations to the student's academic, residential, or other relevant communities or programs; in addition, reasonable modifications do not include those that unduly burden university resources. An appeal of such a leave must be made in writing to the dean of the School no later than seven days from the effective date of the leave. An incident that gives rise to voluntary or mandatory leave of absence may also result in subsequent disciplinary action.

A student who is placed on medical leave during any term will have tuition adjusted according to the same schedule used for withdrawals. (See Schedule of Academic Dates and Deadlines). Before re-registering, a student on medical leave must secure written permission to return from a Yale Health director or their designee.

Eligible Ph.D. students will receive a Health Award from the graduate school to cover the cost of the Student Affiliate Coverage plan for the remainder of the coverage period in which the medical leave begins, if they apply for this coverage through Yale Health within thirty days of the start of their leave. In addition, Ph.D. students who extend their medical leave for a second term will receive a Health Award from the graduate school to cover the cost of Student Affiliate Coverage for one additional term. Yale Health's fall coverage ends January 31 and spring coverage ends July 31. Ph.D. students on a medical leave in the fall term who are cleared to register for the following fall term will receive a graduate school Health Award for the month of August once their fall return has been officially approved. Ph.D. students may apply for and receive the graduate school Family Support Subsidy during the term in which a medical leave begins, but not beyond.

Parental Leave of Absence A student who wishes or needs to interrupt study temporarily to care for a child or children may be granted a parental leave of absence. The general policies governing all leaves of absence are described above. A student who is making satisfactory progress toward degree requirements is eligible for parental leave any time after matriculation.

Eligible Ph.D. students will receive a Health Award from the graduate school to cover the cost of the Student Affiliate Coverage plan for the remainder of the coverage period in which the parental leave begins, if they apply for affiliate coverage through Yale Health within thirty days of the start of their leave. Yale Health's fall coverage ends January 31 and spring coverage ends July 31. Ph.D. students on a parental leave in the fall term who are cleared to register for the following fall term will receive a graduate school Health Award for the month of August once their fall return has been officially approved. Ph.D. students may apply for and receive the graduate school Family Support Subsidy during the term in which a parental leave begins, but not beyond.

Parental Support and Relief

Registered Ph.D. students who wish to modify their academic responsibilities because of the birth or adoption of a child may request parental support and relief during or following the term in which a birth or adoption occurs. Ph.D. students who become foster parents and are in the process of adopting a foster child are also eligible for parental relief in the term in which the prospective adoption relationship begins or the term that immediately follows. For the whole of the term in which the support and relief are granted, the student's academic clock stops, effectively adding an additional term to the total time to degree. During this period students remain registered fulltime, receive a standard financial aid stipend and Health Award, and receive modified departmental academic expectations that best suit the specific situation. The precise nature of the academic responsibilities undertaken or suspended during this period should be a matter of consultation between the adviser and the student, with the understanding that students are entitled to full relief from responsibilities for at least an eight-week period. Parental relief may not be combined with other funding. To request parental relief, a student should contact the relevant associate dean prior to the term of a birth or adoption. This benefit is limited to two birth or adoption events. If both parents are Ph.D. students at Yale, both may receive this benefit per birth or adoption event.

Graduate students in terminal M.A./M.S. programs may modify their academic responsibilities because of the birth or adoption of a child. They should contact the associate dean for academic support the term before the planned modifications would occur.

Withdrawal and Readmission

A student may withdraw from a program of study voluntarily or may be administratively withdrawn for cause. A student who wishes to terminate a program of study should confer with their director of graduate studies and the appropriate associate dean regarding withdrawal; their signatures are required on an official withdrawal form. (See http://registrar.yale.edu/forms-petitions.) Upon consultation with the department, the associate dean will determine the effective date of the withdrawal. The student's university identification card must be submitted with the approved withdrawal form in order for their withdrawal to be recorded.

Students who are not in academic good standing will be withdrawn for cause, unless an extension or exception has been granted by the appropriate dean or the Degree Committee. Such withdrawals are noted on the student's transcript.

Students who do not register for any fall or spring term, and for whom a leave of absence has not been approved by the appropriate academic dean, will be administratively withdrawn from the graduate school.

A student who discontinues a program of study during the academic year without submitting an approved withdrawal form and university identification card will be liable for the tuition charge (or CRF) for the term in which the withdrawal occurs. Tuition charges for students who withdraw will be adjusted as described in the Schedule of Academic Dates and Deadlines. The CRF for the term is not canceled if a student withdraws after the fourteenth day of the term. Health service policies related to withdrawal and readmission are described under Health Services, below.

Only students who have withdrawn from the graduate school in good standing may apply for readmission. Normally, students seeking readmission must do so within three years of the original withdrawal. Neither readmission nor financial aid is guaranteed to students who withdraw. The deadline for making application for readmission is January 2 of the year in which the student wishes to return to the graduate school. The student's application will be considered by the department, which will make a recommendation for review by the appropriate academic dean. The student's remaining tuition obligation will be determined at the time of readmission. Students may seek readmission only once. If subsequent to a readmission they must again withdraw, they are ineligible for readmission.

U.S. Military Leave Readmissions Policy

Students who wish or need to interrupt their studies to perform U.S. military service are subject to a separate U.S. military leave readmissions policy. In the event a student withdraws or takes a leave of absence from the graduate school to serve in the U.S. military, the student will be entitled to guaranteed readmission under the following conditions:

- 1. The student must have served in the U.S. Armed Forces for a period of more than thirty consecutive days.
- 2. The student must give advance written or oral notice of such service to the appropriate dean. In providing the advance notice the student does not need to indicate an intent to return. This advance notice need not come directly from the student, but rather, can be made by an appropriate officer of the U.S. Armed Forces or official of the U.S. Department of Defense. Notice is not required if precluded by military necessity. In all cases, this notice requirement can be fulfilled at the time the student seeks readmission, by submitting an attestation that the student performed the service.

- 3. The student must not be away from the graduate school to perform U.S. military service for a period exceeding five years (this includes all previous absences to perform U.S. military service but does not include any initial period of obligated service). If a student's time away from the graduate school to perform U.S. military service exceeds five years because the student is unable to obtain release orders through no fault of the student or the student was ordered to or retained on active duty, the student should contact the appropriate dean to determine if the student remains eligible for guaranteed readmission.
- 4. The student must notify the graduate school within three years of the end of the U.S. military service of the intention to return. However, a student who is hospitalized or recovering from an illness or injury incurred in or aggravated during the U.S. military service has up until two years after recovering from the illness or injury to notify the graduate school of the intent to return.
- 5. The student cannot have received a dishonorable or bad conduct discharge or have been sentenced in a court-martial.

A student who meets all these conditions will be readmitted for the next term, unless the student requests a later date of readmission. Any student who fails to meet one of these requirements may still be readmitted under the general readmission policy but is not guaranteed readmission.

Upon returning to the graduate school, the student will resume education without repeating completed course work for courses interrupted by U.S. military service. The student will have the same enrolled status last held and with the same academic standing. For the first academic year in which the student returns, the student will be charged the tuition and fees that would have been assessed for the academic year in which the student left the institution. Yale may charge up to the amount of tuition and fees other students are assessed, however, if veteran's education benefits will cover the difference between the amounts currently charged other students and the amount charged for the academic year in which the student left.

In the case of a student who is not prepared to resume studies with the same academic status at the same point at which the student left or who will not be able to complete the program of study, the graduate school will undertake reasonable efforts to help the student become prepared. If after reasonable efforts, the graduate school determines that the student remains unprepared or will be unable to complete the program, or after the graduate school determines that there are no reasonable efforts it can take, the graduate school may deny the student readmission.

PERSONAL CONDUCT AND ACADEMIC INTEGRITY STANDARDS

Yale graduate school is an academic community dedicated to the advancement of learning. Its members freely associate themselves with the university and in doing so affirm their commitment to cultivating an environment of tolerance and respect for all members of the community. They pledge to help sustain the intellectual integrity of the university and to uphold its standards of honesty, free expression, and inquiry. They are expected to abide by the regulations of the university, including these graduate school Personal Conduct and Academic Integrity Standards. Because students are expected to show good judgment and use common sense at all times, not all kinds of misconduct

or behavioral standards are codified here. Other actions on the part of students that may in the judgment of the Dean warrant disciplinary action because they may imperil the integrity and values of the Yale community or the well-being of its members may be brought forward. Students are also expected to obey local, state, and federal laws, and violations of these may be cause for discipline by the graduate school. Students are required to report misdemeanor and felony charges to the dean's office.

Personal Conduct Standards

The graduate school specifically prohibits the following forms of behavior by graduate students:

- 1. Physical restriction, assault, or any other act of violence or use of physical force against any member of the community, or any act that threatens the use of violence or physical force.
- 2. Acts of harassment, intimidation, or coercion, including the harassment of a university community member on the basis of race, color, religion, sex, gender identity or expression, sexual orientation, age, status as a veteran, disability, or national or ethnic origin.
- 3. Any sexual activity for which positive, unambiguous, and voluntary consent has not been given in advance; any sexual activity with someone who is incapable of giving valid consent because, for example, that individual is sleeping or otherwise incapacitated due to alcohol or drugs; any act of sexual harassment, intimate partner violence, or stalking. Sexual misconduct includes nonphysical actions such as digital media stalking, cyberbullying, and nonconsensual recording of a sexual nature. Sexual harassment consists of nonconsensual sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature. For a fuller description of sexual misconduct, sexual consent, and sexual harassment see the Title IX website (https://titleix.yale.edu). Sexual misconduct violations shall be addressed by the University-Wide Committee on Sexual Misconduct (UWC) and governed by its procedures.
- 4. Engaging in a relationship with a student while serving as the student's teaching fellow or in any other direct supervisory role over the student (as outlined in the university's policy prohibiting Teacher-Student Consensual Relations).
- 5. Disruption of a legitimate function or activity of the university community, including disrupting classes and meetings, blocking entrances and exits to university buildings, unauthorized occupation of any space on the Yale campus, or preventing the free expression or dissemination of ideas.
- Refusal to comply with the direction of a university police officer or other university official, including a member of the faculty, acting in the performance of their duties.
- 7. Misuse, alteration, or fabrication of university credentials or documents, such as an identification card or transcript, including grade lists submitted by teaching fellows.
- 8. Misrepresentation or lying to university officials, including during a formal inquiry.
- 9. Misrepresentation in applying for admission or financial aid.
- 10. Recording course lectures without explicit permission of the instructor, or selling or distributing for commercial purposes notes, transcriptions, or outlines of class lectures, or any course materials, in any course of instruction.

- 11. The misuse of university funds, or willful damage of university property.
- 12. Misuse of the materials or facilities of the university libraries.
- 13. Unauthorized use of university services, equipment, or facilities, such as telephones and photocopying equipment.
- 14. Violation of university rules for using information technology services and facilities, including computers, the university network, software systems, and electronic mail.
- 15. Trespassing on university property to which access is prohibited.
- 16. Possession or use of explosives, incendiary devices, or weapons on or about the campus.
- 17. Interference with the proper operation of safety or security devices, including fire alarms, electronic doors or gates, fire extinguishers, and sprinkler systems.
- 18. Unlawful manufacture, possession, use, or distribution of drugs or alcohol, including serving underage minors, on university property or as part of any university activity. Yale is a drug-free campus.
- 19. Use of tobacco products on any location on campus, including outdoor spaces. Yale is a tobacco-free institution.
- 20. Violation of university policies for the safeguarding of children and youth on campus whereby minors are put at risk due to action or inaction.

Academic Integrity Standards

The graduate school prohibits academic dishonesty, a term that encompasses making any claim within or about your research or scholarship that is untrue. The following are some forms of academic dishonesty:

- 1. Plagiarism, that is, the failure to acknowledge ideas, research, or language taken from others, whether intentional or unintentional. The graduate school requires citations whenever students either directly quote or indirectly draw upon and benefit from the work or scholarship of others. This requirement applies equally to all academic work by students, including a paper or an examination for a course, a presentation in class or at a conference, a prospectus or dissertation, or a manuscript for publication. This requirement also applies to drafts of written work.
- 2. The unauthorized collaboration with others on graded course work (including problem sets, lab reports, take-home examination questions, and papers) without express permission from the instructor.
- 3. Cheating on examinations, problem sets, or any other form of assessment.
- 4. The falsification, fabrication, or misuse of data.
- 5. Submitting work or substantially the same work, from one course for a grade or credit in another, without first obtaining express written permission from both course instructors.

A note on artificial intelligence (AI) tools: Inserting AI-generated text into an assignment without proper attribution is a violation of academic integrity, and using AI tools in a manner that was not authorized by your instructor may also be considered a breach of academic integrity. How and whether instructors permit you to use AI writing tools at Yale will vary widely from course to course and is always subject to each instructor's authority and policy. Always check with your instructor before using these tools to

produce your Yale coursework. Guidelines about these practices may change over time, so be sure to ask for the most up-to-date policy.

Sanctions for Violations

Alleged violations of any of the above Personal Conduct and Academic Integrity Standards will be referred to the graduate school Committee on Regulations and Discipline, composed of three graduate students, three faculty members, normally one from each division, and an academic dean. Procedures of the Committee on Regulations and Discipline may be obtained from the office of the associate dean for academic support or on the graduate school website (https://gsas.yale.edu/sites/ default/files/page-files/gsas_disciplinary_procedures.pdf). Any of the associate deans of the graduate school may be consulted for further information and advice. A copy of the procedures is sent automatically to any student who is charged with a violation of the graduate school's standards.

A separate process and procedures apply to reports pertaining to sexual misconduct and violations of the Teacher-Student Consensual Relations Policy-the University-Wide Committee on Sexual Misconduct Policies and Procedures. Another policy also applies to reports pertaining to discrimination and/or harassment, as defined on the Yale University website (https://student-dhr.yale.edu/policies-definitions). Incidents of discrimination and harassment should be reported to either a graduate school discrimination and harassment resource coordinator (https://dhr.yale.edu/ discrimination-and-harassment-resource-coordinators) or the Office of Institutional Equity and Access (https://oiea.yale.edu) for support, investigation, and resolution (https://student-dhr.yale.edu/complaint-resolution). In some cases, conduct reported as discrimination and harassment may violate the Personal Conduct Standards, and students will be referred to the Committee on Regulations and Discipline. Students found responsible for violating the Personal Conduct and Academic Integrity Standards may be subject to penalties, including, but not limited to, one or more of the following: reprimand, probation, suspension, dismissal, fines, restitution, and restriction.

Penalties of suspension or dismissal will be noted on the student's transcript. Pending disciplinary charges will be noted on a student's transcript if the student withdraws from the graduate school after being formally charged but before such charges have been resolved. A student who has petitioned for a degree will not receive the degree while charges are pending or while serving a suspension. A student who has been dismissed for a disciplinary violation may petition for a degree, to be awarded at the discretion of the Degree Committee, based on work completed before the infraction occurred.

A student dismissed for academic misconduct will not receive a degree from the graduate school regardless of requirements fulfilled before the infraction occurred. The graduate school reserves the right to impose fines as appropriate, in addition to requiring payment for costs resulting from or associated with the offenses. In addition to imposing these penalties for offenses subject to disciplinary action, the university may refer students for prosecution, and students found guilty of unlawful possession, use, or distribution of illicit drugs or alcohol on university property or as part of any university activity may be required to complete an appropriate rehabilitation program.

Suspension

A suspension is a separation from all programs and activities of the university for a stated period of time. A suspended student forfeits all privileges of enrollment, including on-campus residence, eligibility for health coverage and financial aid, attendance at classes, student visa sponsorship, participation in any Yale-sponsored activities or groups, access to Yale IT resources, and use of university libraries as well as of athletic and other facilities. A suspension is recorded on a student's academic transcript. A suspended student is specifically prohibited from:

- 1. making academic progress towards a Yale degree, including
 - a. enrolling in any university courses or completing university coursework;

b. using non-Yale course credits earned during the period of suspension towards a Yale degree;

- c. preparing for qualifying examinations;
- d. researching or writing a prospectus;
- e. conducting dissertation or thesis research; and
- f. writing a dissertation or thesis;
- 2. returning to Yale's campus during the period of suspension for any reason;
- 3. accessing all Yale IT systems (intranet, shared drives, Yale-hosted databases, etc.) except for a yale.edu email account; and
- 4. representing themself as a Yale graduate student.

Emergency Suspension

The dean of the graduate school, or a delegate of the dean, may place a student on an emergency suspension from residence or academic status when (1) the student has been arrested for or charged with serious criminal behavior by law enforcement authorities; or (2) the student allegedly violated a disciplinary rule of the graduate school and the student's presence on campus poses a significant risk to the safety or security of members of the community. Following an individualized risk and safety analysis, the student will be notified in writing of the emergency suspension. A student who is notified of an emergency suspension will have twenty-four hours to respond to the notice. The emergency suspension will not be imposed prior to an opportunity for the student to respond unless circumstances warrant immediate action for the safety and security of members of the community. In such cases, the student will have an opportunity to respond after the emergency suspension has been imposed.

When a student in the graduate school is placed on an emergency suspension, the matter will be referred for disciplinary action in accordance with school policy. Such a suspension may remain in effect until disciplinary action has been taken with regard to the student; however, it may be lifted earlier by action of the dean or dean's delegate, or by the disciplinary committee after a preliminary review.

Office of Institutional Equity and Accessibility

Students who believe that a student, faculty member, or staff member has engaged in discrimination or harassment other than gender discrimination or sexual misconduct

may report their concerns to the Office of Institutional Equity and Accessibility, a university-wide office that assists with dispute resolution and investigates reports of discrimination and harassment. For additional information, see https://studentdhr.yale.edu/complaint-resolution. Complaints of sexual misconduct, which includes sexual harassment and sexual assault, may be brought to a Title IX coordinator or to the University-Wide Committee on Sexual Misconduct (UWC). For more information on the university's Title IX coordinators or the UWC, please see Resources to Address Discrimination and Harassment Concerns, Including Sexual Misconduct under Yale University Resources and Services.

FREEDOM OF EXPRESSION

The Yale graduate school is committed to the protection of free inquiry and expression in the classroom and throughout the school community. In this, the School reflects the university's commitment to and policy on freedom of expression as eloquently stated in the Woodward Report (Report of the Committee on Freedom of Expression at Yale, 1974), which states, in part:

The primary function of a university is to discover and disseminate knowledge by means of research and teaching. To fulfill this function a free interchange of ideas is necessary not only within its walls but with the world beyond as well. It follows that the university must do everything possible to ensure within it the fullest degree of intellectual freedom. The history of intellectual growth and discovery clearly demonstrates the need for unfettered freedom, the right to think the unthinkable, discuss the unmentionable, and challenge the unchallengeable. To curtail free expression strikes twice at intellectual freedom, for whoever deprives another of the right to state unpopular views necessarily also deprives others of the right to listen to those views.

We take a chance, as the First Amendment takes a chance, when we commit ourselves to the idea that the results of free expression are to the general benefit in the long run, however unpleasant they may appear at the time. The validity of such a belief cannot be demonstrated conclusively. It is a belief of recent historical development, even within universities, one embodied in American constitutional doctrine but not widely shared outside the academic world, and denied in theory and in practice by much of the world most of the time.

Because few other institutions in our society have the same central function, few assign such high priority to freedom of expression. Few are expected to. Because no other kind of institution combines the discovery and dissemination of basic knowledge with teaching, none confronts quite the same problems as a university.

For if a university is a place for knowledge, it is also a special kind of small society. Yet it is not primarily a fellowship, a club, a circle of friends, a replica of the civil society outside it. Without sacrificing its central purpose, it cannot make its primary and dominant value the fostering of friendship, solidarity, harmony, civility, or mutual respect. To be sure, these are important values; other institutions may properly assign them the highest, and not merely a subordinate, priority; and a good university will seek and may in some significant measure attain these ends. But it will never let these values, important as they are, override its central purpose. We value freedom of expression precisely because it provides a forum for the new, the provocative, the disturbing, and the unorthodox. Free speech is a barrier to the tyranny of authoritarian or even majority opinion as to the rightness or wrongness of particular doctrines or thoughts.

If the priority assigned to free expression by the nature of a university is to be maintained in practice, clearly the responsibility for maintaining that priority rests with its members. By voluntarily taking up membership in a university and thereby asserting a claim to its rights and privileges, members also acknowledge the existence of certain obligations upon themselves and their fellows. Above all, every member of the university has an obligation to permit free expression in the university. No member has a right to prevent such expression. Every official of the university, moreover, has a special obligation to foster free expression and to ensure that it is not obstructed.

The strength of these obligations, and the willingness to respect and comply with them, probably depend less on the expectation of punishment for violation than they do on the presence of a widely shared belief in the primacy of free expression. Nonetheless, we believe that the positive obligation to protect and respect free expression shared by all members of the university should be enforced by appropriate formal sanctions, because obstruction of such expression threatens the central function of the university. We further believe that such sanctions should be made explicit, so that potential violators will be aware of the consequences of their intended acts.

In addition to the university's primary obligation to protect free expression there are also ethical responsibilities assumed by each member of the university community, along with the right to enjoy free expression. Though these are much more difficult to state clearly, they are of great importance. If freedom of expression is to serve its purpose and thus the purpose of the university, it should seek to enhance understanding. Shock, hurt, and anger are not consequences to be weighed lightly. No member of the community with a decent respect for others should use, or encourage others to use, slurs and epithets intended to discredit another's race, ethnic group, religion, or sex. It may sometimes be necessary in a university for civility and mutual respect to be superseded by the need to guarantee free expression. The values superseded are nevertheless important, and every member of the university community should consider them in exercising the fundamental right to free expression.

We have considered the opposing argument that behavior which violates these social and ethical considerations should be made subject to formal sanctions, and the argument that such behavior entitles others to prevent speech they might regard as offensive. Our conviction that the central purpose of the university is to foster the free access of knowledge compels us to reject both of these arguments. They assert a right to prevent free expression. They rest upon the assumption that speech can be suppressed by anyone who deems it false or offensive. They deny what Justice Holmes termed "freedom for the thought that we hate." They make the majority, or any willful minority, the arbiters of truth for all. If expression may be prevented, censored, or punished, because of its content or because of the motives attributed to those who promote it, then it is no longer free. It will be subordinated to other values that we believe to be of lower priority in a university. The conclusions we draw, then, are these: even when some members of the university community fail to meet their social and ethical responsibilities, the paramount obligation of the university is to protect their right to free expression. This obligation can and should be enforced by appropriate formal sanctions. If the university's overriding commitment to free expression is to be sustained, secondary social and ethical responsibilities must be left to the informal processes of suasion, example, and argument.

See also https://studentlife.yale.edu/guidance-regarding-free-expression-and-peaceable-assembly-students-yale.

RECORDINGS BY FACULTY, STAFF, STUDENTS, AND INVITED GUESTS

The purpose of this policy is to foster a spirit of trust, to promote the open exchange of viewpoints and ideas within the graduate school, and to protect the privacy of community members.

Prohibition on Surreptitious Recordings

It is expected that faculty, staff, students, and invited guests of the graduate school will engage openly and forthrightly with others in educational settings and in the workplace. To that end, this policy prohibits all forms of recording that are illegal under Connecticut law. In addition, this policy prohibits the surreptitious recording of meetings and activities within the graduate school and its programs and departments, whether by telephone, audio, video, Zoom, or another virtual platform technology or other recording device. Recording devices may only be used in an overt and conspicuous manner so that it readily is apparent to all parties that a recording or record of an event is being made. Recording for research purposes is subject to requirements, approval, and consent in accordance with university research policies.

Recording of Classes

Students may not record Yale University course content, such as lectures, discussions, presentations, critiques, or performances, unless they obtain the instructor's written permission before recording. In the event a faculty member gives permission, recordings must not be transmitted or distributed without the written consent of all participants who are recorded. Recordings of a class made by Yale University and provided to a student by the university are for private study use only and are not to be shared, altered, or posted.

POSTERING, CHALKING, AND PUBLICITY POLICY

Posters must be confined to bulletin boards, kiosks, display cases, and other spaces that the graduate school has specifically designated for postering. Chalking must be confined to walkways directly open to the weather. Other forms of non-electronic publicity on campus grounds or buildings at the graduate school is prohibited. The following regulations apply to postering and chalking on campus:

1. Posters may not exceed 11x14 inches. Only one copy of each poster may be placed on the same bulletin board.
- 2. Posters for an event must provide the name of the event, its date, time, and location, the name of its sponsoring organization, and the email address or phone number of its organizers.
- 3. The dean of the graduate school may impose additional requirements or exceptions. Before posting in a particular Yale building, the applicable poster policy should be reviewed.
- 4. Authorized staff members typically remove all posters from bulletin boards and other designated spaces once a week. Posters improperly placed in other locations (interior or exterior walls, doors, signs, trees, utility poles, etc.) or that otherwise do not comply with this policy will be subject to immediate removal.
- 5. Unless by authorized staff members in the course of their duties, the removal, defacing, destroying, or postering over of existing posters is prohibited.
- 6. Students may use chalk on walkways to advertise events, but such markings are permitted only to the extent that they are temporary. Chalking must be on areas that are directly open to the sky and the weather. Walkways cannot be marked under overhangs, archways, or other covered areas. Chalk may not be applied to walls or other vertical surfaces. Chalk notices must be limited in size to 4x4 feet, and not more than one chalk announcement for a single event may be visible from any single point. Only water-soluble chalk may be used. Spray chalk is strictly prohibited.
- 7. Glue, staples, and tape of any variety (e.g., Scotch tape, masking tape, duct tape) are damaging and may not be used on any Yale property. Thumbtacks or pushpins should be used on bulletin boards but may not be used on any interior or exterior woodwork or interior wall covering.

Violation of these regulations may result in an organization's loss of official recognition and consequent loss of funding opportunities. Violations may also subject individuals to discipline under other university or school regulations. Students or organizations may be charged for the costs of removing improperly posted materials and repairing any damaged property.

FINANCING GRADUATE SCHOOL

Tuition and Fees

TUITION, 2024–2025*

Full-time study, per term: \$24,750

Full-time study in IDE, per term: \$25,250

Half-time study, per term: \$12,375

Master's programs, less than half-time per term

One-quarter time study, per term: \$6,187.50

Division of Special Registration (DSR, nondegree study)

Course work, per course, per term (including audited courses): \$6,187.50

Visiting Students, per term: \$24,750

Visiting Assistants in Research, per month: \$425

FEES, 2024–2025[†]

Continuous Registration Fee (CRF), per term[‡]: \$820

Yale Health Hospitalization/Specialty Coverage, twelve months[§]: \$3,111

* It is anticipated that tuition will be increased in subsequent years.

⁺ It is anticipated that the Continuous Registration Fee will be increased in subsequent years.

Other fees are subject to change without notice. For fees relating to registration and course enrollment, see Course Enrollment, under Academic Regulations.

‡ See Registration Status and Leaves of Absence, under Academic Regulations.

§ Hospitalization fees are for single students. Rates are higher for students needing dependent coverage. Hospitalization/Specialty Coverage includes prescription coverage.

Appointment to a university post does not exempt a student from registration and payment of other fees. Full-time (and certain part-time) Yale managerial and professional employees and their spouses, postdoctoral appointees and their spouses, as well as the spouses of Yale faculty, are eligible for a tuition reduction in the DSR and master's programs. They should consult Human Resources for details. Postdoctoral appointees (whose appointments are at least half-time) may only receive tuition benefits if the classes taken are consistent with their educational training. With the permission of the instructor, full-time faculty members and their spouses, emeritus faculty and their spouses, postdoctoral appointees and their spouses, and university employees may audit courses without charge. Audited courses are not recorded on graduate school transcripts. Classes audited by postdoctoral appointees should be consistent with the appointees' training objectives, and appointees should discuss their plans with their mentors to ensure that the course work does not interfere with their research activities.

Candidates for degrees in the graduate school, nondegree students paying full tuition, and spouses of full-time candidates for degrees in the graduate school may audit courses without charge provided that they have received the approval of the course instructor.

Student Accounts and Billing

Student accounts, billing, and related services are administered through the Office of Student Accounts, located at 246 Church Street. The office's website is http://student-accounts.yale.edu.

The Student Account is a record of all the direct charges for a student's Yale education such as tuition, room, board, fees, and other academically related items assessed by offices throughout the university. It is also a record of all payments, financial aid, and other credits applied toward these charges.

Students and student-designated proxies can view all activity posted to their Student Account in real time through the university's online billing and payment system, YalePay (https://student-accounts.yale.edu/yalepay). At the beginning of each month, email reminders to log in to YalePay to review the Student Account activity are sent to all students at their official Yale email address and to all student-designated YalePay proxies. Payment is due by 4 p.m. Eastern Time on the first of the following month.

Yale does not mail paper bills or generate monthly statements. Students and their authorized proxies can generate their own account statements in YalePay in pdf form to print or save. The statements can be generated by term or for a date range and can be submitted to employers, 401K plans, 529/College Savings Plans, scholarship agencies, or other organizations for documentation of the charges.

Students can grant others proxy access to YalePay to view student account activity, set up payment plans, and make online payments. For more information, see Proxy Access and Authorization (http://student-accounts.yale.edu/understanding-your-bill/your-student-account).

The Office of Student Accounts will impose late fees of \$125 per month (up to a total of \$375 per term) if any part of the term bill, less Yale-administered loans and scholarships that have been applied for on a timely basis, is not paid when due. Students who have not paid their student account term charges by the due date will also be placed on Financial Hold. The hold will remain until the term charges have been paid in full. While on Financial Hold, the university will not provide diplomas and reserves the right to withhold registration or withdraw the student for financial reasons.

PAYMENT OPTIONS

There are a variety of options offered for making payments toward a student's Student Account. Please note:

- · All bills must be paid in U.S. currency.
- Yale does not accept credit or debit cards for Student Account payments.

• Payments made to a Student Account in excess of the balance due (net of pending financial aid credits) are not allowed on the Student Account. Yale reserves the right to return any overpayments.

Online Payments through YalePay

Yale's recommended method of payment is online through YalePay (https://studentaccounts.yale.edu/yalepay). Online payments are easy and convenient and can be made by anyone with a U.S. checking or savings account. There is no charge to use this service. Bank information is password-protected and secure, and there is a printable confirmation receipt. Payments are immediately posted to the Student Account, which allows students to make payments at any time up to 4 p.m. Eastern Time on the due date of the bill, from any location, and avoid late fees.

For those who choose to pay by check, a remittance advice and mailing instructions are available on YalePay. Checks should be made payable to Yale University, in U.S. dollars, and drawn on a U.S. bank. To avoid late fees, please allow for adequate mailing time to ensure that payment is received by 4 p.m. Eastern Time on the due date.

Cash and check payments are also accepted at the Office of Student Accounts, located at 246 Church Street and open Monday through Friday from 8:30 a.m. to 4:30 p.m.

Yale University partners with Flywire, a leading provider of international payment solutions, to provide a fast and secure way to make international payments to a Student Account within YalePay. Students and authorized proxies can initiate international payments from the Make Payment tab in YalePay by selecting "International Payment via Flywire" as the payment method, and then selecting the country from which payment will be made to see available payment methods. International payment via Flywire allows students and authorized proxies to save on bank fees and exchange rates, track the payment online from start to finish, and have access to 24/7 multilingual customer support. For more information on making international payments via Flywire, see International Payments Made Easy at https://student-accounts.yale.edu/paying-your-bill/payment-options.

A processing charge of \$25 will be assessed for payments rejected for any reason by the bank on which they were drawn. In addition, for every returned ACH payment due to insufficient funds made through YalePay, Flywire will charge a penalty fee of \$30 per occurrence. Furthermore, the following penalties may apply if a payment is rejected:

- 1. If the payment was for a term bill, late fees of \$125 per month will be charged for the period the bill was unpaid, as noted above.
- 2. If the payment was for a term bill to permit registration, the student's registration may be revoked.
- 3. If the payment was given to settle an unpaid balance in order to receive a diploma, the university may refer the account to an attorney for collection.

YALE PAYMENT PLAN

A Yale Payment Plan provides parents and students with the option to pay education expenses monthly. It is designed to relieve the pressure of lump-sum payments by allowing families to spread payments over a period of months without incurring any

interest charges. Participation is optional and elected on a term basis. The cost to sign up is \$50 per term.

Depending on the date of enrollment, students may be eligible for up to five installments for the fall and spring terms. Payment Plan installments will be automatically deducted on the 5th of each month from the bank account specified when enrolling in the plan. For enrollment deadlines and additional details concerning the Yale Payment Plan, see https://student-accounts.yale.edu/ypp.

BILL PAYMENT AND PENDING MILITARY BENEFITS

Yale will not impose any penalty, including the assessment of late fees, the denial of access to classes, libraries, or other facilities, or the requirement that a student borrow additional funds, on any student because of the student's inability to meet their financial obligations to the institution, when the delay is due to the delayed disbursement of funding from VA under chapter 31 or 33.

Yale will permit a student to attend or participate in their course of education during the period beginning on the date on which the student provides to Yale a certificate of eligibility for entitlement to educational assistance under chapter 31 or 33 and ending on the earlier of the following dates: (1) the date on which payment from VA is made to Yale; (2) ninety days after the date Yale certifies tuition and fees following the receipt of the certificate of eligibility.

Interruption or Temporary Suspension of University Services or Programs

Certain events that are beyond the university's control may cause or require the interruption or temporary suspension of some or all services and programs customarily furnished by the university. These events include, but are not limited to, epidemics or other public health emergencies; storms, floods, earthquakes, or other natural disasters; war, terrorism, rioting, or other acts of violence; loss of power, water, or other utility services; and protest disruptions, strikes, work stoppages, or job actions. In the face of such events, the university may, at its sole discretion, provide substitute services and programs, suspend services and programs, or issue appropriate refunds. Such decisions shall be made at the sole discretion of the university.

Financial Aid

Financial assistance is provided in the form of Yale University Fellowships, tuition fellowships, teaching fellowships, traineeships, and research assistantships. The nature of the assistance varies among the divisions and departments. In most departments and programs, doctoral students are guaranteed five years of twelve-month stipend and tuition support. Applicants for admission to Ph.D. programs will automatically be considered for all Yale fellowships, traineeships, research assistantships, and teaching fellowships for which they are eligible. These awards of financial aid are announced in letters of admission, which are usually sent during the month of February. Students are strongly encouraged to seek financial support from external sources (see External Fellowships and Combined Award Policy).

In addition to grants and fellowships for tuition and living costs, Yale Health Basic Coverage is provided at no cost to students enrolled at least half-time in degreegranting programs.

Eligible Ph.D. students also receive a Health Award, which covers the full cost of student's elected health coverage, including the following plans: Student + Spouse, Student + Child(ren), and the Family Plan. Eligible Ph.D. students with a child will also receive an annual Student Family Support subsidy in the amount of \$7,500, issued in installments of \$3,750 per term. The annual subsidy will increase by \$2,500 (\$1,250 per term) for each additional child under the age of six.

Students who do not participate in Yale Health Hospitalization/Specialty Coverage will not be provided with Health Awards. The graduate dental and vision plans are options that eligible students may choose to purchase for themselves and their dependents and are not covered by the Health Award. (For further information regarding health care options through Yale Health, see Health Services under Yale University Resources and Services.)

UNIVERSITY AND TEACHING FELLOWSHIPS

The graduate school provides all Ph.D. students with a minimum level of support as outlined in the letter of admission. Fellowships are awarded at admission to entering students on the basis of merit and recommendations made by individual departments. In most departments, the source of stipend support will change after the first or second year of study to a teaching fellowship or research assistantship. Students who teach outside of the standard departmental pattern defer their University Fellowships to a later year and do not receive more than the standard departmental stipend while teaching. University and Teaching Fellowships may not be deferred beyond the sixth year of registration.

Students awarded a University and Teaching Fellowship may not accept any other award without the permission of the appropriate associate dean. The graduate school is the final authority on University Fellowships and any combination of university funding with other sources of financial aid. (See External Fellowships and Combined Award Policy.)

Because the graduate school considers teaching experience to be an integral part of graduate education, doctoral students receive financial aid packages that include teaching fellowships. In many programs, there are specific years when students are expected to teach. For example, most humanities and social science students will teach in their third, fourth, and sixth years. In the natural sciences, the timing of teaching may be earlier or flexible over several years. When requested by the student for compelling academic reasons, these patterns may be adjusted with the permission of the director of graduate studies contingent on the student's satisfactory academic progress and sufficient course enrollment.

If the associate dean and director of graduate studies determine that no suitable teaching is available in a term in which a student is expected to teach, the student will continue to receive the standard departmental stipend that term. Stipend support will be withheld if a student elects not to teach in a term in which the student is expected to teach as part of the student's funding package. The financial aid packages of many students, particularly in the science departments, may include non-university funds. Should these non-university funds become unavailable, additional university support may be provided. Doctoral students who receive additional university support during their first six years of registration will be required to do additional terms of teaching, if necessary. This additional teaching will typically be at the TF20 level and will be required in each term that the student receives university support. Students will not be required to teach more than the equivalent of six terms at the TF20 level during their first six years of registration. Students in good standing who require additional university support but who have already completed six terms of teaching at the TF20 level will receive university funds with no teaching obligation. Students receiving university funds are ineligible to seek additional teaching assignments that would be paid beyond the standard stipend.

Access to Teaching Fellowships

When departments are considering applications for teaching fellowships, priority is given to qualified graduate students who are expected to teach as part of their funding package. Students in years two through six who have completed their required teaching may teach if enrollments permit. In the humanities and social sciences, students who are on funding extensions are expected to teach at the TF20 level. In cases where an appointing department must choose between two or more graduate students who are each well qualified to teach a particular course, the student or students who have not yet had a chance to teach or who have taught the least will be given preference.

Limits on Teaching

Except when specified in their letters of admission, first-year doctoral students may be appointed as teaching fellows only in exceptional cases, and only after prior approval by their director of graduate studies and the associate dean. Students in the humanities and social sciences may teach during their second year only when such teaching is permitted by their department. Students in years one through six may teach no more than one TF20 assignment (up to twenty hours per week) per term. Students in the natural sciences teaching above the requirement are limited to one TF10 assignment per term. Seventh-year students may teach up to three TF20 assignments per year.

Students who have met their program's teaching expectation and who are supported by non-university funds may seek additional teaching assignments at the TF10 level. Students who are teaching to fulfill a funding or academic requirement will have priority for available teaching assignments over those who are seeking additional teaching assignments. Students may not be appointed as lecturers while registered in the graduate school.

Students seeking TF appointments outside of their departments should discuss their plans with their director of graduate studies well in advance of the start of a term.

Students with outside fellowships may be eligible to serve as TFs according to the policies of the graduate school and the conditions of their outside awards.

Assignment Letters

Letters of assignment are sent to graduate students via the online Teaching Fellow System (TFS) indicating the course in which a graduate student is expected to teach and the level of the assignment. An assignment is not official until the electronic assignment letter has been transmitted via the online TFS.

Teaching Fellow Levels

All teaching fellows teach at one of two effort levels. Students assigned at the TF10 level are expected to teach for up to 10 hours per week. Students assigned at the TF20 level are expected to teach for up to 20 hours per week. Science students engaged in required teaching and doctoral students in the humanities and social sciences who teach in years one through six receive the standard departmental stipend irrespective of the assignment level. Doctoral students in the humanities and social sciences are typically expected to perform required teaching at the TF20 level. All students, including master's and professional school students, who are teaching outside of a doctoral financial aid package receive \$5,535 for a TF10 assignment and \$11,070 for a TF20 assignment.

TRAINEESHIPS AND ASSISTANTSHIPS IN RESEARCH

Traineeships (National Research Service Awards) from the National Institutes of Health are available in most of the biological sciences and in some other departments. These awards support full-time Ph.D. study by U.S. citizens, noncitizen nationals of the United States, and permanent residents. In combination with university and departmental supplements, they provide payment of tuition, a monthly stipend, and the hospitalization premium. Federal rules require that trainees pursue their research training on a full-time basis. In some instances, there is a federal payback provision, which is ordinarily satisfied by serving in health-related research or teaching at the conclusion of training. Information about this obligation and other matters relating to traineeships is available from the director of graduate studies or the principal investigator of the specific training grant in question.

RESEARCH APPOINTMENTS

Doctoral students in departments where the faculty receive research grants or contracts may be eligible for appointments as assistants in research (AR). In most of the science departments, advanced Ph.D. students are normally supported as ARs by individual faculty research grants. An assistantship in research provides a monthly salary at a rate agreed upon by the department and the graduate school. It is understood that the work performed not only is part of the faculty principal investigator's research project but also is the student's dissertation research and therefore in satisfaction of a degree requirement. For a standard AR appointment, in addition to the salary, the grant pays half of the tuition or the full CRF. When the appointee is eligible for a University Fellowship, the other half of tuition is covered by a fellowship.

An appointment as a project assistant (PA) is intended for a student who performs services for projects that are not a part of the student's degree program. A project assistant may normally work no more than ten hours per week. The rate of compensation is based on the department-approved rate paid to assistants in research. With the permission of the director of graduate studies and the appropriate associate dean, a student may receive a combination of project assistant and assistant in research appointments. Questions about AR or PA appointments should be directed to the director of graduate studies or the appropriate associate dean in the graduate school.

External Fellowships and Combined Award Policy

To benefit both their current work and their future career prospects, students are strongly encouraged to seek funding from external agencies through grants and fellowships. These awards, sponsored by both public and private agencies, confer distinction on a student who wins an award in a national competition. Students must report to the Office of Financial Aid any scholarship or fellowship received from an outside agency or organization.

Stipends provided to Ph.D. students by the graduate school are intended to be a form of financial aid. As such, external fellowships which support student stipends will replace the Yale stipend. As an incentive to pursue external funding, students will be permitted to combine their external fellowships with a portion of Yale's financial support as described below. Alternatively, students in a teaching year may replace the Yale stipend and accompanying teaching commitment with an external fellowship, subject to the conditions described below.

Grants, awards, prizes, or fellowships which support non-stipend expenses (research, equipment, travel) are not subject to the Combined Award Policy and may be held concurrently with a Yale stipend. If external support includes both a stipend and a non-stipend component, only the stipend component is used for the purpose of calculating the combined award.

COMBINING EXTERNAL SUPPORT WITH THE YALE STIPEND

Students receiving external awards may combine the outside award with a university stipend. These combined awards are capped at a level equal to the department or program stipend plus \$4,000. Students will first receive the full value of the external fellowship, and the university will then provide supplemental support, up to a cap of \$4,000 above the department or program stipend. The university supplement will come from either a research assistantship, university fellowship, or teaching fellowship, depending on the financial support remaining from the student's financial package awarded at the time of admission. The total value of the combined award will be prorated for fellowships awarded for less than one year. If the external fellowship stipend exceeds the department or program stipend, but is less than the combined award cap (stipend plus \$4,000), the graduate school will provide the difference, up to the combined award cap. In this case, the top-up will not count against the financial aid package offered at admission. If the external fellowship stipend exceeds the value of the combined award cap, the recipient will retain the full external fellowship funding and will receive no university supplement.

No university support may be deferred beyond the end of the sixth year.

EXTERNAL FELLOWSHIP COMBINED WITH TEACHING FELLOWSHIPS

Students who wish to combine their external fellowship with a year of university teaching support awarded at the time of admission may do so, with the following provisions:

- 1. If the annual value of the external fellowship, plus the value of the teaching at current teaching rates, exceeds the standard stipend, students may waive one term of teaching and still receive the full value of the combined award (e.g., if the stipend is \$50,000, and a student with an external award equaling \$30,000 is expected to teach two TF-20S at \$11,000 per course, the total value of the award and the teaching equals \$52,000). Since this exceeds the stipend, the student may waive one term of financial teaching and still receive the full value of the combined award (\$54,000). However, teaching that is part of an academic requirement may not be waived. The teaching to be waived may be concurrent with the fellowship or a future term of teaching. One term of teaching may be waived for each year of fellowship support.
- 2. If a student has only teaching fellowships remaining in their financial aid package, and they win an external fellowship that requires them to be in residence at a site away from Yale such that it is not possible to teach, the university will provide a supplement to the fellowship up to the standard stipend. This benefit will apply only to fellowships that support at least 50 percent of the standard stipend. Please note that this benefit applies only to residential fellowships that require a student's presence at a particular institution, not to standard research or travel grants that may allow a student to travel abroad for field work.

REPLACING THE YALE STIPEND WITH EXTERNAL SUPPORT

Students who wish to reduce their financial teaching obligation may accept an external award in lieu of university support. Students who choose this option will not receive any stipend from Yale for the term or year in which they are not teaching. However, students may not reduce teaching that is an academic requirement unless the Ph.D. program guidelines specifically allow this.

If a fellowship provides stipend support for the summer, and the student has a guarantee of only five summers of support from Yale, the student may choose to forfeit the combined award over the summer and instead defer the university support to their sixth summer. No university support may be deferred beyond the end of the sixth year.

FELLOWSHIP BUDGETS

In rare cases, students may win a fellowship whose terms state that the university may not reduce its financial aid package to the student, in contradiction of this Combined Award Policy. If such an award allows students to designate some portion of the award for travel, supplies, or research expenses that would not be considered stipend, students are required to submit a fellowship budget that, to the degree possible, complies with the Combined Award Policy. In order to maximize the amount of stipend that a fellow receives, no more than \$4,000 per year should be designated for stipend support (unless they are designating additional stipend support for an unfunded summer, as described in the previous paragraph), and the remaining fellowship award should be budgeted for non-stipend purposes. This will allow a fellow to receive the maximum stipend allowed under the Combined Award Policy, and to use the rest of the fellowship for travel and research. Such budgets, if not already required and approved by the funding agency, will require approval of the dean. This budget should be submitted to the Financial Aid Office along with the notice of award. In these cases, if the fellowship funds are awarded to the university, they will be paid out to the student based on the approved budget. If the funds are awarded directly to the student, the student is expected to use the funds as designated in the budget.

Eligibility for Fellowships

Students who hold Yale-administered fellowships are required to be engaged in fulltime study. No fellowships will be paid for any period when a student is not registered.

Students are not eligible for stipend support from the graduate school after six years of study but may apply for student loans as long as they are enrolled at least half-time.

A fellowship will be withdrawn and a stipend withheld if the recipient's activities become detrimental to the purpose for which the fellowship was granted or if a student becomes ineligible to register for any reason.

Other Means of Financing Graduate Education

PART-TIME EMPLOYMENT

Unless otherwise noted in the letter of admission, students are expected to register on a full-time basis. Part-time employment at the university or elsewhere may not conflict with the obligations of the degree program or interfere with academic progress. International students must consult the Office of International Students and Scholars (OISS) regarding their eligibility for employment while in the United States.

Part-time employment beyond an average of ten hours per week requires permission of the director of graduate studies in consultation with the appropriate associate dean.

International students on U.S. student visas are limited by U.S. immigration regulations to twenty hours of on-campus employment while school is in session. On-campus employment may include required teaching assignments and other optional on-campus employment. J-1 students sponsored by Yale must also report in advance any employment opportunity to the OISS. Part-time on-campus employment opportunities may be found at https://yalestudentjobs.org or occasionally through the student's academic department.

LOANS AND STUDENT EMPLOYMENT

U.S. citizens and permanent residents may be eligible to borrow from the Federal Direct Loan Program. Eligibility is based on federal regulations and university policies. Information is available from the Office of Financial Aid (gradfinaid@yale.edu).

On-campus student employment opportunities can be found at https:// www.yalestudentjobs.org. All students applying for federal loan programs must fill out a Free Application for Federal Student Aid (FAFSA). Information on loan programs is contained in *Financial Information for Entering Graduate Students*, included with the student's letter of admission. These documents are available from the Office of Financial Aid. Information and FAFSA applications are also available at the website of the United States Department of Education (https://studentaid.gov).

Yale currently offers a loan for international students. Features of the Yale International Loan include no requirement for a co-signer and a ten-year repayment period. Students may apply for the Yale Graduate and Professional International Loan or any other loan of their choice. Students are encouraged to identify a loan that best suits their needs.

Two Federal Regulations Governing Title IV Financial Aid Programs

SATISFACTORY ACADEMIC PROGRESS

Federal regulations require that students be making satisfactory academic progress each year in order to be eligible for Title IV funding (i.e., federal loans, Javits Fellowships, and College Work-Study). The standards by which satisfactory academic progress is measured are determined by the graduate school and by individual departments. See Degree-Granting Departments and Programs in this bulletin for more information.

DEPARTMENT OF EDUCATION REFUND POLICY

Students receiving Title IV financial assistance who withdraw during a term will have their Title IV assistance adjusted according to a formula specified by the Department of Education. Please consult the Office of Financial Aid, 246 Church St.

YALE UNIVERSITY RESOURCES AND SERVICES

Identification Cards

Yale University issues identification (ID) cards to faculty, staff, and students. ID cards support the community's safety and security by allowing access to many parts of campus: dining halls and cafés, residential housing, libraries, athletic centers, workspaces, labs, and academic buildings. Cultivating an environment of public safety requires the entire community to work together to ensure appropriate use of our spaces, as well as to foster a sense of belonging for all members of our community.

University policies, regulations, and practice require all students, faculty, and staff to carry their Yale ID card on campus and to show it to university officials on request. Yale ID cards are not transferable. Community members are responsible for their own ID card and should report lost or stolen cards immediately to the Yale ID Center (https://idcenter.yale.edu).

Members of the university community may be asked to show identification at various points during their time at Yale. This may include, but not be limited to, situations such as: where individuals are entering areas with access restrictions, for identification in emergency situations, to record attendance at a particular building or event, or for other academic or work-related reasons related to the safe and effective operation and functioning of Yale's on-campus spaces.

For some members of our community, based on the needs and culture of their program, department, or characteristics of their physical spaces, being asked to show an ID card is a regular, even daily, occurrence. However, for others it may be new or infrequent. For some, being asked to produce identification can be experienced negatively, as a contradiction to a sense of belonging or as an affront to dignity. Yale University is committed to enhancing diversity, supporting equity, and promoting an environment that is welcoming, inclusive, and respectful. University officials requesting that a community member show their ID card should remain mindful that the request may raise questions and should be prepared to articulate the reasons for any specific request during the encounter. In addition, individuals requesting identification should also be prepared to present their own identification, if requested.

Health Services

https://yalehealth.yale.edu

The Yale Health Center is located on campus at 55 Lock Street. The center is home to Yale Health, a not-for-profit, physician-led health coverage option that offers a wide variety of health care services for students and other members of the Yale community. Services include student health, gynecology, mental health, pediatrics, pharmacy, blood draw, radiology, a fifteen-bed inpatient care unit, and an acute care clinic with extended hours and telephone triage/guidance from a registered nurse twenty-four hours a day. Additional specialty services such as allergy, dermatology, orthopedics, a travel clinic, and more are available through Yale Health Hospitalization Specialty Coverage. Yale Health's services are detailed in the *Yale Health Student Handbook*, available through the Yale Health Member Services Department, 203.432.0246, or online at https://yalehealth.yale.edu/coverage/student-coverage.

ELIGIBILITY FOR SERVICES

All full-time Yale degree-candidate students who are paying at least half tuition are enrolled automatically for Yale Health Basic Student Health Services, which is offered at no charge and includes preventive health and medical services in the departments of Student Health, Gynecology, Student Wellness, and Mental Health & Counseling. In addition, treatment or triage for urgent medical problems can be obtained twenty-four hours a day through Acute Care.

Students on leave of absence, on extended study and paying less than half tuition, or enrolled per course credit are not eligible for Yale Health Basic Student Health Services but may enroll in Yale Health Student Affiliate Coverage. Students enrolled in the Division of Special Registration as nondegree special students or visiting scholars are not eligible for Yale Health Basic Student Health Services but may enroll in the Yale Health Billed Associates Plan and pay a monthly fee. Associates must register for a minimum of one term within the first thirty days of affiliation with the university.

Students not eligible for Yale Health Basic Student Health Services may also use the services on a fee-for-service basis. Students who wish to be seen fee-for-service must register with the Member Services Department. Enrollment applications for the Yale Health Student Affiliate Coverage, Billed Associates Plan, or Fee-for-Service Program are available from the Member Services Department.

All students who purchase Yale Health Hospitalization/Specialty Coverage (see below) are welcome to use specialty and ancillary services at Yale Health Center. Upon referral, Yale Health will cover the cost of specialty and ancillary services for these students. Students with an alternate insurance plan should seek specialty services from a provider who accepts their alternate insurance.

HEALTH COVERAGE ENROLLMENT

The university also requires all students eligible for Yale Health Basic Student Health Services to have adequate hospital insurance coverage. Students may choose Yale Health Hospitalization/Specialty Coverage or elect to waive the plan if they have other hospitalization coverage, such as coverage through a spouse or parent. The waiver must be renewed annually, and it is the student's responsibility to confirm receipt of the waiver by the university's deadlines noted below.

Yale Health Hospitalization/Specialty Coverage

For a detailed explanation of this plan, which includes coverage for prescriptions, see the *Yale Health Student Handbook*, available online at https://yalehealth.yale.edu/student-coverage.

Students are automatically enrolled and charged a fee each term on their Student Financial Services bill for Yale Health Hospitalization/Specialty Coverage. Students with no break in coverage who are enrolled during both the fall and spring terms are billed each term and are covered from August 1 through July 31. For students entering Yale for the first time, readmitted students, and students returning from a leave of absence who have not been covered during their leave, Yale Health Hospitalization/ Specialty Coverage begins on the first day required to be on campus for program orientation. A student who is enrolled for the fall term only is covered for services through January 31; a student enrolled for the spring term only is covered for services through July 31.

Waiving Yale Health Hospitalization/Specialty Coverage Students are permitted to waive Yale Health Hospitalization/Specialty Coverage by completing an online waiver form at https://yhpstudentwaiver.yale.edu that demonstrates proof of alternate coverage. It is the student's responsibility to report any changes in alternate insurance coverage to the Member Services Department within thirty days. Students are encouraged to review their present coverage and compare its benefits to those available under Yale Health. The waiver form must be filed annually and must be received by September 15 for the full year or fall term or by January 31 for the spring term only.

Revoking the Waiver Students who waive Yale Health Hospitalization/Specialty Coverage but later wish to be covered must complete and send a form voiding their waiver to the Member Services Department by September 15 for the full year or fall term, or by January 31 for the spring term only. Students who wish to revoke their waiver during the term may do so, provided they show proof of loss of the alternate insurance plan and enroll within thirty days of the loss of this coverage. Yale Health fees will not be prorated.

Yale Health Student Dependent Plans

A student may enroll the student's lawfully married spouse or civil union partner and/or legally dependent child(ren) under the age of twenty-six in one of three student dependent plans: Student + Spouse, Student + Child/Children, or Student Family Plan. These plans include services described in both Yale Health Basic Student Health Services and Yale Health Hospitalization/Specialty Coverage. Coverage is not automatic, and enrollment is by application. Applications are available from the Member Services Department or can be downloaded from the website (https:// yalehealth.yale.edu/forms-and-guidelines) and must be renewed annually. Applications must be received by September 15 for full-year or fall-term coverage, or by January 31 for spring-term coverage only.

Yale Health Student Affiliate Coverage

Students on leave of absence, on extended study, or enrolled per course per credit; students paying less than half tuition; students enrolled in the EMBA program; students enrolled in the Broad Center M.M.S. program; students enrolled in the PA Online program; and students enrolled in the EMPH program may enroll in Yale Health Student Affiliate Coverage, which includes services described in both Yale Health Basic and Yale Health Hospitalization/Specialty Coverage. Applications are available from the Member Services Department or can be downloaded from the website (https://yalehealth.yale.edu/forms-and-guidelines) and must be received by September 15 for full-year or fall-term coverage, or by January 31 for spring-term coverage only.

ELIGIBILITY CHANGES

Withdrawal A student who withdraws from the university during the first fifteen days of the term will be refunded the fee paid for Yale Health Hospitalization/Specialty Coverage. The student will not be eligible for any Yale Health benefits, and the student's Yale Health membership will be terminated retroactive to the beginning of the term. The medical record will be reviewed, and any services rendered and/or claims paid will be billed to the student on a fee-for-service basis. Assistance with identifying and locating alternative sources of medical care may be available from the Care Management Department at Yale Health. At all other times, a student who withdraws from the university will be covered by Yale Health for thirty days following the date of withdrawal. Fees will not be prorated or refunded. Students who withdraw are not eligible to enroll in Yale Health Student Affiliate Coverage. Regardless of enrollment in Yale Health Hospitalization/Specialty Coverage, students who withdraw will have access to services available under Yale Health Basic Student Health Services (including Student Health, Athletic Medicine, Mental Health & Counseling, and Care Management) during these thirty days to the extent necessary for a coordinated transition of care.

Leaves of Absence Students who are granted a leave of absence are eligible to purchase Yale Health Student Affiliate Coverage for the term(s) of the leave. If the leave occurs on or *before* the first day of classes, Yale Health Hospitalization/Specialty Coverage will end retroactive to the start of the coverage period for the term. If the leave occurs anytime after the first day of classes, Yale Health Hospitalization/Specialty coverage will end on the day the registrar is notified of the leave. In either case, students may enroll in Yale Health Student Affiliate Coverage. Students must enroll in Affiliate Coverage prior to the beginning of the term unless the registrar is notified after the first day of classes, in which case, the coverage must be purchased within thirty days of the date the registrar was notified. Fees paid for Yale Health Hospitalization/Specialty Coverage will be applied toward the cost of Affiliate Coverage. Coverage is not automatic, and enrollment forms are available at the Member Services Department or can be downloaded from the website (https://yalehealth.yale.edu/forms-and-guidelines). Fees will not be prorated or refunded.

Extended Study or Reduced Tuition Students who are granted extended study status or pay less than half tuition are not eligible for Yale Health Hospitalization/Specialty Coverage. They may purchase Yale Health Student Affiliate Coverage during the term(s) of extended study. This plan includes services described in both Yale Health Basic and Yale Health Hospitalization/Specialty Coverage. Coverage is not automatic, and enrollment forms are available at the Member Services Department or can be downloaded from the website (https://yalehealth.yale.edu/forms-and-guidelines). Students must complete an enrollment application for the plan prior to September 15 for the full year or fall term, or by January 31 for the spring term only.

Per Course Per Credit Students who are enrolled per course per credit are not eligible for Yale Health Hospitalization/Specialty Coverage. They may purchase Yale Health Student Affiliate Coverage during the term(s) of per course per credit enrollment. This plan includes services described in both Yale Health Basic and Yale Health Hospitalization/Specialty Coverage. Coverage is not automatic, and enrollment forms are available at the Member Services Department or can be downloaded from the website (https://yalehealth.yale.edu/forms-and-guidelines). Students must complete an enrollment application for the plan prior to September 15 for the full year or fall term, or by January 31 for the spring term only.

For a full description of the services and benefits provided by Yale Health, please refer to the *Yale Health Student Handbook*, available online at https://yalehealth.yale.edu/ resource/student-handbook and from the Member Services Department, 203.432.0246, 55 Lock Street, PO Box 208237, New Haven CT 06520-8237.

REQUIRED IMMUNIZATIONS

Proof of vaccination is a pre-entrance requirement determined by the Connecticut State Department of Public Health. Students who are not compliant with this state regulation will not be permitted to register for classes or move into the dormitories for the fall term, 2024. Please access the Incoming Student Vaccination Record form for graduate and professional students at https://yalehealth.yale.edu/new-student-healthrequirements. Connecticut state regulation requires that this form be completed and signed, for each student, by a physician, nurse practitioner, or physician's assistant. The form must be completed, independent of any and all health insurance elections or coverage chosen. Once the form has been completed, the information must be entered into the Yale Vaccine Portal, and all supporting documents must be uploaded to https://campushealth.yale.edu/welcome-to-health-on-track. The final deadline is August 1.

COVID-19 As per recommendations from the Centers for Disease Control and Prevention, vaccination against COVID-19 is strongly encouraged, but not required, for incoming (matriculating) students. Students are asked to submit documentation of prior any primary series vaccinations or bivalent boosters that they have received through the Yale Health website, http://yalehealth.yale.edu. Vaccination requirements remain in place for healthcare workers and trainees, including students who work in settings where patient care is provided, or those who work with human research subjects in clinical settings. Those individuals must submit documentation of vaccination with a primary series and one booster (or, for those who have not yet received a primary series, one bivalent dose of vaccine) to the university or seek approval for a medical or religious exemption. Yale will accept any combination of COVID-19 vaccines that have received full approval or Emergency Use Authorization (EUA) by the U.S. Food and Drug Administration (FDA) or have been issued Emergency Use Listing (EUL) by the World Health Organization (WHO). International students who do not have access to WHO or FDA authorized or approved vaccines may be vaccinated at Yale Health on request.

Influenza All students are required to have flu vaccination in the fall term when it is made available to them by Yale Health.

Measles, Mumps, Rubella, and Varicella All students are required to provide proof of immunization against measles (rubeola), mumps, German measles (rubella), and varicella. Connecticut state regulation requires two doses of MMR (combined measles, mumps, and rubella) vaccine and two doses of varicella vaccine. The first dose must have been given after the student's first birthday; the second dose must have been given at least twenty-eight days after the first dose. If dates of vaccination are not available, titer results (blood test) demonstrating immunity may be substituted for proof of

vaccination. The cost for all vaccinations and/or titers rests with the student, as these vaccinations are considered to be a pre-entrance requirement by the Connecticut State Department of Public Health. Students who are not compliant with this state regulation will not be permitted to register for classes or move into the dormitories for the fall term, 2024.

Quadrivalent Meningitis All students living in on-campus dormitory facilities (all undergraduate residential colleges and the following graduate dormitories: 254 Prospect Street, 272 Elm Street, 276 Prospect Street, Baker Hall, and Edward S. Harkness Memorial Hall) must be vaccinated against meningitis. The only vaccines that will be accepted in satisfaction of the meningitis vaccination requirement are ACWY Vax, Menveo, Nimenrix, Menactra, Mencevax, and Menomune. The vaccine must have been given within five years of the first day of classes at Yale. Students who are not compliant with this state regulation will not be permitted to register for classes or move into the dormitories for the fall term, 2024. The cost for all vaccinations and/or titers rests with the student, as these vaccinations are a pre-entrance requirement by the Connecticut State Department of Public Health. Please note that the state of Connecticut does not require this vaccine for students who intend to reside on campus and are over the age of twenty-nine.

TB Screening The university requires tuberculosis screening for all incoming students who have lived or traveled outside of the United States within the past year. Tuberculosis screening is required for all medical, physician assistant, and nursing students.

Hepatitis B Series The university recommends that incoming students receive a series of three Hepatitis B vaccinations. Students may consult their health care provider for further information. Hepatitis B immunity is required for all medical, physician assistant, and nursing students.

Student Accessibility Services

https://sas.yale.edu 203.432.2324

Student Accessibility Services (SAS) engages in an interactive process with Yale students, including undergraduate, graduate, and professional-school students with permanent conditions and/or temporary injuries, to determine reasonable and appropriate accommodations on a case-by-case basis. Students may initiate this process by requesting accommodations through the online registration form available at https://yale-accommodate.symplicity.com/public_accommodation.

Engagement with SAS is confidential, and faculty/staff are notified of approved accommodations on a need-to-know basis only, except when required by law for health and safety reasons. Students may upload supporting documentation regarding their condition and request for accommodations with their accommodation request form. Documentation guidelines are available on the SAS website at https://sas.yale.edu/students/documentation-guidelines.

Office of International Students and Scholars

http://oiss.yale.edu 203.432.2305

The Office of International Students and Scholars (OISS) coordinates services and support for more than 6,300 international students, faculty, staff, and their dependents at Yale. OISS assists international students and scholars with issues related to employment, immigration, and personal and cultural adjustment and serves as a source of general information about living at Yale and in New Haven. As Yale University's representative for immigration concerns, OISS helps students and scholars obtain and maintain legal nonimmigrant status in the United States.

OISS programs, like daily English conversation groups, the Understanding America series, DEIB workshops, bus trips, and social events provide an opportunity to meet members of Yale's international community and become acquainted with the many resources of Yale University and New Haven. Spouses and partners of Yale students and scholars will want to get involved with the International Spouses and Partners at Yale (ISPY) community, which organizes a variety of programs and events.

The OISS website provides useful information to students and scholars prior to and upon arrival in New Haven as well as throughout their stay at Yale. International students, scholars, and their families and partners can connect with OISS and the Yale international community virtually through Yale Connect, Facebook, and Instagram.

OISS is a welcoming venue for students and scholars who want to check their email, grab a cup of coffee, and meet up with a friend or colleague. The International Center is OISS's home on Yale campus and is located at 421 Temple Street. The International Center provides meeting space for student groups and a venue for events organized by both student groups and university departments. For more information about our hours, directions, and how to reserve space at OISS, please visit https://oiss.yale.edu/about/hours-directions-parking.

Resources to Address Discrimination, Harassment, and Sexual Misconduct

Yale is a community committed to fostering an environment of diversity, mutual respect, and intellectual discovery in which all members of the community can thrive. Acts of discrimination and harassment are contrary to the community standards and ideals of our university. Staff in the following offices work within the Yale community to promote respect, inclusivity, diversity, and equal opportunity, and are available to talk through situations you have witnessed or experienced, as well as to provide guidance.

When you have concerns or questions related to discrimination or harassment, you have a wide range of choices for support. You can reach out to a discrimination and harassment resource coordinator, or you can talk with others, such as a residential college dean, dean of student affairs, or the Office of Institutional Equity and Accessibility.

If you'd like to talk with someone about sexual misconduct or sex-based discrimination, you can reach out directly to the deputy Title IX coordinator of your school or the

Title IX Office. The Title IX website (https://titleix.yale.edu) is a helpful resource for additional questions or concerns about sex-based discrimination or sexual misconduct. If an individual is unsure of which resource to contact and wants to explore options for addressing sexual misconduct, the SHARE Center is a good place to start.

DISCRIMINATION AND HARASSMENT RESOURCE COORDINATORS

Office hours: 9 a.m.-5 p.m., M–F https://dhr.yale.edu/discrimination-and-harassment-resource-coordinators

Discrimination and harassment resource coordinators (formerly deans' designees) have been identified by the dean of each college and school as community members with the responsibility to receive concerns and offer advice and guidance related to diversity and inclusion, discrimination and harassment, and equal opportunity. Discrimination and harassment resource coordinators may also help facilitate informal resolution. This may be an individual's best "first stop" in discussing a concern related to discrimination, harassment, or retaliation, particularly as discrimination and harassment resource coordinators will be knowledgeable about resources specific to their school or college.

OFFICE OF INSTITUTIONAL EQUITY AND ACCESSIBILITY

Office hours: 9 a.m.-5 p.m., M-F 203.432.0849 https://oiea.yale.edu

Any individual who would like to report a concern of discrimination, harassment, and/or retaliation may contact the Office of Institutional Equity and Accessibility (OIEA). OIEA staff are available to discuss concerns, university resources, and options for resolution, including informal resolution. Where appropriate, OIEA staff are also available to conduct investigations into complaints of discrimination, harassment, and/ or retaliation. Talking with someone at OIEA about a concern or making a complaint does not automatically launch an investigation. It can, however, be an important step to alerting the university about a concern and getting assistance to resolve it.

SHARE: INFORMATION, ADVOCACY, AND SUPPORT

55 Lock Street, Lower Level Appointments: 9 a.m.–5 p.m., M–F 24/7 on-call service (for time-sensitive matters): 203.432.2000 https://sharecenter.yale.edu

SHARE, the Sexual Harassment and Assault Response and Education Center, has trained counselors available to members of the Yale community who wish to discuss any current or past experience of sexual misconduct involving themselves or someone they care about. SHARE services are confidential and can be anonymous if desired. SHARE can provide professional help with medical and health issues (including accompanying individuals to the hospital or the police), as well as ongoing counseling and support for students. SHARE works closely with the University-Wide Committee on Sexual Misconduct, the Title IX Office, the Yale Police Department, and other campus resources and can provide assistance with initiating a complaint. If you wish to make use of SHARE's services, you can call the SHARE number (203.432.2000) at any time for a phone consultation or to set up an in-person appointment. Some legal and medical options are time-sensitive, so if you have experienced an assault, we encourage you to call SHARE and/or the Yale Police as soon as possible.

TITLE IX COORDINATORS

203.432.6854 Office hours: 9 a.m.-5 p.m., M-F https://titleix.yale.edu

Title IX of the Education Amendments of 1972 protects people from sex discrimination in educational programs and activities at institutions that receive federal financial assistance. Sex discrimination includes sexual harassment, sexual assault, and other forms of sexual misconduct. The university is committed to providing an environment free from discrimination on the basis of sex or gender.

Yale College, the Graduate School of Arts and Sciences, and the professional schools have each designated one or more deputy Title IX coordinators, who work closely with the university Title IX Office and university Title IX Coordinator Elizabeth Conklin. Coordinators respond to and address concerns, provide information on available resources and options, track and monitor incidents to identify patterns or systemic issues, deliver prevention and educational programming, and address issues relating to gender-based discrimination and sexual misconduct within their respective schools. Coordinators also work with pregnant and parenting individuals to coordinate needed accommodations and to respond to instances of discrimination. Discussions with a deputy Title IX coordinator are private and information is only shared with other university officials on a need-to-know basis. In the case of imminent threat to an individual or the community, the coordinator may need to consult with other administrators or take action in the interest of safety. The coordinators also work closely with the SHARE Center, the University-Wide Committee on Sexual Misconduct, and the Yale Police Department.

UNIVERSITY-WIDE COMMITTEE ON SEXUAL MISCONDUCT

203.432.4449 Office hours: 9 a.m.-5 p.m., M-F https://uwc.yale.edu

The University-Wide Committee on Sexual Misconduct (UWC) is an internal disciplinary board for complaints of sexual misconduct available to students, faculty, and staff across the university, as described in the committee's procedures. The UWC provides an accessible, representative, and trained body to fairly and expeditiously address formal complaints of sexual misconduct. UWC members can answer inquiries about procedures and the university sexual misconduct policy. The UWC is composed of faculty, senior administrators, and graduate and professional students drawn from throughout the university. UWC members are trained to observe strict confidentiality with respect to all information they receive about a case.

YALE POLICE DEPARTMENT

101 Ashmun Street 24/7 hotline: 203.432.4400 https://your.yale.edu/community/public-safety/yale-police-department

The Yale Police Department (YPD) operates 24/7 and is comprised of highly trained, professional officers. The YPD can provide information on available victims' assistance services and also has the capacity to perform full criminal investigations. If you wish to speak with the sensitive crimes and support coordinator, they can be reached at 203.432.9547. Informational sessions are available with the sensitive crimes and support coordinator to discuss safety planning, available options, etc. The YPD works closely with the New Haven State's Attorney, the SHARE Center, the Title IX Office, and various other departments within the university. Talking to the YPD does not commit you to submitting evidence or pressing charges; with few exceptions, all decisions about how to proceed are up to you.

THE WORK OF YALE UNIVERSITY

The work of Yale University is carried on in the following schools:

Yale College Est. 1701. Courses in humanities, social sciences, natural sciences, mathematical and computer sciences, and engineering. Bachelor of Arts (B.A.), Bachelor of Science (B.S.).

For additional information, please visit https://admissions.yale.edu, email student.questions@yale.edu, or call 203.432.9300. Postal correspondence should be directed to Office of Undergraduate Admissions, Yale University, PO Box 208234, New Haven CT 06520-8234.

Graduate School of Arts and Sciences Est. 1847. Courses for college graduates. Master of Arts (M.A.), Master of Science (M.S.), Master of Philosophy (M.Phil.), Doctor of Philosophy (Ph.D.).

For additional information, please visit https://gsas.yale.edu, email graduate.admissions@yale.edu, or call the Office of Graduate Admissions at 203.432.2771. Postal correspondence should be directed to Office of Graduate Admissions, Yale Graduate School of Arts and Sciences, PO Box 208236, New Haven CT 06520-8236.

School of Medicine Est. 1810. Courses for college graduates and students who have completed requisite training in approved institutions. Doctor of Medicine (M.D.). Postgraduate study in the basic sciences and clinical subjects. Five-year combined program leading to Doctor of Medicine and Master of Health Science (M.D./M.H.S.). Combined program with the Graduate School of Arts and Sciences leading to Doctor of Medicine and Doctor of Philosophy (M.D./Ph.D.). Master of Medical Science (M.M.Sc.) from the Physician Associate Program and the Physician Assistant Online Program.

For additional information, please visit https://medicine.yale.edu/edu, email medical.admissions@yale.edu, or call the Office of Admissions at 203.785.2643. Postal correspondence should be directed to Office of Admissions, Yale School of Medicine, 367 Cedar Street, New Haven CT 06510.

Divinity School Est. 1822. Courses for college graduates. Master of Divinity (M.Div.), Master of Arts in Religion (M.A.R.). Individuals with an M.Div. degree may apply for the program leading to the degree of Master of Sacred Theology (S.T.M.).

For additional information, please visit https://divinity.yale.edu, email div.admissions@yale.edu, or call the Admissions Office at 203.432.5360. Postal correspondence should be directed to Admissions Office, Yale Divinity School, 409 Prospect Street, New Haven CT 06511.

Law School Est. 1824. Courses for college graduates. Juris Doctor (J.D.). For additional information, please visit https://law.yale.edu, email admissions.law@yale.edu, or call the Admissions Office at 203.432.4995. Postal correspondence should be directed to Admissions Office, Yale Law School, PO Box 208215, New Haven CT 06520-8215.

Graduate Programs: Master of Laws (LL.M.), Doctor of the Science of Law (J.S.D.), Master of Studies in Law (M.S.L.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. For additional information, please visit https:// law.yale.edu, email gradpro.law@yale.edu, or call the Graduate Programs Office at 203.432.1696. Postal correspondence should be directed to Graduate Programs, Yale Law School, PO Box 208215, New Haven CT 06520-8215.

School of Engineering & Applied Science Est. 1852. Courses for college graduates. Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://seas.yale.edu, email grad.engineering@yale.edu, or call 203.432.4252. Postal correspondence should be directed to Office of Graduate Studies, Yale School of Engineering & Applied Science, PO Box 208292, New Haven CT 06520-8292.

School of Art Est. 1869. Professional courses for college and art school graduates. Master of Fine Arts (M.F.A.).

For additional information, please visit http://art.yale.edu, email artschool.info@yale.edu, or call the Office of Academic Administration at 203.432.2600. Postal correspondence should be directed to Office of Academic Administration, Yale School of Art, PO Box 208339, New Haven CT 06520-8339.

School of Music Est. 1894. Graduate professional studies in performance and composition. Certificate in Performance (CERT), Master of Music (M.M.), Master of Musical Arts (M.M.A.), Artist Diploma (A.D.), Doctor of Musical Arts (D.M.A.).

For additional information, please visit https://music.yale.edu, email gradmusic.admissions@yale.edu, or call the Office of Admissions at 203.432.4155. Postal correspondence should be directed to Yale School of Music, PO Box 208246, New Haven CT 06520-8246.

School of the Environment Est. 1900. Courses for college graduates. Master of Forestry (M.F.), Master of Forest Science (M.F.S.), Master of Environmental Science (M.E.Sc.), Master of Environmental Management (M.E.M.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://environment.yale.edu, email admissions.yse@yale.edu, or call the Office of Admissions at 800.825.0330. Postal correspondence should be directed to Office of Admissions, Yale School of the Environment, 300 Prospect Street, New Haven CT 06511.

School of Public Health Est. 1915. Courses for college graduates. Master of Public Health (M.P.H.). Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://publichealth.yale.edu, email ysph.admissions@yale.edu, or call the Admissions Office at 203.785.2844.

School of Architecture Est. 1916. Courses for college graduates. Professional and postprofessional degree: Master of Architecture (M.Arch.); nonprofessional degree: Master of Environmental Design (M.E.D.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://architecture.yale.edu, email gradarch.admissions@yale.edu, or call 203.432.2296. Postal correspondence should be directed to the Yale School of Architecture, PO Box 208242, New Haven CT 06520-8242.

School of Nursing Est. 1923. Courses for college graduates. Master of Science in Nursing (M.S.N.), Post Master's Certificate (P.M.C.), Doctor of Nursing Practice (D.N.P.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://nursing.yale.edu or call 203.785.2389. Postal correspondence should be directed to Yale School of Nursing, Yale University West Campus, PO Box 27399, West Haven CT 06516-0972.

David Geffen School of Drama Est. 1925. Courses for college graduates and certificate students. Master of Fine Arts (M.F.A.), Certificate in Drama, Doctor of Fine Arts (D.F.A.).

For additional information, please visit https://drama.yale.edu, email ysd.admissions@yale.edu, or call the Registrar/Admissions Office at 203.432.1507. Postal correspondence should be directed to David Geffen School of Drama at Yale University, PO Box 208325, New Haven CT 06520-8325.

School of Management Est. 1976. Courses for college graduates. Master of Business Administration (M.B.A.), Master of Advanced Management (M.A.M.), Master of Management Studies (M.M.S.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://som.yale.edu. Postal correspondence should be directed to Yale School of Management, PO Box 208200, New Haven CT 06520-8200.

Jackson School for Global Affairs Est. 2022. Courses for college graduates. Master in Public Policy (M.P.P.) and Master of Advanced Study (M.A.S.).

For additional information, please visit https://jackson.yale.edu, email jackson.admissions@yale.edu, or call 203.432.6235.

YALE UNIVERSITY CAMPUS NORTH



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© Yale University. Map not to scale

The university is committed to affirmative action under law in employment of women, minority group members, individuals with disabilities, and protected veterans. Additionally, in accordance with Yale's Policy Against Discrimination and Harassment (https://your.yale.edu/policies-procedures/policies/9000-yale-university-policyagainst-discrimination-and-harassment), and as delineated by federal and Connecticut law, Yale does not discriminate in admissions, educational programs, or employment against any individual on account of that individual's sex; sexual orientation; gender identity or expression; race; color; national or ethnic origin; religion; age; disability; status as a special disabled veteran, veteran of the Vietnam era, or other covered veteran; or membership in any other protected classes as set forth in Connecticut and federal law.

Inquiries concerning these policies may be referred to the Office of Institutional Equity and Accessibility, 203.432.0849; equity@yale.edu. For additional information, please visit https://oiea.yale.edu.

Title IX of the Education Amendments of 1972 protects people from sex discrimination in educational programs and activities at institutions that receive federal financial assistance. Questions regarding Title IX may be referred to the university's Title IX coordinator, Elizabeth Conklin, at 203.432.6854 or at titleix@yale.edu, or to the U.S. Department of Education, Office for Civil Rights, 8th Floor, 5 Post Office Square, Boston MA 02109-3921; tel. 617.289.0111, TDD 800.877.8339, or ocr.boston@ed.gov. For additional information, including information on Yale's sexual misconduct policies and a list of resources available to Yale community members with concerns about sexual misconduct, please visit https://titleix.yale.edu.

In accordance with federal and state law, the university maintains information on security policies and procedures and prepares an annual campus security and fire safety report containing three years' worth of campus crime statistics and security policy statements, fire safety information, and a description of where students, faculty, and staff should go to report crimes. The fire safety section of the annual report contains information on current fire safety practices and any fires that occurred within on-campus student housing facilities. Upon request to the Yale Police Department at 203.432.4400, the university will provide this information to any applicant for admission, or to prospective students and employees. The report is also posted on Yale's Public Safety website; please visit http://your.yale.edu/community/public-safety.

In accordance with federal law, the university prepares an annual report on participation rates, financial support, and other information regarding men's and women's intercollegiate athletic programs. Upon request to the Director of Athletics, PO Box 208216, New Haven CT 06520-8216, 203.432.1414, the university will provide its annual report to any student or prospective student. The Equity in Athletics Disclosure Act (EADA) report is also available online at http://ope.ed.gov/athletics.

BULLETIN OF YALE UNIVERSITY New Haven CT 06520-8227 Periodicals postage paid New Haven, Connecticut