

Graduate School of Arts and Sciences

Programs and Policies

2023–2024



BULLETIN OF YALE UNIVERSITY

Series 119 Number 5 July 15, 2023

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THE PRESIDENT AND FELLOWS OF YALE UNIVERSITY

President

Peter Salovey, A.B., A.M., Ph.D.

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Gina Rosselli Boswell, B.S., M.B.A., Vero Beach, Florida (*June 2029*)

Michael James Cavanagh, B.A., J.D., Philadelphia, Pennsylvania (*June 2026*)

Catharine Bond Hill, B.A., B.A., M.A., Ph.D., Bronx, New York (*June 2024*)

Maryana Iskander, B.A., M.Sc., J.D., Round Rock, Texas (*June 2029*)

William Earl Kennard, B.A., J.D., Charleston, South Carolina (*June 2026*)

Frederic David Krupp, B.S., J.D., Norwalk, Connecticut (*June 2028*)

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Neal Steven Wolin, B.A., M.Sc., J.D., Washington, D.C. (*June 2029*)

His Excellency the Governor of Connecticut, *ex officio*

Her Honor the Lieutenant Governor of Connecticut, *ex officio*

THE OFFICERS OF YALE UNIVERSITY

President

Peter Salovey, A.B., A.M., Ph.D.

Provost

Scott Allan Strobel, B.A., Ph.D.

Secretary and Vice President for University Life

Kimberly Midori Goff-Crews, B.A., J.D.

Senior Vice President for Operations

Jack Francis Callahan, Jr., B.A., M.B.A.

Senior Vice President for Institutional Affairs and General Counsel

Alexander Edward Dreier, A.B., M.A., J.D.

Vice President for Finance and Chief Financial Officer

Stephen Charles Murphy, B.A.

Vice President for Alumni Affairs and Development

Joan Elizabeth O'Neill, B.A.

Vice President for Human Resources

John Whelan, B.A., J.D.

Vice President for Facilities, Campus Development, and Sustainability

Jack Michael Bellamy, B.S., M.S.

Vice President for Information Technology and Chief Information Officer

John Barden, B.A., M.B.A.

Vice President for Communications

Renee Kopkowski, B.A.

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

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Jasmina Besirevic Regan, Ph.D., Associate Dean for Graduate Education

Allegra di Bonaventura, J.D., Ph.D., Associate Dean for Graduate Academic Support

Ann Gaylin, Ph.D., Associate Dean for Graduate Education

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 Diversity

Matthew Tanico, Ph.D., Assistant Dean for Academic Support and Outreach

Suzanne Young, Ph.D., Assistant Dean for Graduate Student Professional Development

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Eva Wilson, Ph.D., Mental Health Counselor

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**

Peter Salovey, 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 2023–2024 academic year. Changes will be posted online on the Graduate School's website.

FALL TERM 2023

Aug. 21	M	New student orientation week begins (mandatory)
Aug. 23	W	Add/drop period opens, 8:30 a.m.
Aug. 30	W	Fall-term classes begin, 8:20 a.m.
Sept. 1	F	Monday classes meet on Friday Due date to notify department of intention to submit dissertation for award of the Ph.D. in December Final day to file petition for M.A., M.S., and M.Phil. degrees to be awarded in December
Sept. 4	M	Labor Day. Classes do not meet
Sept. 5	T	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 this date, or who are granted a leave of absence effective on or before this date
Sept. 22	F	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
Oct. 1	SU	Due date for dissertations to be considered by the Degree Committee for award of the Ph.D. in December Final date for the faculty to submit grades to replace grades of Temporary Incomplete (TI) awarded during the previous academic year
Oct. 17	T	October recess begins, 11 p.m.
Oct. 23	M	Classes resume, 8:20 a.m.
Oct. 27	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 One-quarter 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 Teaching appointments will not appear on the transcripts of students who withdraw from the assignment on or before this date
Oct. 31	T	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in December

Nov. 8	W	Final day to withdraw a degree petition for degrees to be awarded in December
Nov. 10	F	Deadline for departments to return Degree Recommendation Forms for December degrees to registrar
Nov. 15	W	Registration for spring term 2024 opens, 8 a.m.
Nov. 17	F	November recess begins, 5:30 p.m.
Nov. 27	M	Classes resume, 8:20 a.m.
Nov. 29	W	Final day to submit petitions for extended registration and Dissertation Completion Status for the spring term
Dec. 13	W	Registration for spring term 2024 closes, 5 p.m.
Dec. 14	TH	Classes end, 5:30 p.m. Final examinations begin, 7 p.m.
Dec. 20	W	Examinations end, 5:30 p.m. Winter recess begins
Dec. 21	TH	Date of December degree award

SPRING TERM 2024

Jan. 2	T	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. 8	M	Add/drop period opens, 8:30 a.m.
Jan. 15	M	Martin Luther King, Jr. Day. Administrative offices are closed. Classes do not meet
Jan. 16	T	Spring-term classes begin, 8:20 a.m.
Jan. 19	F	Add/drop period closes, 5 p.m. A fee of \$50 is assessed for course schedules accepted after this date
Jan. 30	T	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. 9	F	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. 15	TH	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. 8	F	Midterm Spring recess begins, 5:20 p.m. 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 Teaching appointments will not appear on the transcripts of students who withdraw from the assignment on or before this date

Mar. 15	F	Due date for dissertations to be uploaded to DPRS for consideration by the Degree Committee for award of the Ph.D. in May
Mar. 25	M	Classes resume, 8:20 a.m.
Mar. 29	F	Good Friday. Administrative offices closed. Classes meet
April 15	M	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in May
Apr. 17	W	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
May 2	TH	Classes end, 5:20 p.m.
May 3	F	Final examinations begin
May 8	W	Final examinations end
May 10	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 19	SU	Graduate School Convocation
May 20	M	University Commencement Date of May degree award
May 29	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 5	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

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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; 206 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 Experience, 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

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<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.

Admissions

Leah Phinney, Director; 307 Warner House, 1 Hillhouse Ave., 203.432.2771, graduate.admissions@yale.edu
 Lisa Furino, Assistant Director; 302 Warner House, 1 Hillhouse Ave., 203.432.2771, graduate.admissions@yale.edu
<http://gsas.yale.edu/admission>

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

Kerry Worsencroft, Director; 246 Church St., gradfinaid@yale.edu
 Kellie Webb, Assistant Director; 246 Church St., gradfinaid@yale.edu
<http://gsas.yale.edu/funding-aid/office-financial-aid>

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

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., registrar.gsas@yale.edu

Claudia Schiavone, Assistant University Registrar; 246 Church St., registrar.gsas@yale.edu

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

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

Matthew Regan, Assistant Director; matthew.regan@yale.edu
teaching.fellows@yale.edu

<http://gsas.yale.edu/academic-professional-development/teaching-fellow-program>

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 selected 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 members from each division (Humanities, Sciences, and Social Sciences) 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 reviews 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, the committee reviews 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-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

Director of Graduate Studies

Erica Edwards

Professors Elijah Anderson, David Blight, Daphne Brooks, Hazel Carby (*Emerita*), Marlene Daut, Erica Edwards, Roderick Ferguson, Kaiama Glover, Phillip Atiba Goff, Jacqueline Goldsby, Elizabeth Hinton, Matthew Jacobson, Gerald Jaynes, Tavia Nyong'o, Edward Rugemer, Robert Stepto (*Emeritus*), Michael Veal, Shane Vogel

Associate Professors Crystal Feimster

Assistant Professors Allison Harris, Jonathan Howard, Elleza Kelley, Ernest Mitchell, Carolyn Roberts

Lecturers Thomas Allen Harris, 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 Erica Edwards

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 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 687a / AMST 701a / HIST 751a, Race in American Studies Matthew Jacobson
This reading-intensive seminar examines influential scholarship across disciplines on “the race concept” and racialized relations in American culture and society. Major topics include the cultural construction of race; race as both an instrument of oppressions and an idiom of resistance in American politics; the centrality of race in literary, anthropological, and legal discourse; the racialization of U.S. foreign policy; “race mixing” and “passing,” vicissitudes of “whiteness” in American politics; the centrality of race in American political culture; and “race” in the realm of popular cultural representation. Writings under investigation include classic formulations by such scholars as Lawrence Levine and Ronald Takaki, as well as more recent work by Saidiya Hartman, Robin Kelley, and Ann Fabian. Seminar papers give students an opportunity to explore in depth the themes, periods, and methods that most interest them. Permission of the instructor required.

AFAM 752b / HIST 937b / HSHM 761b, Medicine 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 764a / AMST 715a / HIST 715a, Readings in Nineteenth-Century America
David Blight

The course explores recent trends and historiography on several problems through the middle of the nineteenth century: sectionalism, expansion; slavery and the Old South; northern society and reform movements; Civil War causation; the meaning of the Confederacy; why the North won the Civil War; the political, constitutional, and social meanings of emancipation and Reconstruction; violence in Reconstruction society; the relationships between social/cultural and military/political history; problems in historical memory; the tension between narrative and analytical history writing; and the ways in which race and gender have reshaped research and interpretive agendas.

AFAM 771a / AMST 830a / HIST 729a, The American Carceral State Elizabeth Hinton

This readings course examines the historical development of the U.S. carceral state, focusing on policing practices, crime control policies, prison conditions, and the production of scientific knowledge in the twentieth century. Key works are considered to understand the connections between race and the development of legal and penal systems over time, as well as how scholars have explained the causes and consequences of mass incarceration in America. Drawing from key insights from new histories in the field of American carceral studies, we trace the multifaceted ways in which policymakers and officials at all levels of government have used criminal law, policing,

and imprisonment as proxies for exerting social control in communities of color throughout U.S. history.

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 774b / HIST 740b, Slavery and Abolition in the Atlantic World Edward Rugemer

This course explores the history and historiography of racial slavery in the Atlantic World from its emergence in the fifteenth century through its formal abolition in the nineteenth century and the processes of emancipation that followed.

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

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 820a / HIST 821a, A Greater Caribbean: New Approaches to Caribbean History Anne Eller

We engage with new work emerging about the Greater Caribbean in the context of Latin America, the African diaspora, Atlantic history, global history, comparative emancipation from chattel slavery, and the study of global revolutions. Students make in-class presentations that locate these titles in a deeper historiography with classic texts. This course crosses imperial boundaries of archives and historiography in order to consider the intersecting allegiances, identities, itineraries, and diaspora of peoples, in local, hemispheric, and global context. Some central questions include: What is the lived geography of the Caribbean at different moments, and how does using different geographic and temporary frameworks help approach the region's history? What role did people living in this amorously demarcated region play in major historical transformations of the eighteenth and nineteenth centuries? How did the varied but interconnected processes of Caribbean emancipation impact economic and political systems throughout the Atlantic and beyond?

AFAM 860a / ENGL 957a, 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).

AFAM 867a / CPLT 958a / EMST 667a / ER&M 677a / SPAN 867a, Black Iberia:

Then and Now Nicholas Jones

This graduate seminar examines the variety of artistic, cultural, historical, and literary representations of black Africans and their descendants—both enslaved and free—across the vast stretches of the Luso-Hispanic world and the United States. Taking a chronological frame, the course begins its study of Blackness in medieval and early modern Iberia and its colonial kingdoms. From there, we examine the status of Blackness conceptually and ideologically in Asia, the Caribbean, Mexico, and South America. Toward the end of the semester, we concentrate on black Africans by focusing on Equatorial Guinea, sub-Saharan African immigration in present-day Portugal and Spain, and the politics of Afro-Latinx culture and its identity politics in the United States. Throughout the term, we interrogate the following topics in order to guide our class discussions and readings: bondage and enslavement, fugitivity and maroonage, animal imageries and human-animal studies, geography and maps, Black Feminism and Black Queer Studies, material and visual cultures (e.g., beauty ads, clothing, cosmetics, food, Blackface performance, royal portraiture, reality TV, and music videos), the Inquisition and African diasporic religions, and dispossession and immigration. Our challenging task remains the following: to see how Blackness conceptually and experientially is subversively fluid and performative, yet deceptive and paradoxical. This course will be taught in English, with all materials available in the original (English, Portuguese, Spanish) and in English translation.

AFAM 895a, Dissertation Prospectus Workshop Erica Edwards

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

AFAM 929b / HSHM 775b, The Afterlives of Slavery, Health, and Medicine Carolyn Roberts

This graduate reading course is limited to a small number of graduate and professional school students who are interested in studying historical and contemporary texts that explore the history of slavery and its afterlives from the perspective of health and medicine. Graduate and professional school students co-create the course based on their interests. All students serve as co-teachers and co-learners in a supportive, compassion-based learning community that prioritizes values of deep listening, presence, and care.

AFAM 947b / ENGL 947b, Black Existentialisms Shane Vogel

This course is an introduction to Black existential thought as it developed in the writing of African American and Afro-Caribbean authors. Existentialism was a historical movement in philosophy and culture typically associated with mid-twentieth-century European intellectuals that asked how individuals constitute themselves within and beyond the given constraints of and possibilities of their situation. But a deep tradition of Black existentialism—or what Lewis R. Gordon calls *Africana philosophies of existence*—is related to but distinct from the European tradition. Throughout the course we explore key existential concepts such as freedom, authenticity, responsibility, action, struggle, situation, anguish, dread, the gaze, and the Other as they have been imagined in Black diasporic expressive cultures. Some of the questions we ask include: How have Black writers developed existential ideas in novels, poetry, and

drama? How does the encounter between European and African existentialisms animate the literature of Black freedom struggles in the US and across the colonial and postcolonial world? How does Black existentialism understand the (im)possibility of self-making within a society structured by dominance, and what might an existentialist understanding of Black collectivity look like? How can Black existential thought provide productive opportunities to reevaluate some of the seeming binaries that have shaped conversations in Black studies (in the mid-twentieth century and again today) such as hope/despair, being/nonbeing, humanism/antihumanism, and social life/social death? Why Black existentialism, and why now? Readings include work by Frantz Fanon, Richard Wright, Lorraine Hansberry, Ann Petry, William Melvin Kelley, George Lamming, Jackie Sibblies Drury, Ralph Ellison, Lewis R. Gordon, Jean-Paul Sartre, Albert Camus, Simone de Beauvoir, and others. This is an introductory level seminar, and no previous knowledge of the course content is required.

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

Louisa Lombard (*Anthropology*)

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 & 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; Epidemiology*), David Post (*Ecology and Evolutionary Biology*), Asghar Rastegar (*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*), Kaveh Khoshnood (*Epidemiology*), Louisa Lombard (*Anthropology*), Urania Magriples (*Obstetrics, Gynecology, and Reproductive Sciences*), LaRon Nelson (*Nursing*), Sunil Parikh (*Public Health; Internal Medicine*), Carla Staver (*Ecology and Evolutionary Biology*), Jonathan Wyrzten (*Sociology*)

Assistant Professors Amy Bei (*Epidemiology*), Jill Jarvis (*French*), Benedito Machava (*History*), Hani Mowafi (*Emergency Medicine*), Christine Ngaruiya (*Emergency Medicine*), 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*)

Lecturers Adalgisa Caccone (*Ecology and Evolutionary Biology*), 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, Management, 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. A student who is able to demonstrate advanced proficiency in an African language may have the language requirement waived and substitute four other approved courses. 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.

PROGRAM IN AFRICAN LANGUAGES

The language program offers instruction in five major languages from sub-Saharan Africa: Kiswahili (eastern and central Africa), Twi, Wolof, 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-Wyrzten

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 567a / PLSC 798a, Bureaucracy in Africa: Revolution, Genocide, and Apartheid

Jonny Steinberg

A study of three major episodes in modern African history characterized by ambitious projects of bureaucratically driven change—apartheid and its aftermath, Rwanda's genocide and post-genocide reconstruction, and Ethiopia's revolution and its long aftermath. Examination of Weber's theory bureaucracy, Scott's thesis on high modernism, Bierschenk's attempts to place African states in global bureaucratic history. Overarching theme is the place of bureaucratic ambitions and capacities in shaping African trajectories.

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 590a, African Studies Colloquium Jill Jarvis

Students conduct research for the master's thesis, give presentations on their research, and prepare a bibliography, a prospectus, and a draft chapter of the master's thesis. Discussion of model essays and other examples of writing.

AFST 719a, Christianity and Coloniality in Contemporary Africa Kyama Mugambi

Missionary complicity with the colonial enterprise puts Christianity at the heart of the problematic relationship between the African continent and the West. At the same time, Christianity has continued to grow rapidly in post-independence Africa. In much of Africa south of the Sahara, decolonization efforts coincided with the period of the greatest Christian expansion in history. Africa is now the continent with the highest population of Christians. This course examines this conundrum through critical engagement with theory, literature, and data from the continent. Students examine historiographic, political, social, economic, and demographic dimensions of this discussion. They meet key theories posited with regard to African Christianity in the wake of a colonial history. The course surveys contemporary issues in the discourse within the urban, educational, social, and cultural spheres. Students also consider gender perspectives on coloniality as it pertains to religion and politics. The course assesses the role of indigenous agency in the development of Christianity within contemporary Africa. Through this course students will gain a more nuanced perspective as they examine and problematize critical arguments in the prevailing discourse on Christianity and coloniality in Africa today. Area III, Area V.

AFST 779a, 2000 Years of Christianity in Africa: A History of the African Church

Kyama Mugambi

The rapid, previously unexpected growth of Christianity in Africa in the twentieth century calls for deeper scholarly reflection. Keen students of global trends are aware that Africa is now home to more Christians than Europe or North America. While the rapid growth can be traced to a century of vigorous activity, Christianity has a long eventful history on the continent. This course provides a broad overview of Christianity in Africa over two millennia. The early part of the course focuses on the beginnings and development of the Church in Africa. The material highlights the role of African Christian thinkers in shaping early Christian discourses in increasingly dynamic global and continental contexts. The course weaves critical themes emerging in African Christianity north of the expansive Sahara desert, and then south of it. Students encounter critical issues in missionary Christianity in Africa and gain a historical understanding of the milestones in Christian growth that contribute to Christianity's status as both an African and global religion. Area III.

AFST 833a, Agrarian History of Africa Robert Harms

This course examines changes in African rural life from precolonial times to the present. Issues to be examined include land use systems, rural modes of production, gender roles, markets and trade, the impact of colonialism, cash cropping, rural-urban migration, and development schemes.

AFST 889a / CPLT 889a / ENGL 889a, Postcolonial Ecologies Cajetan Ihaka

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.

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 630a, Intermediate Kiswahili I Veronica Waweru

Further development of speaking, listening, reading, and writing skills. Prepares students for further work in literary, language, and cultural studies as well as for a functional use of Kiswahili. Study of structure and vocabulary is based on a variety of texts from traditional and popular culture. Emphasis on command of idiomatic usage and stylistic nuance. Prerequisite: SWAH 620.

SWAH 650a, Advanced Kiswahili I John Wa'Njogu

Development of fluency through readings and discussions on contemporary issues in Kiswahili. Introduction to literary criticism in Kiswahili. Materials include Kiswahili oral literature, prose, poetry, and plays, as well as texts drawn from popular and political culture. Prerequisite: SWAH 640.

SWAH 670a, Topics in Kiswahili Literature John Wa'Njogu

Advanced readings and discussion with emphasis on literary and historical texts. Reading assignments include materials on Kiswahili prose, plays, poetry, Kiswahili dialects, and the history of the language.

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 620b, Beginning Yorùbá II Oluseye Adesola

Continuing practice in using and recognizing tone through dialogues. More emphasis is placed on simple cultural texts and role playing. Prerequisite: YORU 610.

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 640b, Intermediate Yorùbá II Oluseye Adesola

Students are exposed to more idiomatic use of the language in a variety of interactions, including occupational, social, religious, and educational. Cultural documents include literary and nonliterary texts. Prerequisite: YORU 630.

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 660b, Advanced Yorùbá II Oluseye Adesola

Continuing development of aural and reading comprehension, and speaking and writing skills, with emphasis on idiomatic usage and stylistic nuance. Study materials are selected to reflect research interests of the students. Prerequisite: YORU 650.

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 672b, Topics in Yorùbá Literature and Culture II Oluseye Adesola

Continuation of YORU 670.

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

Greta LaFleur (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, Daniel HoSang, 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

Lecturer Leah Mirakhor

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. The M.A. is awarded only to Ph.D. students not continuing in the program upon completion of seven term courses (two grades must be Honors and the other five grades must average High Pass), and the successful completion of the language requirement. Candidates in combined programs will be awarded the master's degree only when the master's requirements for both programs have been met. Students who have already received the M.Phil. degree will not be awarded the M.A. degree.

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

COURSES

AMST 600a, American Scholars Lisa Lowe

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 Laura Barraclough, Daniel HoSang, Kathryn Dudley, and Greta LaFleur

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 620a, Pedagogy Julian Posada and Madiha Tahir

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 630a / HSAR 529a / RLST 819a, 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? Permission of the instructor required; qualified undergraduates are welcome.

AMST 640a, Muslims in the United States Zareena Grewal

Since 9/11, cases of what has been termed “home-grown terrorism” have cemented the fear that “bad” Islam is not just something that exists far away, in distant lands. As a result, there has been an urgent interest to understand who American Muslims are by officials, experts, journalists, and the public. Although Muslims have been part of America’s story from its founding, Muslims have alternated from an invisible minority to the source of national moral panics, capturing national attention during political crises, as a cultural threat or even a potential fifth column. Today the stakes are high to understand what kinds of meanings and attachments connect Muslims in America to the Muslim world and to the U.S. as a nation. Over the course of the semester, students grapple with how to define and apply the slippery concept of diaspora to different dispersed Muslim populations in the U.S., including racial and ethnic diasporas, trading diasporas, political diasporas, and others. By focusing on a range of communities-in-motion and a diverse set of cultural texts, students explore the ways mobility, loss, and communal identity are conceptualized by immigrants, expatriates, refugees, guest-workers, religious seekers, and exiles. To this end, we read histories, ethnographies, essays, policy papers, novels, poetry, memoirs; we watch documentary and fictional films; we listen to music, speeches, spoken word performances, and prayers. Our aim is to deepen our understanding of the multiple

meanings and conceptual limits of homeland and diaspora for Muslims in America, particularly in the Age of Terror.

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

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 twenty-first 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 701a / AFAM 687a / HIST 751a, Race in American Studies Matthew Jacobson

This reading-intensive seminar examines influential scholarship across disciplines on "the race concept" and racialized relations in American culture and society. Major topics include the cultural construction of race; race as both an instrument of oppressions and an idiom of resistance in American politics; the centrality of race in literary, anthropological, and legal discourse; the racialization of U.S. foreign policy; "race mixing" and "passing," vicissitudes of "whiteness" in American politics; the centrality of race in American political culture; and "race" in the realm of popular cultural representation. Writings under investigation include classic formulations by such scholars as Lawrence Levine and Ronald Takaki, as well as more recent work by Saidiya Hartman, Robin Kelley, and Ann Fabian. Seminar papers give students an opportunity to explore in depth the themes, periods, and methods that most interest them. Permission of the instructor required.

AMST 704b / ENGL 886b / WGSS 704b, War and Everyday Life Sunny Xiang

This course thinks together two spatiotemporal phenomena that appear opposed: war and everyday life. Why is war generally thought of as an exceptional phenomenon, a climactic event that disrupts the quotidian rhythms of the everyday? And why does

everyday life so often appear parceled off from war, a placid domestic realm that soldiers depart from and return to? The study of war is often a masculine, muscular endeavor. This course's turn to the methodologies that are guided by feminist, anti-imperialist, and anti-racist critique allows us to better contemplate how militaristic logics shape everyday life and how anti-militarism might be lived at the level of daily practices. This notion of everyday militarisms is both the impetus and the frame for our engagement of the special collections at Yale Library. As an impetus, lived experience of militarism requires us to account for our specific institutional location. What has Yale's role been in war-making and empire-building? How might we analyze our own experiences at Yale and in the historical present with these flashpoints in mind? An attunement to the more quotidian aspects of militarisms also provides an alternate frame for rethinking wartime events that may at the outset seem extraordinary or exceptional. What might it mean to understand nuclear bombs, forced migrations, and environmental disasters as ordinary crises? What do people's day-to-day experience of such crises look like? To approach such questions from different angles and at different scales, we need to consult primary source materials in tandem with an array of interdisciplinary scholarship. Considered together, these course materials help us contemplate why everyday wars tend to go undetected—whether because of new kinds of weapons, war crimes that pass as governance, the time lag of slow violence, or the representational norms of popular culture. Of course, the militarization of daily life looks different depending on one's geographical, historical, social, and disciplinary orientation. So, even though the course tries to assemble a range of materials and examples, it reflects the instructor's orientation as an Americanist scholar of twentieth-century transpacific culture and politics. But the assessment of everydayness is a matter of perception and perspective in a more general sense as well. How does militarism hide in plain sight, and for whom is it hidden? Throughout the term, the power relations embedded in discerning and analyzing everyday militarisms require us to bring an added layer of critical self-reflection to all our research endeavors.

AMST 715a / AFAM 764a / HIST 715a, Readings in Nineteenth-Century America

David Blight

The course explores recent trends and historiography on several problems through the middle of the nineteenth century: sectionalism, expansion; slavery and the Old South; northern society and reform movements; Civil War causation; the meaning of the Confederacy; why the North won the Civil War; the political, constitutional, and social meanings of emancipation and Reconstruction; violence in Reconstruction society; the relationships between social/cultural and military/political history; problems in historical memory; the tension between narrative and analytical history writing; and the ways in which race and gender have reshaped research and interpretive agendas.

AMST 716b / ANTH 769b / ARCG 769b / HSAR 716b, Landscapes of Meaning:

Museums and Their Objects Anne Underhill

This seminar explores how museums convey various meanings about ethnographic, art, and archaeological objects through the processes of collecting, preparing exhibitions, and conducting research. Participants also discuss broader theoretical and methodological issues such as the roles of museums in society, relationships with source communities, management of cultural heritage, and various specializations valuable for careers in art, natural history, anthropology, history, and other museums.

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 724b / PLSC 868b / WGSS 724b, Gender and Sexuality in American Politics and Policy Dara Strolovitch

This seminar familiarizes students with foundational work on and approaches to the study of gender and sexuality in American politics and public policy. It explores empirical work that addresses these topics, a range of theoretical and epistemological approaches to them, and the social scientific methods that have been used to examine them. It explores the history, findings, and controversies in research about gender and sexuality in American politics and political science, examining work within several subfields of American politics (e.g., political development; public law; political behavior; legislative studies; public policy; interest groups and social movements), important work from other disciplines, and research that does not fit neatly into traditional disciplinary categories, paying particular attention to the implications of this “messiness” for the study of gender, sexuality, and politics. We are attentive to the complicated histories of science and social science when it comes to the study of gender and sexuality and to the ways in which gender and sexuality intersect with other politically relevant categories, identities, and forms of marginalization, such as race, ethnicity, class, and ideological and partisan identification.

AMST 725a, Writing the Academic Journal Article Albert Laguna

Graduate students are often told that publishing a journal article is a crucial part of their professional development. This course helps students get it done. Students come to class with a piece of writing—seminar paper, dissertation chapter—that we workshop as a group throughout the course of the term. In addition to personalized feedback, we also have broader discussions about the nuts and bolts of this genre of academic writing: organizing your argument, revision, clarity, framing interventions, etc. We complement this structured approach to writing with discussions aimed at demystifying the process by which an article gets published—the art of selecting the right journal, how to read and respond to reader reports, and general timelines. The

goal is for all students to submit their article to the journal of their choice by the end of the term. Students are required to have a piece of writing ready to workshop into an article at the very beginning of the class. Students interested in the course should contact the instructor at albert.laguna@yale.edu.

AMST 746a / ANTH 503a, Ethnographic Writing Kathryn Dudley

This course explores the practice of ethnographic analysis, writing, and representation. Through our reading of contemporary ethnographies and theoretical work on ethnographic fieldwork in anthropological and interdisciplinary research, we explore key approaches to intersubjective encounters, including phenomenological anthropology, relational psychoanalysis, affect studies, and the new materialisms. Our inquiries coalesce around the poetics and politics of what it means to sense and sensationalize co-present subjectivities, temporalities, and ontologies in multispecies worlds and global economies. This is a core anthropology graduate program course; others admitted only by permission of the instructor.

AMST 754b / ANTH 757b, The Ethnographic Imaginary Kathryn Dudley

At its best, ethnographic meaning-making is a way of knowing that illuminates social worlds both seen and unseen, said and unsaid, texted and extra-textual. Yet try as we might to convey the truth of our lives lived in concert with others, something *more*, and something *else* always exceeds our efforts. When the anthropocentric logics of cultural representation fail us, the imaginary offers a hold, however fleeting and tenuous, on our own and others' experiential realities. This seminar focuses on the use of images, imagery, and the imaginary in ethnography that explores the hazy uncertainties that surround and underpin what can be both known and unknown by us as well as our interlocutors. Thinking critically about anthropology's colonial gaze and how its afterlives haunt our ethnographic encounters today, we engage a range of interdisciplinary scholarship that embraces, and troubles, the sensorial imagination as a source of knowledge about cultural histories and immediacies. Final projects are ethnographic in spirit and explore representational/anti-representational practices that may include photography, video documentary, and creative writing, among other artforms. In-class workshops will offer opportunities to share work-in-progress.

AMST 778b / ANTH 666b / ER&M 762b / WGSS 666b, The Study of Privilege in the Americas Ana Ramos-Zayas

Examination of inequality, not only through experiences of the poor and marginal, but also through institutions, beliefs, social norms, and everyday practices of the privileged. Topics include critical examination of key concepts like "studying up," "elite," and "privilege," as well as variations in forms of capital; institutional sites of privilege (elite prep schools, Wall Street); living spaces and social networks (gated communities, private clubs); privilege in intersectional contexts (privilege and race, class, and gender); and everyday practices of intimacy and affect that characterize, solidify, and promote privilege.

AMST 780b / HIST 734b / WGSS 734b, Class and Capitalism in the Twentieth-Century United States Jennifer Klein

Reading course on class formation, labor, and political economy in the twentieth-century United States; how regionalism, race, and class power shaped development of American capitalism. The course reconsiders the relationships between economic structure and American politics and political ideologies, and between global and

domestic political economy. Readings include primary texts and secondary literature (social, intellectual, and political history; geography).

AMST 783a / FILM 783a, The Historical Documentary Charles Musser

This course looks at the historical documentary as a method for carrying out historical work in the public humanities. It investigates the evolving discourse and resonances within such topics as the Vietnam War, the Holocaust, and African American history. It is concerned with the relationship of documentary to traditional scholarly written histories as well as the history of the genre and what is often called the “archival turn.”

AMST 801b / HIST 700b, U.S. Colonial Present Lisa Lowe

Settler colonialism, slavery, racialized immigration, and military empire have been integral to the emergence of the U.S. nation, state, and economy, and their historical consequences continue today. In this interdisciplinary seminar, we study the relevance of these historical and ongoing formations to the founding and development of the United States, giving attention to the independence of each, as well as to their differences, convergences, and contestations. We consider the strengths and limits of given analytic frames for understanding our current historical crises of public health, economic austerity, and racial state violence. Despite the differentiated histories of settler colonialism, slavery, and empire, contemporary struggles and solidarities can identify links and convergences that colonial logics may disallow. The seminar includes readings in history, anthropology, political theory, and literature, as well as films and other media. Enrollment limited. Permission of the instructor required.

AMST 804a, Religion and U.S. Empire Tisa Wenger and Zareena Grewal

This course draws on perspectives from anthropology, history, American studies, religious studies, Indigenous studies, and postcolonial studies to interrogate the varied intersections between religion and US empire. It asks not only how Christianity and other religious traditions have facilitated imperialism and how they have served as resources for resistance, but also how the categories of “religion” and the “secular” have been assembled as imperial products alongside modern formations of race, class, gender, and sexuality. Through seminar discussions and written assignments, students gain new analytical tools along with critical purchase on an important new area for research in several intersecting fields of study.

AMST 830a / AFAM 771a / HIST 729a, The American Carceral State Elizabeth Hinton

This readings course examines the historical development of the U.S. carceral state, focusing on policing practices, crime control policies, prison conditions, and the production of scientific knowledge in the twentieth century. Key works are considered to understand the connections between race and the development of legal and penal systems over time, as well as how scholars have explained the causes and consequences of mass incarceration in America. Drawing from key insights from new histories in the field of American carceral studies, we trace the multifaceted ways in which policymakers and officials at all levels of government have used criminal law, policing, and imprisonment as proxies for exerting social control in communities of color throughout U.S. history.

AMST 832a and AMST 833b / FILM 735a and FILM 736b, 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 835b / HIST 731b, Research in Recent U.S. History Joanne Meyerowitz

Students conduct research in primary sources and write original essays on post-1945 U.S. history. Readings include scholarly articles that might serve as models for students' research projects.

AMST 836b / HIST 570b, American Religion in the Archives Tisa Wenger

An advanced seminar on archival research methods for historians of American religion. The class begins with readings that theorize the archive, particularly for the study of American religion. What counts as an archive? How are archives constituted and by whom? What are the limits and pitfalls of archives—and the construct of “the archive”—for research in this field? Over the course of the term, students are guided through the process of writing an archivally grounded research paper using Yale Divinity School Library Special Collections and the Beinecke Rare Book and Manuscript Library. Enrollment capped at fifteen; meets at YDS Library L104.

AMST 838b / HIST 749b / HSHM 753b, Research in Environmental History Paul Sabin

Students conduct advanced research in primary sources and write original essays over the course of the term. Readings and library activities inform students' research projects. Interested graduate students should contact the instructor with proposed research topics.

AMST 856b, 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 seventeenth 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 900a or b, Independent Research Staff

AMST 901a or b, Directed Reading Staff

AMST 902a or b, Prospectus Workshop Staff

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, and evaluating work in progress. The workshop meets once a month.

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

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 Karin Roffman

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 Karin Roffman

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 Staff

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.

Anthropology

10 Sachem Street, 203.432.3670

<http://anthropology.yale.edu>

M.A., M.Phil., Ph.D.

Chair

Douglas Rogers

Director of Graduate Studies

Erik Harms

Professors Richard Bribiescas, Richard Burger, Michael Dove (*School of the Environment*), Kathryn Dudley (*American Studies*), J. Joseph Errington (*Emeritus*), Eduardo Fernandez-Duque, Erik Harms, Marcia Inhorn (*Middle East Studies*), William Kelly (*Emeritus*), Paul Kockelman, Roderick McIntosh (*Emeritus*), Catherine Panter-Brick, Douglas Rogers, Eric Sargis, Helen Siu, Kalyanakrishnan Sivaramakrishnan, Anne Underhill, Claudia Vaggia, David Watts

Associate Professors Oswaldo Chinchilla, William Honeychurch, Yukiko Koga, Louisa Lombard

Assistant Professors Lisa Messeri, 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: classics in ethnography and social theory, 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

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 six required courses, with the remainder being electives among Anthropology courses and other departments' courses. Admission

to Ph.D. candidacy requires (1) completion of two years of course work (twelve term courses for students matriculating in fall 2018 and beyond; sixteen term courses for students who matriculated earlier); (2) independent study and research; (3) satisfactory performance on qualifying examinations; and (4) a dissertation research proposal submitted and approved before the end of the third year. For sociocultural anthropology students, the research proposal requirement takes the form of a field paper of approximately eighty pages in length. Qualifying examinations are normally taken at the end of the second year. For archaeology and biological anthropology subfields, they consist of eight hours written (four hours on one of the subfields, four hours on the student's special interest) and two hours oral. The sociocultural anthropology exam consists of five hours written and approximately one hour oral and is based on the six required courses.

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 combined-degree 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 Douglas Rogers

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

ANTH 503a / AMST 746a, Ethnographic Writing Kathryn Dudley
This course explores the practice of ethnographic analysis, writing, and representation. Through our reading of contemporary ethnographies and theoretical work on ethnographic fieldwork in anthropological and interdisciplinary research, we explore key approaches to intersubjective encounters, including phenomenological anthropology, relational psychoanalysis, affect studies, and the new materialisms. Our inquiries coalesce around the poetics and politics of what it means to sense and sensationalize co-present subjectivities, temporalities, and ontologies in multispecies worlds and global economies. This is a core anthropology graduate program course; others admitted only by permission of the instructor.

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 515a / EAST 515a, 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 nation-state, 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 speakers and engage in planning activities associated with organizing the EST 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. ½ Course cr

ANTH 541a / ENV 836a / HIST 965a / PLSC 779a / SOCY 617a, Agrarian Societies:

Culture, Society, History, and Development Jonathan Wyrzten and Marcela Echeverri Munoz

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 548a, Medical Anthropology at the Intersections: Theory and Ethnography Marcia Inhorn

Examination of narratives of gender in India. Folkloristic and anthropological approaches to gendered performance in story, song, and theater. Recent feminist examinations of television, film, advertising, and literature. Topics include classical epic (Ramayana, Shilapathigaram).

ANTH 562b, 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 575b / EAST 575b, Hubs, Mobilities, and Global Cities Helen Siu

Analysis of urban life in historical and contemporary societies. Topics include capitalist and postmodern transformations, class, gender, ethnicity, migration, and global landscapes of power and citizenship.

ANTH 600b, Anthropological Imaginations Yukiko Koga

This is the second course of a yearlong sequence for doctoral students in Anthropology and combined programs. The seminar explores anthropological imaginations as modes of experience, perception, and writing. Anthropology as a discipline has transformed from the frontline of colonial projects to critical reflections on power dynamics that produce and reproduce systems of oppression, injustice, and violence. Yet knowing and representing are never external to these power dynamics, and there is simply a vast unknowability of human and non-human experiences. How do we as anthropologists give meanings to the world out there that is so intertwined and complex beneath what we see and hear? How do we see what seems invisible and how to listen to silence? How do we account for our own implication in the encounters through which we experience and learn, and reflect upon? How do we weave stories through writing? While there are no right or wrong answers to these questions, in this seminar we explore how different imaginaries open up new possibilities as we embark on our ethnographic research.

ANTH 601a, Meaning and Materiality Paul Kockelman

This course is about the relation between meaning and materiality. We read classic work at the intersection of biosemiosis, technocognition, and sociogenesis. And we use these readings to understand the relation between significance, selection, sieving, and serendipity.

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 666b / AMST 778b / ER&M 762b / WGSS 666b, The Study of Privilege in the Americas Ana Ramos-Zayas

Examination of inequality, not only through experiences of the poor and marginal, but also through institutions, beliefs, social norms, and everyday practices of the privileged. Topics include critical examination of key concepts like “studying up,” “elite,” and “privilege,” as well as variations in forms of capital; institutional sites of privilege (elite prep schools, Wall Street); living spaces and social networks (gated communities, private clubs); privilege in intersectional contexts (privilege and race, class, and gender); and everyday practices of intimacy and affect that characterize, solidify, and promote privilege.

ANTH 701a / ARCG 701a, 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 717a / ARCG 717a, Ancient Maya Writing Oswaldo Chinchilla Mazariegos

Introduction to the ancient Maya writing system. Contents of the extant corpus, including nametags, royal and ritual commemorations, dynastic and political subjects, and religious and augural subjects; principles and methods of decipherment; overview of the Maya calendar; comparison with related writing systems in Mesoamerica and elsewhere in the ancient world.

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 755a / ARCG 755a, Inca Culture and Society Richard Burger

The history and organization of the Inca empire and its impact on the nations and cultures conquered by it. The role of archaeology in understanding the transformation of Andean lifeways is explored, as is the interplay between ethnohistoric and archaeological approaches to the subject.

ANTH 757b / AMST 754b, The Ethnographic Imaginary Kathryn Dudley

At its best, ethnographic meaning-making is a way of knowing that illuminates social worlds both seen and unseen, said and unsaid, texted and extra-textual. Yet try as we might to convey the truth of our lives lived in concert with others, something *more*, and something *else* always exceeds our efforts. When the anthropocentric logics of cultural representation fail us, the imaginary offers a hold, however fleeting and tenuous, on our own and others' experiential realities. This seminar focuses on the use of images, imagery, and the imaginary in ethnography that explores the hazy uncertainties that surround and underpin what can be both known and unknown by us as well as our interlocutors. Thinking critically about anthropology's colonial gaze and how its afterlives haunt our ethnographic encounters today, we engage a range of interdisciplinary scholarship that embraces, and troubles, the sensorial imagination as a source of knowledge about cultural histories and immediacies. Final projects are ethnographic in spirit and explore representational/anti-representational practices that may include photography, video documentary, and creative writing, among other artforms. In-class workshops will offer opportunities to share work-in-progress.

ANTH 759a / ARCG 759a, Social Complexity in Ancient China Anne Underhill

This seminar explores the variety of archaeological methods and theoretical approaches that have been employed to investigate the development and nature of social complexity in ancient China. The session meetings focus on the later prehistoric and early historic periods, and several geographic regions are included. They also consider how developments in ancient China compare to other areas of the world. Most of the

readings emphasize archaeological remains, although relevant information from early historical texts is considered.

ANTH 769b / AMST 716b / ARCG 769b / HSAR 716b, Landscapes of Meaning: Museums and Their Objects Anne Underhill

This seminar explores how museums convey various meanings about ethnographic, art, and archaeological objects through the processes of collecting, preparing exhibitions, and conducting research. Participants also discuss broader theoretical and methodological issues such as the roles of museums in society, relationships with source communities, management of cultural heritage, and various specializations valuable for careers in art, natural history, anthropology, history, and other museums.

ANTH 771b / ARCG 771b, Early Complex Societies Anne Underhill and Richard Burger

A consideration of theories and methods developed by archaeologists to recognize and understand complex societies in prehistory. Topics include the nature of social differentiation and stratification as applied in archaeological interpretation; emergence of complex societies in human history; case studies of societies known ethnographically and archaeologically.

ANTH 772b / ARCG 772b, Cities in Antiquity: The Archaeology of Urbanism Oswaldo Chinchilla Mazariegos

Archaeological studies of ancient cities and urbanism. Topics include the origin and growth of cities; the economic, social, and political implications of urban life; and archaeological methods and theories for the study of ancient urbanism. Case studies include ancient cities around the world.

ANTH 775b, Anthropology of Mobile Societies William Honeychurch

The social and cultural significance of the ways that hunter-gatherers, pastoral nomads, maritime traders, and members of our own society traverse space. The impact of mobility and transport technologies on subsistence, trade, interaction, and warfare from the first horse riders of five thousand years ago to jet-propulsion tourists of today.

ANTH 780b / ARCG 780b, Archaeology of Religion Richard Burger

The course explores archaeological approaches to the study of religion. While the term “religion” is hard to define, it is generally agreed that religious phenomena occur in almost all cultures and that this realm played a significant part in most prehistoric cultures. In order to provide a broad vision of this theme, the course begins by considering influential schools of thought on the definition, origins, and social significance of religious behavior. The course then reviews a variety of methods that scholars may use to reconstruct ancient beliefs and rituals. The course assesses the applicability and success of these methodologies across the broad spectrum of ancient cultures representing differing degrees of sociopolitical complexity. Finally, we explore case studies from a diverse range of ancient societies and consider the impact of religious behaviors within their broader cultural contexts.

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 788a / ARCG 788a / NELC 731a, Origins of Ancient Egypt: Archaeology of the

Neolithic, Predynastic, and Early Dynastic Periods Gregory Marouard

This seminar is a graduate-level course that examines, from an archaeological and material culture perspective, the origins of the Egyptian civilization from the late Neolithic period (ca. 5500 BC) to the beginning of the Early Dynastic period (ca. 2900–2800 BC). After a progressive change of the Northeastern Africa climate in the course of the sixth millennium BC, the late Neolithic populations regroup within the Nile valley and rapidly settle in several parts of this natural corridor and major axis of communication between the African continent and the Middle East. Strongly influenced by the Saharan or the Levantine Neolithic, two early Egyptian sedentary communities will arise in Lower and Upper Egypt with very distinctive material cultures and burial practices, marking the gradual development of a complex society from which emerge important societal markers such as social differentiation, craft specialization, long-distance exchange networks, emergence of writing, administration and centralization, that will slowly lead to the development of local elites and early forms of kingship controlling proto-kingdoms. From those societies and the consecutive assimilation of both into a single cultural identity, around 3200 BC, some of the main characteristics of the subsequent Egyptian civilization will emerge from this crucial phase of state formation. Most of the major archaeological sites of this period are investigated through the scope of material culture; art; funerary traditions; and the study of large settlement and cemetery complexes using, as much as possible, information from recent excavations and discoveries. This course includes in particular the study of the first Neolithic settlements (Fayum, Merimde, al-Omari, Badari), the Lower Egyptian cultures (Buto, Maadi, Helwan and the Eastern Delta), the various phases of the Naqada cultures (at Hierakonpolis, Naqada and Ballas, Abydos), and the rise of the state (specifically in Abydos and Memphis areas). This course is suitable for graduate students (M.A. and Ph.D. programs) in the fields of Egyptology, archaeology, anthropology, and ancient history. With instructor and residential college dean approval, undergraduate students with a specialty in Egyptology or archaeology can register. No background in Egyptology is required, and no Egyptian language is taught. This course is the first in a series of chronological survey courses in Egyptian Archaeology.

ANTH 801a, Behavioral Ecology and Social Evolution Eduardo Fernandez-Duque

Critical evaluation of the current state of theory and empirical research on sexual selection and parental investment in evolutionary ecology through discussion of reviews and empirical studies. Evidence that sexual selection and parental investment have played and continue to play key roles in the evolution and maintenance of particular features of morphology, behavior, and social organization.

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 864a or b / ARCG 864a or b, 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 890b, Advanced Topics in Health of Indigenous Peoples Claudia Vaggia

This seminar is an exploration of the current health status of indigenous populations around the world. We discuss epidemiological profiles, health disparities, and the uniqueness (or not) of the health situation of indigenous populations. We also use these topics as a base for developing oral presentation and teaching skills.

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 950a, Directed Research: Preparation for Qualifying Exam Erik Harms

By arrangement with faculty.

ANTH 951a, Directed Research in Ethnology and Social Anthropology Erik Harms

By arrangement with faculty.

ANTH 952a, Directed Research in Linguistics Erik Harms

By arrangement with faculty.

ANTH 953a or b, Directed Research in Archaeology and Prehistory Erik Harms

By arrangement with faculty.

ANTH 954a or b, Directed Research in Biological Anthropology Staff

By arrangement with faculty.

ANTH 955a, Directed Research in Evolutionary Biology Erik Harms

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 Paul Sabin and Sunil Amrith

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

ANTH 965b, Directed Research in Physical Anthropology Erik Harms

By arrangement with faculty.

Applied Mathematics

A.K. Watson Hall, 203.432.1278
<http://applied.math.yale.edu>
 M.S., M.Phil., Ph.D.

Director of Graduate Studies

Vladimir Rokhlin

Professors Andrew Barron (*Statistics and Data Science*), 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*), Peter Jones (*Mathematics*), Yuval Kluger (*Pathology*), Owen Miller (*Applied Physics*), Nicholas Read (*Physics; Applied Physics; Mathematics*), Vladimir Rokhlin (*Computer Science; Mathematics*), John Schotland (*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 Smita Krishnaswamy (*Genetics; Computer Science*), Sekhar Tatikonda (*Statistics and Data Science*)

Assistant Professor Roy Lederman (*Statistics and Data 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, cryptography, statistical theory and applications, probability theory 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 twelve term courses (including reading courses) at the graduate level, at least two with Honors grades; (2) 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 within their first two years. 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 third 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. 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 552b / CB&B 663b / CPSC 552b, Deep Learning Theory and Applications

Smita Krishnaswamy

Deep neural networks have gained immense popularity within the past decade due to their success in many important machine-learning tasks such as image recognition, speech recognition, and natural language processing. This course provides a principled and hands-on approach to deep learning with neural networks. Students master the principles and practices underlying neural networks, including modern methods of deep learning, and apply deep learning methods to real-world problems including image recognition, natural language processing, and biomedical applications. Course work includes homework, a final exam, and a final project—either group or individual, depending on enrollment—with both a written and oral (i.e., presentation) component. The course assumes basic prior knowledge in linear algebra and probability.

Prerequisites: CPSC 202 and knowledge of Python programming.

AMTH 553a / CB&B 555a / CPSC 553a / GENE 555a, Unsupervised Learning for Big Data Staff

This course focuses on machine-learning methods well-suited to tackling problems associated with analyzing high-dimensional, high-throughput noisy data including: manifold learning, graph signal processing, nonlinear dimensionality reduction, clustering, and information theory. Though the class goes over some biomedical applications, such methods can be applied in any field. Prerequisites: knowledge of linear algebra and Python programming.

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 640a or b / CPSC 640a or b / MATH 640a, 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 667b / CPSC 576b / ENAS 576b, Advanced Computational Vision Steven Zucker

Advanced view of vision from a mathematical, computational, and neurophysiological perspective. Emphasis on differential geometry, machine learning, visual psychophysics, and advanced neurophysiology. Topics include perceptual organization, shading, color, and texture.

AMTH 710a / MATH 710a, Harmonic Analysis on Graphs and Applications to Empirical Modeling Ronald Coifman

The goal of this graduate-level class is to introduce analytic tools to enable the systematic organization of geometry and analysis on subsets of \mathbb{R}^N (data). In particular, extensions of multi-scale Fourier analysis on graphs and optimal graph constructions for efficient computations are studied. Geometrization of various Neural Net architectures and related challenges are discussed. Topics are driven by students goals.

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

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 Robert Schoelkopf

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 548a / ENAS 850a / PHYS 548a, Solid State Physics I Yu He

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 Sohrab Ismail-Beigi

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 Schiffer

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 588a, 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 high-symmetry 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 modal-expansion (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 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 628a / PHYS 628a, Statistical Physics II Meng Cheng

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 633b / PHYS 633b, Introduction to Superconductivity Yu He

The fundamentals of superconductivity, including both theoretical understandings of basic mechanism and description of major applications. Topics include historical overview, Ginzburg-Landau (mean field) theory, critical currents and fields of type II superconductors, BCS theory, Josephson junctions and microelectronic and quantum-bit devices, and high-T_c oxide superconductors.

APHY 634a / PHYS 634a, Mesoscopic Physics I Michel Devoret

Introduction to the physics of nanoscale solid state systems, which are large and disordered enough to be described in terms of simple macroscopic parameters like resistance, capacitance, and inductance, but small and cold enough that effects usually associated with microscopic particles, like quantum-mechanical coherence and/or charge quantization, dominate. Emphasis is placed on transport and noise phenomena in the normal and superconducting regimes.

APHY 650a / PHYS 650a, Theory of Solids I Leonid Glazman**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 676a / PHYS 676a, Introduction to Light-Matter Interactions Peter Rakich

Optical properties of materials and a variety of coherent light-matter interactions are explored through the classical and quantum treatments. The role of electronic, phononic, and plasmonic interactions in shaping the optical properties of materials is examined using generalized quantum and classical coupled-mode theories.

The dynamic response of media to strain, magnetic, and electric fields is also treated. Modern topics are explored, including optical forces, photonic crystals, and metamaterials; multi-photon absorption; and parametric processes resulting from electronic, optomechanical, and Raman interactions.

APHY 679a, Nonlinear Optics and Lasers Logan Wright

Properties and origins of the nonlinear susceptibility; Sum-freq, diff-freq and 2nd-harmonic generation; Intensity-dependent refractive index; Optical phase conjugation; Self-focusing, self-phase modulation, solitons; Stimulated light scattering; Fixed points, bifurcations; Amplification; Rate equations; Relaxation oscillations, frequency pulling; Hole burning; Q-switching; Semiconductor and DFB lasers; Mode-locking; Injection-locking; Intense-field NLO and QM laser theory (time permitting)

APHY 691a / PHYS 691a, Quantum Optics Shruti Puri

Quantization of the electromagnetic field, coherence properties and representation of the electromagnetic field, quantum phenomena in simple nonlinear optics, atom-field interaction, stochastic methods, master equation, Fokker-Planck equation, Heisenberg-Langevin equation, input-output formulation, cavity quantum electrodynamics, quantum theory of laser, trapped ions, light forces, quantum optomechanics, Bose-Einstein condensation, quantum measurement and control.

APHY 990a or b, Special Investigations Peter Schiffer

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]

Acting Chair and Director of Graduate Studies

William Honeychurch [Sp]

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*), J.G. Manning (*Classics; History*), Roderick McIntosh (*Anthropology*), 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*), William Honeychurch (*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 642a / NELC 744a, Ancient Egyptian Materials and Techniques: Their Histories and Socioeconomic Implications Gregory Marouard

This seminar investigates in detail ancient Egyptian materials, techniques, and industries through the scope of archaeology, history, and socioeconomical, textual, and iconographic data. When possible, ethnoarchaeological and experimental approaches of the antique *chaîne-opératoire* are discussed in order to illustrate skills and professions that have now completely disappeared. This class is organized according to various themes within a diachronical approach, from the fourth millennium BCE to the Roman period. Copper and precious metals, construction stones, hard stones and gems, glass and faience production, imported wood or ivory—we explore multiple categories of materials; where and how they were collected or exchanged; the way these products were transported, transformed, refined, or assembled; and the complex organization of the work involved and administration that was required in order to satisfy the tastes of Egyptian elites or their desires to worship their gods. Some other vernacular savoir-faire linked to everyday life and death is explored, through food production and mummification practices. The aim is not only to give an overview of the history of techniques for this early civilization but also, beyond how things were made, to acquire a more critical view of ancient Egyptian culture through material culture and the strong economic and sociological implications linked to objects and constructions—rather than the usual focus on Egyptian temples and tombs.

ARCG 701a / ANTH 701a, 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 717a / ANTH 717a, Ancient Maya Writing Oswaldo Chinchilla Mazariegos
Introduction to the ancient Maya writing system. Contents of the extant corpus, including nametags, royal and ritual commemorations, dynastic and political subjects, and religious and augural subjects; principles and methods of decipherment; overview of the Maya calendar; comparison with related writing systems in Mesoamerica and elsewhere in the ancient world.

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 755a / ANTH 755a, Inca Culture and Society Richard Burger

The history and organization of the Inca empire and its impact on the nations and cultures conquered by it. The role of archaeology in understanding the transformation of Andean lifeways is explored, as is the interplay between ethnohistoric and archaeological approaches to the subject.

ARCG 759a / ANTH 759a, Social Complexity in Ancient China Anne Underhill

This seminar explores the variety of archaeological methods and theoretical approaches that have been employed to investigate the development and nature of social complexity in ancient China. The session meetings focus on the later prehistoric and early historic periods, and several geographic regions are included. They also consider how developments in ancient China compare to other areas of the world. Most of the readings emphasize archaeological remains, although relevant information from early historical texts is considered.

ARCG 769b / AMST 716b / ANTH 769b / HSAR 716b, Landscapes of Meaning: Museums and Their Objects Anne Underhill

This seminar explores how museums convey various meanings about ethnographic, art, and archaeological objects through the processes of collecting, preparing exhibitions, and conducting research. Participants also discuss broader theoretical and methodological issues such as the roles of museums in society, relationships with source communities, management of cultural heritage, and various specializations valuable for careers in art, natural history, anthropology, history, and other museums.

ARCG 771b / ANTH 771b, Early Complex Societies Anne Underhill and Richard Burger

A consideration of theories and methods developed by archaeologists to recognize and understand complex societies in prehistory. Topics include the nature of social differentiation and stratification as applied in archaeological interpretation; emergence of complex societies in human history; case studies of societies known ethnographically and archaeologically.

ARCG 772b / ANTH 772b, Cities in Antiquity: The Archaeology of Urbanism Oswaldo Chinchilla Mazariegos

Archaeological studies of ancient cities and urbanism. Topics include the origin and growth of cities; the economic, social, and political implications of urban life; and archaeological methods and theories for the study of ancient urbanism. Case studies include ancient cities around the world.

ARCG 780b / ANTH 780b, Archaeology of Religion Richard Burger

The course explores archaeological approaches to the study of religion. While the term “religion” is hard to define, it is generally agreed that religious phenomena occur in almost all cultures and that this realm played a significant part in most prehistoric cultures. In order to provide a broad vision of this theme, the course begins by considering influential schools of thought on the definition, origins, and social significance of religious behavior. The course then reviews a variety of methods that scholars may use to reconstruct ancient beliefs and rituals. The course assesses the applicability and success of these methodologies across the broad spectrum of ancient cultures representing differing degrees of sociopolitical complexity. Finally, we explore case studies from a diverse range of ancient societies and consider the impact of religious behaviors within their broader cultural contexts.

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 788a / ANTH 788a / NELC 731a, Origins of Ancient Egypt: Archaeology of the Neolithic, Predynastic, and Early Dynastic Periods Gregory Marouard

This seminar is a graduate-level course that examines, from an archaeological and material culture perspective, the origins of the Egyptian civilization from the late Neolithic period (ca. 5500 BC) to the beginning of the Early Dynastic period (ca. 2900-2800 BC). After a progressive change of the Northeastern Africa climate in the course of the sixth millennium BC, the late Neolithic populations regroup within the Nile valley and rapidly settle in several parts of this natural corridor and major axis of communication between the African continent and the Middle East. Strongly influenced by the Saharan or the Levantine Neolithic, two early Egyptian sedentary communities will arise in Lower and Upper Egypt with very distinctive material cultures and burial practices, marking the gradual development of a complex society from which emerge important societal markers such as social differentiation, craft specialization, long-distance exchange networks, emergence of writing, administration and centralization, that will slowly lead to the development of local elites and early forms of kingship controlling proto-kingdoms. From those societies and the consecutive assimilation of both into a single cultural identity, around 3200 BC, some of the main characteristics of the subsequent Egyptian civilization will emerge from this crucial phase of state formation. Most of the major archaeological sites of this period are investigated through the scope of material culture; art; funerary traditions; and the study of large settlement and cemetery complexes using, as much as possible, information from recent excavations and discoveries. This course includes in particular the study of the first Neolithic settlements (Fayum, Merimde, al-Omari, Badari), the Lower Egyptian cultures (Buto, Maadi, Helwan and the Eastern Delta), the various phases of the Naqada cultures (at Hierakonpolis, Naqada and Ballas, Abydos), and the rise of the state (specifically in Abydos and Memphis areas). This course is

suitable for graduate students (M.A. and Ph.D. programs) in the fields of Egyptology, archaeology, anthropology, and ancient history. With instructor and residential college dean approval, undergraduate students with a specialty in Egyptology or archaeology can register. No background in Egyptology is required, and no Egyptian language is taught. This course is the first in a series of chronological survey courses in Egyptian Archaeology.

ARCG 864a or b / ANTH 864a or b, 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 (324 Rudolph, 203.432.6874, joan.ockman@yale.edu)

Professors Pier Vittorio Aureli, Sunil Bald (*Adjunct*), Deborah Berke, Phillip Bernstein (*Adjunct*), Turner Brooks (*Adjunct*), Esther da Costa Meyer, Anna Dyson, Keller Easterling, Peter Eisenman, John Jacobson (*Adjunct*), Joan Ockman, Eeva-Liisa Pelkonen, Alan Plattus, Robert A.M. Stern

Professors in the Practice Steven Harris, Joel Sanders

Associate Professors Mark Foster Gage, Kyoung Sun Moon, Elihu Rubin

Assistant Professors Anthony Acciavatti, Joyce Hsiang, Bimal Mendis (*Adjunct*)

Lecturers and Critics Marta Caldeira, Kyle Dugdale, Elisa Iturbe, Dana Karwas, M. Surry Schlabs

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 Internet-based 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. While the content of the two seminars varies from year to year, they tend to involve primary research on a specific topic, a survey of critical approaches, or the reading of a body of texts.

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 oral examinations on three topics relevant to their field of doctoral research. The three field exams are 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 pre-dissertation 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 Internet-based 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. 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

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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 lab-based 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 grad 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) Re-examination 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
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ARCH 552	Ph.D. Seminar: History/Theory II
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Required Courses in the Ecosystems in Architectural Sciences Track

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

52 Hillhouse Avenue, 203.432.3000

<http://astronomy.yale.edu>

M.S., M.Phil., Ph.D.

Chair

Priyamvada Natarajan

Director of Graduate Studies

Héctor Arce (203.432.3018, hector.arce@yale.edu)

Professors Héctor Arce, Charles Bailyn, Charles Baltay (*Physics*), Sarbani Basu, Paolo Coppi, Pierre Demarque (*Emeritus*), Debra Fischer, Marla Geha, Larry Gladney (*Physics*), Jeffrey Kenney, Richard Larson (*Emeritus*), Gregory Laughlin, 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 Laura Newburgh (*Physics*)

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 500b, 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 501a, Dynamics of Astrophysical Many-Body Systems Frank van den Bosch

This course presents an in-depth treatment of the dynamics of astrophysical systems, including gases, plasmas, and stellar systems. The course starts with a detailed formulation of the theoretical foundations, using kinetic theory and statistical physics to describe the dynamics of many-body systems. Special emphasis is given to collisional processes in various astrophysical systems. Next, after deriving the relevant moment equations, we focus on specific topics related to (1) stellar dynamics, (2) hydrodynamics, and (3) plasma physics. Related to stellar dynamics we cover potential theory, orbit theory, Jeans modeling, gravitational encounters, and secular evolution (bars and spiral structure). In the field of (non-radiative) hydrodynamics we study, among others, the Navier-Stokes equation, vorticity, transport coefficients, accretion flow, turbulence, fluid instabilities, and shocks. We end with a cursory overview of plasma physics, including the Vlasov equation and the two-fluid model, Langmuir waves, Alfvén waves, Landau damping, ideal vs. resistive magnetohydrodynamics (MHD), and dynamos. Throughout the course, we focus on specific astrophysical applications. Prerequisites: undergraduate degree in physics or astronomy and basic knowledge of classical, Hamiltonian dynamics.

ASTR 510b, Stellar Populations Robert Zinn

The stellar population of our galaxy and the galaxies of the local group. The properties of stars and star clusters, stellar evolution, and the structure and evolution of our galaxy.

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 550a, 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 555b, Observational Astronomy Pieter van Dokkum

The design and use of optical telescopes, cameras, spectrographs, and detectors to make astronomical observations. The reduction and analysis of photometric and spectroscopic observations.

ASTR 570b / PHYS 570b, High-Energy Astrophysics Paolo Coppi

A survey of current topics in high-energy astrophysics, including accreting black hole and neutron star systems in our galaxy, pulsars, active galactic nuclei and relativistic jets, gamma-ray bursts, and ultra-high-energy cosmic rays. The basic physical processes underlying the observed high-energy phenomena are also covered.

ASTR 580a, Research Staff

By arrangement with faculty.

ASTR 585b, 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 600a / PHYS 600a, Cosmology Nikhil Padmanabhan

A comprehensive introduction to cosmology at the graduate level. The standard paradigm for the formation, growth, and evolution of structure in the universe is covered in detail. Topics include the inflationary origin of density fluctuations; the thermodynamics of the early universe; assembly of structure at late times and current status of observations. The basics of general relativity required to understand essential topics in cosmology are covered. Advanced undergraduates may register for the course with permission of the instructor.

ASTR 610b, The Theory of Galaxy Formation Frank van den Bosch

This astronomy course focuses on the physical processes associated with galaxy formation. Topics include Newtonian perturbation theory, the spherical collapse model, formation and structure of dark matter haloes (including Press-Schechter theory), the virial theorem, gravitational interactions, cooling processes, theory of star formation, feedback processes, and numerical simulations. The course also includes a detailed treatment of statistical tools used to describe the large-scale distribution of galaxies and introduces the student to the concepts of galaxy bias and halo occupation modeling. During the final lectures we discuss a number of outstanding issues in galaxy formation.

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, Jay Humphrey, Fahmeed Hyder,† Farren Issacs,* Themis Kyriakides,† Francis Lee,* Andre Levchenko, 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,* Steven Zucker†

Associate Professors Fadi Akar,* Stuart Campbell, Tarek Fahmy, Gigi Galiana,* Anjelica Gonzalez, Michelle Hampson,* Michael Higley,* Henry Hsia,* Chenxiang Lin,* Chi Liu,* Kathryn Miller-Jensen, Michael Murrell, Dana Peters,* Yibing Qyang,* Jiangbing Zhou*

Assistant Professors Sanjay Aneja,* Julius Chapiro,* Daniel Coman,* Nicha Dvornek,* Ansel Hillmer,* Michael Mak, John Onofrey, Cristina Rodriguez, Dustin Scheinost,* Gregory Tietjen*

* 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. STUDENTS

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 911 (First Laboratory Rotation), 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 / MCDB 602a, Molecular Cell Biology Thomas Melia, Martin Schwartz, Shawn Ferguson, Malaiyalam Mariappan, Nadya Dimitrova, Xiaolei Su, Valerie Horsley, Megan King, Patrick Lusk, Christopher Burd, David Breslow, Shaul Yogev, and Min Wu

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. Prerequisites:

none, but 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).

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.

CBIO 604b / PTB 604b, Physiologic Function and Cellular Structure of Organ Systems Agnes Vignery

Introduction to the organization and function of cells within complex multicellular systems as encountered in the human body. Covers major tissues and organs as well as the cardiovascular, immune, and nervous systems, with special emphasis on the molecular and cellular bases of developmental processes and human diseases. Lectures supplemented by electronic-based tutorials on the histology of tissues and organs.

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 or b / GENE 655a or b, 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 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 903a or b, Reading Course in Cell Biology Staff

Independent study of specific topics in cell biology through directed reading of the literature under faculty supervision. Student may choose any topic and any Yale faculty who agree to participate. Subject to approval by the cell biology DGS. Open to cell

biology students and to students in other departments with approval from their respective DGS.

CBIO 911a / GENE 911a / MCDB 911a, First Laboratory Rotation Chenxiang Lin
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 Staff
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 Shirin Bahmanyar
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, Lawrence Cohen, Alan Dardik (*Surgery*), Jonathan Demb (*Ophthalmology and Visual Science*), Marie Egan (*Pediatrics*), Barbara Ehrlich (*Pharmacology*), Anne Eichmann (*Internal Medicine/Cardiology*), John Geibel (*Surgery*), Leonard Kaczmarek (*Pharmacology*), 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, 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, Tore Eid (*Laboratory Medicine*), Elena Gracheva, Shuta Ishibe (*Internal Medicine/Nephrology*), Erdem Karatekin, Richard Kibbey (*Internal Medicine/Endocrinology*), Jesse Rinehart, Matthew Rodeheffer (*Comparative Medicine*), Carson Thoreen, Xiaoyong Yang (*Comparative Medicine*)

Assistant Professors Rui Chang, Rachel Perry, Marc Schneeberger (*Physiology*), 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 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>.

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.

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, are required. One term of teaching is 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 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 560b / ENAS 570b / MCDB 560b / PHAR 560b, Cellular and Molecular

Physiology: Molecular Machines in Human Disease Emile Boulpaep

The course focuses on understanding the processes that transfer molecules across membranes at the cellular, molecular, biophysical, and physiological levels. Students learn about the different classes of molecular machines that mediate membrane transport, generate electrical currents, or perform mechanical displacement. Emphasis is placed on the relationship between the molecular structures of membrane proteins and their individual functions. The interactions among transport proteins in determining the physiological behaviors of cells and tissues are also stressed. Molecular motors are introduced and their mechanical relationship to cell function is explored. Students read papers from the scientific literature that establish the connections between mutations in genes encoding membrane proteins and a wide variety of human genetic diseases.

C&MP 580b, Mitochondrial Bioenergetics and Intermediary Metabolism Rachel Perry and Richard Kibbey

A comprehensive introduction to the fundamentals of mitochondrial physiology and pathophysiology. Topics include glucose, lipid, amino acid, and cholesterol metabolism; mitochondrial bioenergetics; flux modeling; inherited and acquired metabolic disorders; and common methods used to characterize metabolism. Our goal is for students not only to be able to explain the key pathways involved in maintenance of glucose and lipid homeostasis, but also to be able to select and critically evaluate techniques commonly used in metabolism, design experiments, and interpret others' results. The class is conducted in a semi-flipped manner: portions of lectures are recorded and posted in advance, and most meetings are a mix of lecture and an activity (discussion, exercise, or quiz). Open to all Yale graduate students and to undergraduates who have taken at least one term of biochemistry. Undergraduates must contact Dr. Perry in advance about their interest in the course.

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 and C&MP 611b / PTB 610a, Medical Research Scholars Program: Mentored Clinical Experience Staff

The goals of the course are to introduce MRSP students to aspects of clinically important human diseases. Students explore each disease over three one-and-one-half-hour sessions led by a clinician-scientist who is an expert in the relevant organ system. Students explore two disease processes per term. The first of the three sessions is devoted to a discussion of the clinical presentation, natural history, pathology, epidemiology, treatment, and prognosis of the disease process. During this session students have the opportunity to view gross or microscopic specimens of diseased tissue in association with members of the Pathology faculty. Students are assigned readings in pathology, pathophysiology, and clinical texts to prepare for the first class session. The second session focuses on translational aspects of the disease process. Students read and present papers relevant to the molecular basis of the disease and cutting-edge approaches to its therapy. In the third session students meet with patients who have experienced the disease and/or visit and explore facilities associated with diagnosis and treatment of the disease process. Prior to the third session students receive guidance as to what they will observe and how to approach the experience; and at the end of the session, the group discusses its thoughts and impressions. Students are expected to prepare for sessions, to participate actively, and to be scrupulously respectful of patients and patient facilities.

C&MP 629a and C&MP 630b / PATH 679a and PATH 680b / PHAR 501a and PHAR 502b / PTB 629a, Seminar in Molecular Medicine, Pharmacology, and Physiology Susumu Tomita, Titus Boggon, Don Nguyen, and Christopher Bunick

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 650, The Responsible Conduct of Research Barbara Ehrlich

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 Jack Zhang

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. ½ Course cr

C&MP 711b / MB&B 711b, Practical cryo-EM Workshop Jack Zhang, 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. ½ Course cr

Chemical & Environmental Engineering

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

Chair

Jordan Peccia

Director of Graduate Studies

Michael Loewenberg (michael.loewenberg@yale.edu) [F]

Mingjiang Zhong (mingjiang.zhong@yale.edu) [Sp]

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

Associate Professor Drew Gentner

Assistant Professors Nicole Deziel,^{*} Peijun Guo, Amir Haji-Akbari, Shu Hu, Krystal Pollitt,^{*} 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, soft matter, interfacial phenomena, energy, water and air quality, and sustainability.

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

Chemistry

Sterling Chemistry Laboratory, 203.432.3913
<http://chem.yale.edu>
M.S., Ph.D.

Chair

Kurt Zilm (chemistry.chair@yale.edu)

Director of Graduate Studies

Jonathan Ellman (jonathan.ellman@yale.edu)

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

Associate Professors Jason Crawford, Timothy Newhouse

Assistant Professors Caitlin Davis, Ziad Ganim, Stavroula Hatzios,* Sarah Slavoff, Hailiang Wang

Lecturers Paul Anastas, Paul Cooper, Christine DiMeglio, Narasimhan Ganapathi, Jonathan Parr

* A secondary appointment with primary affiliation in another department.

FIELDS OF STUDY

Fields include bio-inorganic chemistry, bio-organic chemistry, biophysical chemistry, chemical biology, chemical physics, inorganic chemistry, materials chemistry, organic chemistry, physical chemistry, physical-inorganic chemistry, physical-organic chemistry, synthetic-organic 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; (2) pass one oral examination—or, for biophysical chemistry students, two oral examinations—by the end of the second year of study; and (3) submit a thesis prospectus no later than the end of the third 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>.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in Chemistry in the biophysical or theoretical subfields 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.

MASTER'S DEGREE

M.S. (en route to the Ph.D.) A student must pass at least five graduate-level term courses in the Chemistry department 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 509a, Research Frontiers in Materials Chemistry Hailiang Wang

This course aims to serve graduate and senior undergraduate students from various academic departments who are interested in learning advanced chemistry and nanoscience for performing materials-related research. Material synthesis methods and structure characterization techniques are discussed in detail, with the focus on understanding fundamental structure-property correlations. Special topics on state-of-the-art materials chemistry research are also covered, including graphene and carbon nanotubes, inorganic nanocrystals, catalysis, battery materials, etc. Prerequisites: Undergraduate level general chemistry, inorganic chemistry, and physical chemistry, or equivalent level of knowledge. ½ Course cr

CHEM 514a, Molecular Materials: Design, Synthesis, and Properties Amymarie Bartholomew

Materials synthesized from molecular building blocks have an extraordinary range of properties (porosity, magnetism, conductivity, and combinations thereof, etc.), which depend on the molecular components and the manner in which they are assembled. This course introduces ways to understand and predict the properties of molecularly derived materials from their constituent molecules and their covalent, ionic, or spatial interactions upon assembly. The course also introduces techniques used to synthesize and study molecular materials, with the goal of providing students with a holistic understanding of research in this field. Prerequisite: Fundamentals of Transition Metal Chemistry (CHEM 402) or permission of the instructor. ½ 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. ½ Course cr

CHEM 517a, Kinetics and Thermodynamics in Organic Systems William Jorgensen

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, Foundations of Chemical Biology Jason Crawford

Chemical biology is a rapidly developing field at the interface of chemical and biological sciences. This subject deals with how chemistry can be applied to manipulate and study biological problems using a combination of experimental techniques ranging from organic chemistry to analytical chemistry, biochemistry, molecular biology, biophysical chemistry, and cell biology. The purpose of this course is to teach students the core skills that are used by scientists at the interface of chemistry and biology. The course transitions into CHEM 522, where students learn more about therapeutic applications of chemical biology. Prerequisites: two terms of both general chemistry and organic chemistry. ½ Course cr

CHEM 529a, 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. ½ 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. ½ Course cr

CHEM 533a, Synthetic Methods in Organic Chemistry II Timothy Newhouse

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 566a, Introduction to Quantum Mechanics I Sharon Hammes-Schiffer

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. ½ Course cr

CHEM 567a, Introduction to Quantum Mechanics II Sharon Hammes-Schiffer

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. ½ 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. ½ Course cr

CHEM 574a, Experimental Physical Methods in Molecular Sciences I Caitlin Davis

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. ½ Course cr

CHEM 575a, Experimental Physical Methods in Molecular Sciences II Caitlin Davis

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 is covered, such as nonlinear spectroscopy, optical imaging,

vibrational spectroscopy, NMR, and electrochemical methods. Discussions focus on current and classic literature in the fields. This class is the second half of Chem 574, which is a prerequisite. It is expected that Chem 574 & Chem 575 will be taken in the same semester, with Chem 574 taught in the first half of the semester and Chem 575 taught in the second half of the semester. ½ Course cr

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

Patrick Vaccaro

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. ½ 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. ½ 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. 0 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, Current Topics in Organic Chemistry Jon Ellman

A seminar series based on invited speakers in the general area of organic chemistry.

CHEM 730a, Theoretical Chemistry Seminar Kurt Zilm

A seminar series based on invited speakers in the areas of theoretical chemistry.

CHEM 740a, Seminar in Chemical Biology Jon Ellman

CHEM 750a, 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, Seminar in Inorganic Chemistry Nilay Hazari

CHEM 980a, 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 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

Kirk Freudenburg

Director of Graduate Studies

Egbert Bakker (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, J.G. Manning (*Classics; History*)

Associate Professor Andrew Johnston

Assistant Professors Jessica Lamont, Erika Valdivieso

Senior Lector and Language Program Coordinator James Patterson

Lecturers Timothy Robinson, Joseph Solodow, Rosalie Stoner

Postdoctoral Associates Malina Buturović, Alexander Ekserdjian

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

1. 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

1. 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

1. 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;
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 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

1. 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 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.

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 611b / EALL 507b, Ancient Musical Thought from Homer to Confucius Mick Hunter and Pauline LeVen

Examines traditions of musical thought across ancient cultures with a particular focus on Greece (LeVen) and China (Hunter). How did ancient thinkers understand the place of music within society, the ideal state, and the cosmos? What role did musical training and connoisseurship play in education? What is the relationship between music and wisdom? And how do the answers to these questions inform comparative study? As the 2023–24 Archaia core seminar, this course is offered in conjunction with Archaia's year-long Ancient Studies Workshop, through which students have the opportunity to learn from various experts in ancient musical thought.

CLSS 645a, Roman Numismatics Benjamin Hellings

This course aims to familiarize students with the study of coins as evidence for the ancient world and focuses on Roman numismatic iconography and the Roman economy. The course moves at a rapid pace, with seven weekly essays and two larger research projects. Prerequisite: a good understanding of Roman history.

CLSS 737a / PHIL 737a, Early Greek Philosophers Verity Harte and Brad Inwood

A study in the original language of a selection of early Greek philosophers, with special focus on the Eleatics in light of their influence on later Greek philosophy. We will attend to the sources for these philosophers and to their philosophical interpretation. Open to all graduate students in philosophy or classics who have suitable preparation in ancient Greek and some prior knowledge of ancient philosophy. Others interested in taking or attending the class must have prior permission of the instructors. Undergraduates are not normally admitted.

CLSS 861b / HIST 503b, Recent Trends, Current Problems, and New Approaches to Ancient History Joseph Manning

Current trends in the field and an examination of recent work, new theory, and new material. An overview of theory and method in ancient history. Each week is devoted to a case study or a recent monograph in the field.

CLSS 880a / HIST 521a, Roman Law Noel Lenski

A graduate-level extension of CLCV 236/HIST 225. The course inculcates the basic principles of Roman law while training students in advanced topics in the subject and initiating them into research methods.

CLSS 881a, Proseminar: Classical Studies Pauline LeVen

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 898a, Graduate Latin Survey I Christina Kraus

A survey of Latin literature from the earliest texts to the sixth century CE, with the main focus on the period from the second century BCE to the second century CE. Diachronic, synchronic, generic, and topical models of organization. Prepares for the comprehensive examinations in Classics for those majoring in both literatures or concentrating on Latin. Prerequisite: at least two term courses in Latin numbered in the 400s.

CLSS 900a, Directed Reading Staff

By arrangement with faculty.

GREK 743a, Homer's *Iliad* Egbert Bakker

Reading of selected books of the *Iliad*, with attention to Homeric language and style, the Homeric view of heroes and gods, and the reception of Homer in antiquity.

GREK 771a, Plutarch's *Lives* John Dillon

Close reading of selections from the *Parallel Lives*, including the lives of Pericles, Alcibiades, and Nicias. Plutarch's reception and mediation of Greco-Roman historical traditions; the nature and design of the *Lives*; ways in which genres such as biography, history, and historical fiction influenced and were influenced by Plutarch's work.

LATN 718a / EMST 518a, Cicero on Old Age Christina Kraus

A reading of Cicero's *De Senectute*, with attention to content and style. Topics covered include: the persona of Cato the Elder, the values and disadvantages of old age, Roman ideas of growth and decay, the dialogue form, translation and quotation practices.

LATN 777a, Ovid's Poetic Career Kirk Freudenburg

An advanced Latin course (L5) focused on the poetic career of the Roman poet Ovid.

Readings are drawn from all the major works of Ovid, following their publication over the course of his long career. The course is designed to take students beyond matters of grammar, vocabulary, and syntax (though these are stressed) into the complex workings of Latin poetry (including metrics, stylistics, and advanced Latin syntax), and the larger political and social contexts of one of antiquity's greatest literary careers. Class sessions are devoted to close reading of Ovid's Latin, with strong emphasis on grammar and syntax; analysis of Ovid's art; discussion of cultural context; and discussion of Ovid in reception and in modern scholarship.

Comparative Literature

Humanities Quadrangle, 3rd floor, 203.432.2760

<http://complit.yale.edu>

M.A., M.Phil., Ph.D.

Chair

Martin Hägglund

Director of Graduate Studies

Robyn Creswell

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

Associate Professors Robyn Creswell, Marta Figlerowicz, Moira Fradinger, Ayesha Ramachandran

Assistant Professor Samuel Hodgkin

Lecturer Peter Cole

Emeritus Dudley Andrew, Peter Brooks, Peter Demetz, Carol Jacobs, Rainer Nägele, 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*), 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 medieval or classical European literature, philology, or linguistics (or their equivalents in other cultures); one course in the Renaissance or Baroque (or equivalents); and one course in the modern period; (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 English

or American; 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 Literary proficiency in four languages (including English, at least one other modern language, and one classical or ancient language, such as Latin, Greek, Biblical Hebrew, Classical Arabic, Classical Chinese, Provençal). The fulfillment of this requirement will be demonstrated 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 course work.

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 before the Renaissance). 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.

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, the departmental proseminar and at least five further 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 two courses, excluding directed readings, need to receive the grade of Honors. 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 (normally one of these languages is French).

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. The dissertation must pass a presubmission 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 stacey.hampton@yale.edu.

COURSES

CPLT 504a, Proseminar in Translation Studies Marijeta Bozovic

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 510a / GMAN 604a, 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 525b / EALL 530b / EAST 542b, Poetry and Ethics Amidst Imperial Collapse

Lucas Bender

Du Fu has for the last millennium been considered China's greatest poet. Close study of nearly one-sixth of his complete works, contextualized by selections from the tradition that defined the art in his age. Exploration of the roles literature plays in interpreting human lives and the ways different traditional forms shape different ethical orientation. Poetry as a vehicle for moral reflection. All readings are in English.

CPLT 547a / GMAN 515a, Zählen und Erzählen: On the Relation Between Mathematics and Literature Anja LEMKE

Mathematical and literary practices of signs have numerous connections, and despite current debates on digital humanities, algorithm and the "end of the book", the relation between calculus and writing can be traced back to around 3000 BC, when the graphé was split up into figure and character. The seminar explores this relationship by focusing on four different fields, which can be discussed separately but do exhibit numerous overlappings: a) Leibniz' invention of infinitesimal calculus and its relation to the idea of narration from the Baroque to romanticism through to the twentieth century novel, (b) the relation between probability calculus, statistics, and novel writing in the nineteenth and early twentieth century, (c) the role of cypher for aesthetic and poetic questions starting with Schiller's *Letters on the esthetic education of men*, to Robert Walser's *Jakob von Gunten*, and Jenny Erpenbeck's *The old child*, and (d) the economic impact of computation on poetic concepts, e.g. the role of double entry bookkeeping or models of circulation in romantic theories of money and signs. We discuss Leibniz' *Theodizee*, texts on the infinitesimal calculus and his concept of an *ars combinatoria*, novels like *The Fortunatus*, Novalis's *Heinrich von Ofterdingen*, Stifter's "The gentle law", Gustav Freytag's *Debit and Credit*, and Musil's *Man without content*, Novalis's notes on mathematical questions of his time, and economic texts such as Adam Müller's *Attempt on a theory of money*.

CPLT 549a / RUSS 609a, Memory and Memoir in Russian Culture Jinyi Chu

How do we remember and forget? How does memory transform into narrative? Why do we read and write memoirs and autobiography? What can they tell us about the past? How do we analyze the roles of the narrator, the author, and the protagonist?

How should we understand the ideological tensions between official historiography and personal reminiscences, especially in twentieth-century Russia? This course aims to answer these questions through close readings of a few cultural celebrities' memoirs and autobiographical writings that are also widely acknowledged as the best representatives of twentieth-century Russian prose. Along the way, we read literary texts in dialogue with theories of memory, historiography, and narratology. Students acquire the theoretical apparatus that will enable them to analyze the complex ideas, e.g., cultural memory and trauma, historicity and narrativity, and fiction and nonfiction. Students acquire an in-depth knowledge of the major themes of twentieth-century Russian history – e.g., empire, revolution, war, Stalinism, and exilic experience – as well as increased skills in the analysis of literary texts. Students with knowledge of Russian are encouraged to read in the original. All readings are available in English.

CPLT 555a / ENGL 535a / MDVL 535a, Postcolonial Middle Ages Marcel Elias

This course explores the intersections and points of friction between postcolonial studies and medieval studies. We discuss key debates in postcolonialism and medievalists' contributions to those debates. We also consider postcolonial scholarship that has remained outside the purview of medieval studies. The overall aim is for students, in their written and oral contributions, to expand the parameters of medieval postcolonialism. Works by critics including Edward Said, Homi Bhabha, Leela Gandhi, Lisa Lowe, Robert Young, and Priyamvada Gopal are read alongside medieval romances, crusade and jihād poetry, travel literature, and chronicles.

CPLT 606a / FREN 945a / SPAN 845a, Introduction to Digital Humanities I:

Architectures of Knowledge Alexander Gil Fuentes

The cultural record of humanity is undergoing a massive and epochal transformation into shared analog and digital realities. While we are vaguely familiar with the history and realities of the analog record – libraries, archives, historical artifacts – the digital cultural record remains largely unexamined and relatively mysterious to humanities scholars. In this course students are introduced to the broad field of digital humanities, theory and practice, through a stepwise exploration of the new architectures and genres of scholarly and humanistic production and reproduction in the twenty-first century. The course combines a seminar, preceded by a brief lecture, and a digital studio. Every week we move through our discussions in tandem with hands-on exercises that serve to illuminate our readings and help students gain a measure of computational proficiency useful in humanities scholarship. Students learn about the basics of plain text, file and operating systems, data structures and internet infrastructure. Students also learn to understand, produce, and evaluate a few popular genres of digital humanities, including, digital editions of literary or historical texts, collections and exhibits of primary sources and interactive maps. Finally, and perhaps the most important lesson of the term, students learn to collaborate with each other on a common research project. No prior experience is required.

CPLT 610a / GMAN 701a / PLSC 601a / SOCY 701a, Theories of Freedom: Schelling and Hegel Paul North

In 1764 Immanuel Kant noted in the margin of one of his published books that evil was “the subjection of one being under the will of another,” a sign that good was coming to mean freedom. But what is freedom? Starting with early reference to Kant, we study two major texts on freedom in post-Kantian German Idealism,

Schelling's 1809 *Philosophical Investigations into the Essence of Human Freedom and Related Objects* and Hegel's 1820 *Elements of the Philosophy of Right*.

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 617a / GMAN 531a, The Short Spring of German Theory Kirk Wetters

Reconsideration of the intellectual microclimate of German academia 1945–1968. A German prelude to the internationalization effected by French theory, often in dialogue with German sources. Following Philipp Felsch's *The Summer of Theory* (English 2022): Theory as hybrid and successor to philosophy and sociology. Theory as the genre of the philosophy of history and grand narratives (e.g. secularization). Theory as the basis of academic interdisciplinarity and cultural-political practice. The canonization and aging of theoretical classics. Critical reflection on academia now and then. Legacies of the inter-War period and the Nazi past: M. Weber, Heidegger, Husserl, Benjamin, Kracauer, Adorno, Jaspers. New voices of the 1950s and 1960s: Arendt, Blumenberg, Gadamer, Habermas, Jauss, Koselleck, Szondi, Taubes. German reading and some prior familiarity with European intellectual history will be helpful but not essential.

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 632a / FILM 861a, Literature and Film of World War II: Homefront Narratives

Katie Trumpener

Taking a pan-European perspective, this course examines quotidian, civilian experiences of war, during a conflict of unusual scope and duration. Considering key works of wartime and postwar fiction and film alongside verbal and visual diaries, memoirs, documentaries, and video testimonies, we will explore the kinds of literary and filmic reflection war occasioned, how civilians experienced the relationship between history and everyday life (both during and after the war), women's and children's experience of war, and the ways that home front, occupation and Holocaust memories shaped postwar avant-garde aesthetics.

CPLT 644a / JDST 862a, The Betrayal of the Intellectuals Hannan Hever

The target of the seminar is to clarify the concept of the intellectual and its political and literary uses during the twentieth and twenty-first centuries. The point of departure is Julien Benda's influential book, *The Betrayal of the Intellectuals* (1927). Benda defines two kinds of intellectuals: the particularists, who are specifically committed to country, party, and economic issues—later thought of as the arena of “identity politics”—and the universalists, committed to more general humanist values. What makes one an intellectual? Does becoming an intellectual depend on specific historical, social, cultural, literary, and political conditions? Is being an intellectual a matter of “talking truth to power” in accordance with universalist values? The course looks at a variety of definitions of what constitutes an intellectual, based on approaches such as Benda's notion of the betrayal of the particularist intellectual, or postcolonial intellectualism. The course then looks at the specificity of intellectualism as it appears in certain contexts through readings from Martin Luther King, Jr., Abraham Joshua Heschel, Jean-Paul Sartre, George Orwell, Naguib Mahfouz, Frantz Fanon, Eleanor Roosevelt, James Baldwin, Angela Davis, Martin Buber, Edward Said, Antonio Gramsci, Herbert Marcuse, and Toni Morrison. Open to undergraduates with permission of the instructor.

CPLT 646a / EMST 546a / ENGL 723a / GMAN 646a, Rise of the European Novel

Rudiger Campe and Katie Trumpener

In the eighteenth century, the novel became a popular literary form in many parts of Europe. Yet now-standard narratives of its “rise” often offer a temporally and linguistically foreshortened view. This seminar examines key early modern novels in a range of European languages, centered on the dialogue between highly influential eighteenth-century British and French novels (Montesquieu, Defoe, Sterne, Diderot, Laclos, Edgeworth). We begin by considering a sixteenth-century Spanish picaresque life history (Lazarillo de Tormes) and Madame de Lafayette's seventeenth-century secret history of French court intrigue; contemplate a key sentimental Goethe novella; and end with Romantic fiction (an Austen novel, a Kleist novella, Pushkin's historical novel fragment). These works raise important issues about cultural identity and historical experience, the status of women (including as readers and writers), the nature of society, the vicissitudes of knowledge—and novelistic form. We also examine several major literary-historical accounts of the novel's generic evolution, audiences, timing, and social function, and historiographical debates about the novel's rise (contrasting English-language accounts stressing the novel's putatively British genesis, and alternative accounts sketching a larger European perspective). The course gives special emphasis to the improvisatory, experimental character of early modern

novels, as they work to reground fiction in the details and reality of contemporary life. Many epistolary, philosophical, sentimental, and Gothic novels present themselves as collections of “documents” – letters, diaries, travelogues, confessions – carefully assembled, impartially edited, and only incidentally conveying stories as well as information. The seminar explores these novels’ documentary ambitions; their attempt to touch, challenge, and change their readers; and their paradoxical influence on “realist” conventions (from the emergence of omniscient, impersonal narrators to techniques for describing time and place).

CPLT 660a / NELC 618a, Writing Muslims Shawkat Toorawa

We read and enjoy the works of Leila Aboulela, Nadia Davids, Aisha Gawad, Abdulrazak Gurnah, Manzu Islam, Sorayya Khan, Laila Lalami, Hisham Matar and others, and such films as *My Beautiful Laundrette*, *Surviving Sabu*, and *Ae Fond Kiss*, paying special attention to articulations of displacement, faith, history, identity, and memory. We try to develop an understanding of how the “diasporic” or “expatriate” Muslim writes herself, her world, and her condition. All material in English.

Prerequisite: Undergraduates need instructor's permission to register for this course.

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

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 802b / EALL 804b / ENGL 804b, Transpacific Performance in the Cold War

Rosa van Hensbergen

During the Cold War, interdisciplinary artists were crisscrossing the Pacific between Japan and the US, presenting their works in exhibitions, participating in performance festivals, and engaging in experimental collaborations. These crossings and crossovers took place with varying degrees of state involvement as the US government worked to promote its version of American culture abroad. In this course, we discover a series of transpacific performances and events against the backdrop of Cold War cultural politics, from collaborations between Japanese modern dancers and American jazz musicians in the early 60s to immersive works of Japanese video art presented in New York in the 90s. The rare archival and print materials that form an essential component of this course are made available in English. Japanese and other relevant language specialisms are welcome though not required, as are comparative and creative approaches. An aim of this course is to work closely together to produce a publishable

or performable piece of work—critical or creative—related to your future research and career ambitions. For those wishing to work with Japanese-language materials, please contact the instructor directly to organize additional Japanese-language workshops.

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 899b / FREN 893b, Realism and Naturalism Maurice Samuels

This seminar interrogates the nineteenth-century French Realist and Naturalist novel in light of various efforts to define its practice. How does critical theory constitute

Realism as a category? How does Realism articulate the aims of theory? And how do nineteenth-century Realist and Naturalist novels intersect with other discourses besides the literary? In addition to several works by Balzac, novels to be studied include Stendhal's *Le Rouge et le Noir*, Sand's *Indiana*, Flaubert's *Madame Bovary*, and Zola's *Nana*. Some attention also paid to Realist painting. Reading knowledge of French required.

CPLT 904a / FILM 617a / FREN 875a / GMAN 617a / SPAN 901a, Psychoanalysis:

Key Conceptual Differences between Freud and Lacan I Moira Fradinger

This is the first section of a year-long seminar (second section: CPLT 914) designed to introduce the discipline of psychoanalysis through primary sources, mainly from the Freudian and Lacanian corpuses but including late twentieth-century commentators and contemporary interdisciplinary conversations. We rigorously examine key psychoanalytic concepts that students have heard about but never had the chance to study. Students gain proficiency in what has been called "the language of psychoanalysis," as well as tools for critical practice in disciplines such as literary criticism, political theory, film studies, gender studies, theory of ideology, psychology, medical humanities, etc. We study concepts such as the unconscious, identification, the drive, repetition, the imaginary, fantasy, the symbolic, the real, and jouissance. A central goal of the seminar is to disambiguate Freud's corpus from Lacan's reinvention of it. We do not come to the "rescue" of Freud. We revisit essays that are relevant for contemporary conversations within the international psychoanalytic community. We include only a handful of materials from the Anglophone schools of psychoanalysis developed in England and the US. This section pays special attention to Freud's "three" (the ego, superego, and id) in comparison to Lacan's "three" (the imaginary, the symbolic, and the real). CPLT 914 devotes, depending on the interests expressed by the group, the last six weeks to special psychoanalytic topics such as sexualization, perversion, psychosis, anti-asylum movements, conversations between psychoanalysis and neurosciences and artificial intelligence, the current pharmacological model of mental health, and/or to specific uses of psychoanalysis in disciplines such as film theory, political philosophy, and the critique of ideology. Apart from Freud and Lacan, we will read work by Georges Canguilhem, Roman Jakobson, Victor Tausk, Émile Benveniste, Valentin Volosinov, Guy Le Gaufey, Jean Laplanche, Étienne Balibar, Roberto Esposito, Wilfred Bion, Félix Guattari, Markos Zafiroopoulos, Franco Bifo Berardi, Barbara Cassin, Renata Salecl, Maurice Godelier, Alenka Zupančič, Juliet Mitchell, Jacqueline Rose, Norbert Wiener, Alan Turing, Eric Kandel, and Lera Boroditsky among others. No previous knowledge of psychoanalysis is needed. Starting out from basic questions, we study how psychoanalysis, arguably, changed the way we think of human subjectivity. Graduate students from all departments and schools on campus are welcome. The final assignment is due by the end of the spring term and need not necessarily take the form of a twenty-page paper. Taught in English. Materials can be provided to cover the linguistic range of the group.

CPLT 917a / ENGL 920a / FILM 601a, Foundations of Film and Media John MacKay

The course sets in place some undergirding for students who want to anchor their film interest to the professional discourse of this field. A coordinated set of topics in film theory is interrupted first by the often discordant voice of history and second by the obtuseness of the films examined each week. Films themselves take the lead in our discussions.

CPLT 925b, The Practice of Literary Translation Peter Cole

Intensive readings in the history and theory of translation paired with practice in translating. Case studies from ancient languages (the Bible, Greek and Latin classics), medieval languages (classical Arabic literature), and modern languages (poetic texts).

CPLT 929b / ENGL 929 / FILM 651b, Film and Fiction in Interaction Dudley Andrew

Beyond adaptations of complex fiction (Henry James, James Joyce) literature may underlie “original” film masterpieces (*Rules of the Game*, *Voyage to Italy*). What about the reverse? Famous novelists moonlighted in the film world (Scott Fitzgerald, Graham Greene). Others developed styles in contact with cinema (Marguerite Duras, Eileen Chang, Kazuo Ishiguro). Today are these art forms evolving in parallel and in parity under new cultural conditions?

CPLT 958a / AFAM 867a / EMST 667a / ER&M 677a / SPAN 867a, Black Iberia: Then and Now Nicholas Jones

This graduate seminar examines the variety of artistic, cultural, historical, and literary representations of black Africans and their descendants—both enslaved and free—across the vast stretches of the Luso-Hispanic world and the United States. Taking a chronological frame, the course begins its study of Blackness in medieval and early modern Iberia and its colonial kingdoms. From there, we examine the status of Blackness conceptually and ideologically in Asia, the Caribbean, Mexico, and South America. Toward the end of the semester, we concentrate on black Africans by focusing on Equatorial Guinea, sub-Saharan African immigration in present-day Portugal and Spain, and the politics of Afro-Latinx culture and its identity politics in the United States. Throughout the term, we interrogate the following topics in order to guide our class discussions and readings: bondage and enslavement, fugitivity and maroonage, animal imageries and human-animal studies, geography and maps, Black Feminism and Black Queer Studies, material and visual cultures (e.g., beauty ads, clothing, cosmetics, food, Blackface performance, royal portraiture, reality TV, and music videos), the Inquisition and African diasporic religions, and dispossession and immigration. Our challenging task remains the following: to see how Blackness conceptually and experientially is subversively fluid and performative, yet deceptive and paradoxical. This course will be taught in English, with all materials available in the original (English, Portuguese, Spanish) and in English translation.

Computational Biology and Bioinformatics

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 M.S., Ph.D.

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Associate Professors Julien Berro (*Molecular Biophysics and Biochemistry*), Forrest Crawford (*Public Health*), Smita Krishnaswamy (*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 (*Public Health*)

Assistant Professors Arnaud Augert (*Pathology*), David Braun (*Medical Oncology*), Laying Guan (*Biostatistics*), Jeffrey Ishizuka (*Medicine; Pathology; Immunobiology*), Samah Jarad (*Emergency Medicine*), Monkol Lek (*Genetics*), Bluma Lesch (*Genetics*), Benjamin Machta (*Physics*), Robert McDougal (*Biostatistics*), C. Brandon Ogbunu (*Ecology and Evolutionary Biology*), Steven Reilly (*Genetics*), Wade Schulz (*Laboratory Medicine*), Serena Tucci (*Anthropology*), David van Dijk (*Cardiology*), Rex Ying (*Computer Science*), Jack Zhang (*Molecular Biophysics and Biochemistry*)

FIELDS OF STUDY

Computational biology and bioinformatics (CB&B) is a rapidly developing multidisciplinary field. The systematic acquisition of data made possible by genomics and proteomics technologies has created a tremendous gap between available data and

their biological interpretation. Given the rate of data generation, it is well recognized that this gap will not be closed with direct individual experimentation. Computational and theoretical approaches to understanding biological systems provide an essential vehicle to help close this gap. These activities include computational modeling of biological processes, computational management of large-scale projects, database development and data mining, algorithm development, and high-performance computing, as well as statistical and mathematical analyses.

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 the interest-based 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 along with either CB&B 562 or CB&B 750. 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. 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 term courses. 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. 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

M.S. (en route to the Ph.D.) To qualify for the awarding of the 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 an average grade of High Pass or higher, with ten required course credits taken at Yale including three successful research rotations and (3) meet the Graduate School's Honors requirement of at least two Honors grades.

Terminal Master's Degree Program Students can be admitted for a terminal M.S. degree in Computational Biology and Bioinformatics with the goal of gaining competency in three core areas: (1) computational biology and biomedical informatics, (2) biomedical sciences, (3) informatics (including computer science, statistics, and applied mathematics). This is a two-year program. Students must complete nine courses, including at least three graduate courses in CBB, 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 CBB seminar series.

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 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 CBB 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. Part-time study in this program is possible, but the degree must be completed within five years. Part-time students are expected to start the M.S. project after they have taken half of the required courses.

COURSES

Additional courses focused on the biological sciences and on areas of informatics are selected by the student in consultation with CB&B faculty.

CB&B 523a / ENAS 541a / MB&B 523a / PHYS 523a, Biological Physics Yimin Luo
The course has two aims: (1) to introduce students to the physics of biological systems and (2) to introduce students to the basics of scientific computing. The course focuses on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, protein folding, macromolecular crowding, cell motion, and tissue development using computational tools and methods. Intensive tutorials are provided for MATLAB including basic syntax, arrays, for-loops, conditional statements, functions, plotting, and importing and exporting data.

CB&B 555a / AMTH 553a / CPSC 553a / GENE 555a, Unsupervised Learning for Big Data Staff

This course focuses on machine-learning methods well-suited to tackling problems associated with analyzing high-dimensional, high-throughput noisy data including: manifold learning, graph signal processing, nonlinear dimensionality reduction, clustering, and information theory. Though the class goes over some biomedical

applications, such methods can be applied in any field. Prerequisites: knowledge of linear algebra and Python programming.

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

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 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 645b / S&DS 645b, Statistical Methods in Computational Biology Hongyu Zhao

Introduction to problems, algorithms, and data analysis approaches in computational biology and bioinformatics. We discuss statistical issues arising in analyzing population genetics data, gene expression microarray data, next-generation sequencing data,

microbiome data, and network data. Statistical methods include maximum likelihood, EM, Bayesian inference, Markov chain Monte Carlo, and methods of classification and clustering; models include hidden Markov models, Bayesian networks, and graphical models. Offered every other year. Prerequisite: S&DS 538, S&DS 542, or S&DS 661. Prior knowledge of biology is not required, but some interest in the subject and a willingness to carry out calculations using R is assumed.

CB&B 663b / AMTH 552b / CPSC 552b, Deep Learning Theory and Applications

Smita Krishnaswamy

Deep neural networks have gained immense popularity within the past decade due to their success in many important machine-learning tasks such as image recognition, speech recognition, and natural language processing. This course provides a principled and hands-on approach to deep learning with neural networks. Students master the principles and practices underlying neural networks, including modern methods of deep learning, and apply deep learning methods to real-world problems including image recognition, natural language processing, and biomedical applications. Course work includes homework, a final exam, and a final project—either group or individual, depending on enrollment—with both a written and oral (i.e., presentation) component. The course assumes basic prior knowledge in linear algebra and probability. Prerequisites: CPSC 202 and knowledge of Python programming.

CB&B 711a and CB&B 712b and CB&B 713b, Lab Rotations Staff

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 interoperability 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.

Computer Science

A.K. Watson Hall, 203.432.1246

<http://cpsc.yale.edu>

M.S., M.Phil., Ph.D.

Chair

Zhong Shao

Director of Graduate Studies

Lin Zhong (lin.zhong@yale.edu)

Professors Dana Angluin (*Emerita*), James Aspnes, Dirk Bergemann,* 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 Tassioulas,* Nisheeth Vishnoi, Y. Richard Yang, Lin Zhong, Steven Zucker†

Associate Professors Abhishek Bhattacharjee, Yang Cai, Amin Karbasi,* Theodore Kim, Smita Krishnaswamy,* Sahand Negahban,* Charalampos Papamanthou, Ruzica Piskac, Robert Soule, Jakub Szefer*

Assistant Professors Kim Blenman,* Arman Cohan, Yongshan Ding, Benjamin Fisch, Tesca Fitzgerald, Wenjun Hu,* Julian Jara-Ettinger,* Anurag Khandelwal, Daniel Rakita, Katerina Sotiraki, David van Dijk,* Marynel Vázquez, Andre Wibisono, Alex Wong, Zhitao Ying, Manolis Zampetakis, Fan Zhang

Senior Lecturers James Glenn, Andrew Sherman, 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, Andrew Sherman,* Inyoung Shin, 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 connections to worldwide networks. Workstations include Dell dual-processor PCs (running Linux or Windows/XP). Laboratory contains specialized equipment for graphics, vision, and robotics research. Various printers, including color printers, as well as image scanners, are also available. The primary educational facility consists of thirty-seven PC workstations supported by a large Intel PC server. 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 519a or b, Full Stack Web Programming Alan Weide

This course introduces students to a variety of advanced software engineering and programming techniques in the context of full-stack web programming. The focus of the course includes both client- and server-side programming (and database programming), client/server communication, user interface programming, and parallel programming.

CPSC 520b / ENAS 820b, Computer Architecture Abhishek Bhattacharjee

This course offers a treatment of computer architectures for high-performance and power/energy-efficient computer systems. Topics include the foundations of general-purpose computing, including instruction set architectures, pipelines, superscalar and out-of-order execution, speculation, support for precise exceptions, and simultaneous multi-threading. We also cover domain-specific hardware (e.g., graphics processing units), and ongoing industry efforts to elevate them to the status of first-class computing units. In tandem, we cover topics relevant to both general-purpose and domain-specific computing, including memory hierarchies, address translation and virtual memory, on-chip networks, machine learning techniques for resource management, and coherence techniques. If time permits, we study the basics of emerging non-classical computing paradigms like neuromorphic computing. Overall, this course offers insights on how the computing industry is combating the waning of traditional technology scaling via acceleration and heterogeneity. Prerequisites: Courses similar to CPSC 323, 223, and 202. This is a programming-intensive course, so comfort with large programming projects is essential.

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 522b, Operating Systems Anurag Khandelwal

The design and implementation of operating systems. Topics include synchronization, deadlocks, process management, storage management, file systems, security, protection, and networking.

CPSC 524a, Parallel Programming Techniques Andrew Sherman

Practical introduction to parallel programming, emphasizing techniques and algorithms suitable for scientific and engineering computations. Aspects of processor and machine architecture. Techniques such as multithreading, message passing, and data parallel

computing using graphics processing units. Performance measurement, tuning, and debugging of parallel programs. Parallel file systems and I/O.

CPSC 528b, Language-Based Security Zhong Shao

Basic design and implementation of language-based approaches for increasing the security and reliability of systems software. Topics include proof-carrying code; certifying compilation; typed assembly languages; runtime checking and monitoring; high-confidence embedded systems and drivers; and language support for verification of safety and liveness properties.

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 science, with a goal of elucidating the rationales behind the best practices in 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 532b, Computer Music: Sound Representation and Synthesis Scott Petersen

Study of the theoretical and practical fundamentals of computer-generated music, with a focus on low-level sound representation, acoustics and sound synthesis, scales and tuning systems, and programming languages for computer music generation. Theoretical concepts are supplemented with pragmatic issues expressed in a high-level programming language. Prerequisite: ability to read music.

CPSC 533b, Computer Networks Y. Richard Yang

An introduction to the design, implementation, analysis, and evaluation of computer networks and their protocols. Topics include layered network architectures, applications, transport, congestion, routing, data link protocols, local area networks, performance analysis, multimedia networking, network security, and network management. Emphasis on protocols used in the Internet.

CPSC 534a, Topics in Networked Systems Y. Richard Yang

Study of networked systems such as the Internet and mobile networks which provide the major infrastructure components of an information-based society. Topics include the design principles, implementation, and practical evaluation of such systems in new settings, including cloud computing, software-defined networking, 5G, Internet of things, and vehicular networking.

CPSC 535b, Building an Internet Router Robert Soule

Over the course of the term, students build a fully functioning Internet router. Students design the control plane in Python on a Linux host and design the data plane in the new P4 language on the bmv2 software switch. To provide context and background for the design of their router, students read a selection of papers to get both a historical perspective and exposure to current research in networking. Prerequisite: CPSC 533.

CPSC 537a or b, Introduction to 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 538a, Big Data Systems: Trends and Challenges Anurag Khandelwal

Today's Internet-scale applications and cloud services generate massive amounts of data. At the same time, the availability of inexpensive storage has made it possible for these services and applications to collect and store every piece of data they generate, in the hopes of improving their services by analyzing the collected data. This introduces interesting new opportunities and challenges designing systems for collecting, analyzing, and serving the so-called big data. This course looks at technology trends that have paved the way for big data applications, surveys state-of-the-art systems for storage and processing of big data, and considers future research directions driven by open research problems. Our discussions span topics such as cluster architecture, big data analytics stacks, scheduling and resource management, batch and stream analytics, graph processing, ML/AI frameworks, and serverless platforms and disaggregated architectures.

CPSC 539a or b, 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 541a, Zero-Knowledge Proofs Ben Fisch

This is a course in cryptographic proof systems. In the digital world today, we trust services to perform many kinds of computations on our data, from managing financial ledgers and databases to complex analytics. We trust these services not only to operate correctly but also to keep our information private. Proof systems allow us to remove this trust. A succinct proof system is a system that enables a service to attach a small certificate on the correctness of its computation, and the certificate can be verified by small devices, even if the original computation needs substantial computation to compute this result. Beyond correctness, a zero-knowledge proof system enables us to prove knowledge of secret information, including hidden inputs to a computation that

achieves a certain output. Both types of proof systems have incredible applications to privacy and verifiability in a decentralized web. CPSC 567 (Cryptography), MATH 225 (Linear Algebra) are recommended, but not required, prior to taking the course.

CPSC 542a, Theory of Computation Dylan McKay

This course first introduces core, traditional ideas from the theory of computation with more modern ideas used in the process, including basic ideas of languages and automata. Building on the core ideas, the course then covers a breadth of topics in modular units, where each unit examines a new model and potentially a new perspective on computation. Topics may include: basic notions of Complexity Theory, provability and logic, circuits and non-uniform computation, randomized computation, quantum computation, query-based computation, notions of machine learning, compression, and algebraic models of computation. Additional topics might be introduced in lectures or student projects, according to student interests, including mechanism design, voting schemes, cryptography, biological computation, distributed computation, and pseudorandomness. Prerequisite: One of CPSC 365, 366, or 368 is required. This course is a proof-based theory course and mathematical maturity is expected.

CPSC 543a / MATH 543a, Optimal Transport: Theory, Algorithms, and Applications to Data Science Smita Krishnaswamy

Optimal transport started with Gaspard Monge in the 1700s when he stated the problem of moving a large pile of sand (whose shape is a probability distribution) to a target pile with minimal effort. The optimal transport plan not only gives a coupling between distributions but also a metric between such probability measures, which has found use in everything from modern neural networks to economic resource allocation problems, to shape matching in computer vision. This course covers the theoretical foundations as well as computational aspects of optimal transport starting with the original formulations as maps between discrete measures and extending to general measures as well as the key Kantorovich relaxation as a coupling between measures and its metric properties. We also cover algorithmic foundations of optimal transport using linear programs that have recently been sped-up via entropic regularizations. In addition to the primal form, we cover the dual form and relaxations which lead to integral probability metrics. We vary the ground space of optimal transport from Euclidean, to arbitrary metrics, to graphs. We move from static to dynamic formulations of optimal transport, which can provide paths of flow for dynamics that are energy-constrained. Finally, we cover important extensions such as unbalanced optimal transport which allows for transport between generic measures (without the same volume) and for Gromov-Wasserstein distances between measures on different metric spaces. Prerequisites: MATH 241, CPSC 202, CPSC 223, and CPSC 365. Knowledge of Python programming is also required.

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 552b / AMTH 552b / CB&B 663b, Deep Learning Theory and Applications

Smita Krishnaswamy

Deep neural networks have gained immense popularity within the past decade due to their success in many important machine-learning tasks such as image recognition, speech recognition, and natural language processing. This course provides a principled and hands-on approach to deep learning with neural networks. Students master the principles and practices underlying neural networks, including modern methods of deep learning, and apply deep learning methods to real-world problems including image recognition, natural language processing, and biomedical applications. Course work includes homework, a final exam, and a final project—either group or individual, depending on enrollment—with both a written and oral (i.e., presentation) component. The course assumes basic prior knowledge in linear algebra and probability. Prerequisites: CPSC 202 and knowledge of Python programming.

CPSC 553a / AMTH 553a / CB&B 555a / GENE 555a, Unsupervised Learning for Big Data Staff

This course focuses on machine-learning methods well-suited to tackling problems associated with analyzing high-dimensional, high-throughput noisy data including: manifold learning, graph signal processing, nonlinear dimensionality reduction, clustering, and information theory. Though the class goes over some biomedical applications, such methods can be applied in any field. Prerequisites: knowledge of linear algebra and Python programming.

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 Emmanouil Zampetakis

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 557a, Sensitive Information in a Connected World Michael Fischer

Issues of ownership, control, privacy, and accuracy of the huge amount of sensitive information about people and organizations that is collected, stored, and used by

today's ubiquitous information systems. Readings consist of research papers that explore both the power and the limitations of existing privacy-enhancing technologies such as encryption and "trusted platforms."

CPSC 558b, Automated Decision Systems Stephen Slade

People make dozens of decisions every day in their personal and professional lives. What would it mean for you to trust a computer to make those decisions for you? It is likely that many of those decisions are already informed, mediated, or even made by computer systems. Explicit examples include dating sites like match.com or recommendation systems such as Amazon or Netflix. Most Internet ads on sites like Google or Facebook are run by real-time-bidding (RTB) systems that conduct split-second auctions in the hopes of getting your attention. Driverless cars offer the promise of safer highways. Corporations and other enterprises invest in decision support systems to improve the quality of their products and services. This course considers the spectrum of automated decision models and tools, examining their costs and effectiveness. Examples come from a variety of fields including finance, risk management, credit-card fraud, robotics, medicine, and politics.

CPSC 559a, Building Interactive Machines Marynel Vazquez

This advanced course brings together methods from machine learning, computer vision, robotics, and human-computer interaction to enable interactive machines to perceive and act in a variety of environments. Part of the course examines approaches for perception with different sensing devices and algorithms; the other part focuses on methods for decision-making and applied machine learning for control. The course is a combination of lectures, state-of-the-art reading, presentations and discussions, programming assignments, and a final team project. Prerequisites: CPSC 570 and understanding of probability, differential calculus, linear algebra, and planning (in Artificial Intelligence). Programming assignments require proficiency in Python and high-level familiarity with C++. Students who do not fit this profile may be allowed to enroll with the permission of the instructor.

CPSC 563b / ECON 565b, Algorithms for Convex Optimization Nisheeth Vishnoi

Convex optimization has played a major role in the recent development of fast algorithms for problems arising in areas such as theoretical computer science, discrete optimization, and machine learning. The approach is to first formulate the problem as a continuous (convex) optimization problem, even if the problem may be over a discrete domain, adapt or develop deterministic or randomized continuous-time dynamical systems to solve it, and then design algorithms for the problem via appropriate discretizations. The goal of this course is to design state-of-the-art algorithms for various classical discrete problems through the use of continuous optimization/sampling. The algorithmic applications include maximum flow in graphs, maximum matching in bipartite graphs, linear programming, submodular function minimization, and counting problems involving discrete objects such as matroids. We present approaches gradient descent, mirror descent, interior-point methods, and cutting plane methods. Prerequisite: CPSC 365 or permission of the instructor. S&DS 630 and a solid background in calculus, linear algebra, probability, and algorithms are recommended.

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 decision-making 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 565a, Theory of Distributed Systems James Aspnes

Models of asynchronous distributed computing systems. Fundamental concepts of concurrency and synchronization, communication, reliability, topological and geometric constraints, time and space complexity, and distributed algorithms.

CPSC 566b, Blockchain and Cryptocurrency Ben Fisch

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 567b, Introduction to Cryptography Staff

This course introduces modern symmetric and public-key cryptography as well as their broad applications, both from a theoretical and practical perspective. There is an initial

emphasis on fundamental cryptographic primitives (e.g., block ciphers, pseudorandom functions, pseudorandom generators, one-way functions), their concrete efficiency and implementation, as well as their security definitions and proofs. Ways of combining such primitives that lead to more complex objects used to secure today's internet (e.g., via TLS), such as key exchange, randomized encryption, message authentication codes, and digital signatures are also studied. The last part of the course is devoted to modern and more advanced applications of cryptography (some of which are deployed at scale today), such as authenticated data structures, zero-knowledge proofs, oblivious RAM, private information retrieval, secret sharing, distributed consensus, and cryptocurrencies. (e.g., Bitcoin).

CPSC 569b, Randomized Algorithms James Aspnes

Beginning with an introduction to tools from probability theory including some inequalities like Chernoff bounds, the course covers randomized algorithms from several areas: graph algorithms, algorithms in algebra, approximate counting, probabilistically checkable proofs, and matrix algorithms.

CPSC 570a, Artificial Intelligence Tesca Fitzgerald

Introduction to artificial intelligence research, focusing on reasoning and perception. Topics include knowledge representation, predicate calculus, temporal reasoning, vision, robotics, planning, and learning.

CPSC 572a, Intelligent Robotics Brian Scassellati

Introduction to the construction of intelligent, autonomous systems. Sensory-motor coordination and task-based perception. Implementation techniques for behavior selection and arbitration, including behavior-based design, evolutionary design, dynamical systems, and hybrid deliberative-reactive systems. Situated learning and adaptive behavior.

CPSC 574a or b, 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 576b / AMTH 667b / ENAS 576b, Advanced Computational Vision Steven

Zucker

Advanced view of vision from a mathematical, computational, and neurophysiological perspective. Emphasis on differential geometry, machine learning, visual psychophysics, and advanced neurophysiology. Topics include perceptual organization, shading, color, and texture.

CPSC 577b, Natural Language Processing Arman Cohan

Linguistic, mathematical, and computational fundamentals of natural language processing (NLP). Topics include part of speech tagging, Hidden Markov models,

syntax and parsing, lexical semantics, compositional semantics, machine translation, text classification, discourse, and dialogue processing. Additional topics such as sentiment analysis, text generation, and deep learning for NLP.

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 579b, Advanced Topics in Computer Graphics Julie Dorsey

An in-depth study of advanced algorithms and systems for rendering, modeling, and animation in computer graphics. Topics vary and may include reflectance modeling, global illumination, subdivision surfaces, NURBS, physically based fluids systems, and character animation.

CPSC 580a, Introduction to Computer Vision Alex Wong

This course focuses on fundamental topics in computer vision. We begin with the image formation process and discuss the role of camera models and intrinsic calibration in perspective projection. Basic image processing techniques (i.e. filtering) is introduced. After which, we discuss techniques to describe an image, from edges to feature descriptors and methods to establish correspondences between different images of the same scene. The course additionally covers topics in recognition (i.e. image classification, segmentation, detection, etc.) and reconstruction (i.e. stereo, structure-from-motion, optical flow). Machine learning and deep learning based methods in a subset of the topics covered are also introduced. Students get hands-on experience in implementing the techniques covered in the class and applying them to real world datasets and applications. Students taking this course must have successfully passed courses in data structures and object-oriented programming (e.g. CPSC 223a or equivalent courses) and foundational mathematical tools such as discrete math and linear algebra (e.g. CPSC 202 or equivalent courses). It is recommended that students have taken or successfully passed calculus (e.g. MATH 112, MATH 115, MATH 120, or equivalent courses) and linear algebra (e.g. MATH 225, or equivalent courses). A background in statistics, machine learning and deep learning is useful but not required. Experience in programming with Python is preferable, as we use it for assignments and projects. Familiarity with Google Colab and numerical and image processing packages (i.e. NumPy, SciPy, and Sci-kit Image) is helpful throughout the course.

CPSC 581b, Introduction to Machine Learning Alex Wong

This course provides an introduction to machine learning and the problem of learning from data. It introduces several frameworks for formulating the learning task as statistical and computational problems, and explores algorithms for solving them. Topics include supervised learning (classification, regression, kernel methods, neural networks), unsupervised learning (clustering, PCA, dimensionality reduction), reinforcement learning (Markov decision process, online learning), and examples of machine-learning applications in various domains. The course provides a foundation for students interested in pursuing further research or applications of machine learning. Students complete a final project, which can be a synthesis review of recent development and state-of-the-art results in some machine-learning applications. It should also have a research component, for example exploring different algorithms or

generalizing the results to different applications, ideally related to each student's own research.

CPSC 582b, Current Topics in Applied Machine Learning David van Dijk

We cover recent advances in machine learning that focus on real-world data. We discuss a wide range of methods and their applications to diverse domains, such as finance, health care, genomics, protein folding, drug discovery, neuroscience, and natural language processing. The seminar is based on a series of lectures by the instructor and guest lecturers, as well as student presentations. The latter are expected to be on recent publications from leading journals and conferences in the field and are followed by discussions. A final project involves the application of a machine-learning method to real-world data. Graduate students are required to work on projects, which are optional for undergraduates. Prerequisites: mathematical tools for computer science (CPSC 202 or equivalent course), linear algebra (MATH 222/MATH 225 or equivalent course), calculus (MATH 120 or equivalent course), or permission of the instructor; and basic coding knowledge (e.g., Python).

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 584b, Introduction to Human-Computer Interaction Marynel Vazquez

This course introduces students to the interdisciplinary field of human-computer interaction (HCI), with particular focus on human-robot interaction (HRI). The first part of the course covers principles and techniques in the design, development, and evaluation of interactive systems. It provides students with an introduction to UX design and user-centered research. The second part focuses on the emergent field of HRI and several other nontraditional interfaces, e.g., AR/VR, tangibles, crowdsourcing. The course is organized as a series of lectures, presentations, a midterm exam, and a term-long group project on designing a new interactive system. Prerequisites: CPSC 201 and CPSC 202 or equivalents. Students who do not fit this profile may be allowed to enroll with permission of the instructor.

CPSC 585a, Applied Planning and Optimization Daniel Rakita

This course introduces students to concepts, algorithms, and programming techniques pertaining to planning and optimization. At a high level, the course teaches students how to break down a particular problem into a state-space or a state-action space, how to select an effective planning or optimization algorithm given the problem at hand, and how to ultimately apply the selected algorithm to achieve desired outputs. Concepts are solidified through grounded, real-world examples (particularly in robotics, but also including machine learning, graphics, biology, etc.). These examples come in the form of programming assignments, problem sets, and a final project. General topics include discrete planning, sampling-based path planning, optimization via matrix methods, linear programming, computational differentiation, non-linear optimization, and mixed integer programming. After the course, students are able to generalize their knowledge of planning and optimization to any problem domain. Knowledge of linear algebra and calculus is expected. Students should be familiar with matrix multiplication, derivatives, and gradients.

CPSC 586b, Probabilistic Machine Learning Andre Wibisono

This course provides an overview of the probabilistic frameworks for machine learning applications. The course covers probabilistic generative models, learning and inference, algorithms for sampling, and a survey of generative diffusion models. This course studies the theoretical analysis of the problems and how to design algorithms to solve them. This course familiarizes students with techniques and results in literature and prepares them for research in machine learning. Prerequisites: Knowledge of machine learning, linear algebra, probability, and calculus.

CPSC 588a, AI Foundation Models Arman Cohan

Foundation models are a recent class of AI models that are large-scale in terms of number of parameters and are trained on broad data (generally using self-supervision at scale). These models have demonstrated exceptional capabilities in natural language processing, computer vision, and other tasks. Examples of foundation models are GPT-4, ChatGPT, GPT-3, Dall-E, Stable Diffusion, etc. In this course, we discuss building blocks of foundation models, including transformers, self-supervised learning, transfer learning, learning from human feedback, power of scale, large language models, in-context learning, chain-of-thought prompting, parameter-efficient fine-tuning, vision transformers, diffusion models, generative modeling, safety, ethical and societal considerations, their impact, etc. While the course primarily focuses on advances on large language models, we also cover foundation models in computer vision, as well as multi-modal foundation models. Prerequisite: either CPSC 477/577 or CPSC 480/580, or permission of the instructor.

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 467), networks (as covered in Yale's CPSC 433), and databases (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 640a or b / AMTH 640a or b / MATH 640a, 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 659a, Advanced Topics in Cryptography: Lattices and Post-Quantum

Cryptography Aikaterini 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. Overall, this course offers insights on the foundations and recent advancements in lattice-based cryptography. There is no required textbook, but certain lectures are based on the book *Complexity of Lattice Problems: A Cryptographic Perspective* by Daniele Micciancio and Shafi Goldwasser. We supplement the textbook with lecture notes from similar courses taught by Vinod Vaikuntanathan, Oded Regev, Chris Peikert and Daniele Micciancio. Beyond the lecture notes, we also read recent research papers. The course grade is based on multiple assignments and a final project. Prerequisites: This is an advanced course, which requires mathematical maturity and comfort with

linear algebra. The course also assumes prior knowledge of fundamental notions in cryptography (CPSC 467 or equivalent).

CPSC 690a or b, Independent Project I Vladimir Rokhlin

By arrangement with faculty.

CPSC 691a or b, Independent Project II Staff

By arrangement with faculty.

CPSC 692a or b, Independent Project Staff

Individual research for students in the M.S. program. Requires a faculty supervisor and the permission of the director of graduate studies.

CPSC 990a, Ethical Conduct of Research for Master's Students Inyoung Shin

This course is 0 credits for YC students. 0 Course cr

CPSC 991a / MATH 991a, Ethical Conduct of Research Inyoung Shin

0 Course cr

Early Modern Studies

Humanities Quadrangle, Rooms 431 & 436, 203.432.0672

<http://earlymodern.yale.edu>

M.A., M.Phil., Ph.D.

Chair Marisa Bass

Director of Graduate Studies Nicholas R. Jones

Faculty associated with the program Marisa Bass, Paola Bertucci, Dominique Brancher, Paul Bushkovitch, Rudiger Campe, Carlos Eire, Paul Freedman, Cecile Fromont, Supriya Gandhi, Alessandro Giammei, Bruce Gordon, Samuel Hodgkin, K. David Jackson, Nicholas Jones, Christina Kraus, Noel Lenski, Volker Leppin, Tina Lu, Alan Mikhail, Feisal Mohammed, Isaac Nakhimovsky, Morgan Ng, Catherine Nicholson, Jessica Peritz, Mark Peterson, Ayesha Ramachandran, Kishwar Rizvi, Pierre Saint-Amand, Nicola Suthor, Shawkat Toorawa, Katie Trumpener, Jane Tylus, Erika Valdivieso, Jesús Velasco, Lisa Voigt

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, French, History, History of Science and Medicine, History of Art, History of Music, Italian, 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 will normally be 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 will be 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 will remain the same as that of the partner department's Ph.D. program. Students in the combined degree will 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. Students will attend regular research presentations by scholars within and beyond Yale, which will complement EMST 700. This course will not typically count towards the total number of courses required for the Ph.D. by the .
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, EMST 901, Prospectus Workshop for Early Modern Studies : This course will typically be taken in the student's third year of graduate study as a year-long, half-credit course designed to support the development of a dissertation project. In some cases, with the approval of both relevant DGSs, this course may replace (or be replaced by) the prospectus seminar in the student's home department.

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 will follow the student's primary department requirements. However, students in the combined degree will have flexibility with regard to the completion of language requirements: At least one language may be completed by the time of the submission of the dissertation.

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 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. However, students must take EMST 900, as described above. Upon completion of all pre-dissertation 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 History, Italian Studies, Music, and Spanish and Portuguese who seek admission to the combined degree program with EMST for the fall of 2023 should consult with the DGS of EMST to formalize their affiliation and course of study. 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:

1. 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, which counts for a single course; (c) 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.
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 the Comparative Literature proseminar, CPLT 515) 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); 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

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, Workshop in Early Modern Studies, and one seminar outside of English. Students will also participate in EMST 800, 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, the year-long Early Modern Studies Prospectus Workshop.

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, Workshop in Early Modern Studies; EMST 800, Early Modern Colloquium; and EMST 900, a prospectus 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.

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 will complete ten seminars in the History of Art, including the First Year Seminar (HSAR 500) and three seminars on early modern topics, as well as the Workshop in Early Modern Studies (EMST 700). Students will also participate in the Early Modern Studies Colloquium (EMST 800).

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.

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 Third-year students in the combined program will enroll in the year-long Early Modern Studies Prospectus Workshop (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 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 EMST 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, Workshop in Early Modern Studies: This core, 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.
 - b. EMST 800, 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 will typically be taken in the student's third year of graduate study as a year-long, half-credit course designed to support the development of a dissertation project. In some cases, with the approval of both relevant DGSs, this course may replace (or be replaced by) the prospectus seminar in the student's home department.
2. Other EMST Requirements:
 - a. Language Requirement: same as HSHM language requirements
 - b. 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.

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.

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

Jay Ague

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

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. Minimum requirements include satisfactory performance in a course of study (typically six or more courses with at least one Honors grade in a graduate-level class) that is approved by the director of graduate studies (DGS), and a research project 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 519a, Introduction to the Physics and Chemistry of Earth Materials Shun-ichiro Karato

Basic principles that control the physical and chemical properties of Earth materials. Equation of state, phase transformations, chemical reactions, elastic properties, diffusion, kinetics of reaction, and mass/energy transport.

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 530a, Natural History of Reptiles and Amphibians Bhart-Anjan Bhullar

A survey of the phylogeny, biogeography, and natural history of living reptiles and amphibians, with consideration of the fossil record. Emphasis on broad-scale evolutionary patterns, environmental interactions, and behavior. Open to undergraduates with permission from instructor. Incorporates specimens from the Yale Peabody Museum. No prerequisites, although introductory college-level biology is recommended.

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 620a, Essentials of Earth and Planetary Sciences Jun Korenaga

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 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 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 Staff

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 721a, Topics in Geobiology Lidya Tarhan and Jordan Wostbrock

In this course, students explore recent papers and discuss emerging ideas concerning life-environment interactions through Earth's history, with a particular focus on integrating paleontological, sedimentological, and geochemical records.

EPS 790a, Colloquium in Earth and Planetary Sciences Staff

This course focuses on discussion of emerging research across the Earth and planetary sciences. ½ Course cr

EPS 830a, Earth's Past Climates Alan Rooney

This seminar focuses on advanced topics in climate science from a geochemical perspective. We cover intervals from Deep Time to the Anthropocene. Meetings are for two hours, once a week, and are organized around readings from the primary research literature. Undergraduates require permission from the instructor. Enrollment limited to twelve.

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 Michael Hunter

Assistant Professor Lucas Bender, Rosa van Hensbergen

Senior Lecturer Pauline Lin

Senior Lectors II Seungja Choi, Angela Lee-Smith, Ninghui Liang, Peisong Xu

Senior Lectors Hsiu-hsien Chan, Min Chen, Rongzhen Li, Fan Liu, Kumiko Nakamura, Hiroyo Nishimura, Jianhua Shen, Mari Stever, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Mika Yamaguchi, Yongtao Zhang, William Zhou

Lector Hyun Sung Lim

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 & 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://call.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 503a, *The Tale of Genji* James Scanlon-Canegata

A reading of the central work of prose fiction in the Japanese classical tradition in its entirety (in English translation) along with some examples of predecessors, parodies, and adaptations (the latter include Noh plays and twentieth-century short stories). Topics of discussion include narrative form, poetics, gendered authorship and readership, and the processes and premises that have given *The Tale of Genji* its place in world literature. Attention is also given to the text's special relationship to visual culture. No knowledge of Japanese required. A previous college-level course in the study of literary texts is recommended but not required.

EALL 507b / CLSS 611b, Ancient Musical Thought from Homer to Confucius Mick Hunter and Pauline LeVen

Examines traditions of musical thought across ancient cultures with a particular focus on Greece (LeVen) and China (Hunter). How did ancient thinkers understand the place of music within society, the ideal state, and the cosmos? What role did musical training and connoisseurship play in education? What is the relationship between music and wisdom? And how do the answers to these questions inform comparative study? As the 2023–24 Archaia core seminar, this course is offered in conjunction with Archaia's year-long Ancient Studies Workshop, through which students have the opportunity to learn from various experts in ancient musical thought.

EALL 530b / CPLT 525b / EAST 542b, Poetry and Ethics Amidst Imperial Collapse Lucas Bender

Du Fu has for the last millennium been considered China's greatest poet. Close study of nearly one-sixth of his complete works, contextualized by selections from the tradition that defined the art in his age. Exploration of the roles literature plays in interpreting human lives and the ways different traditional forms shape different ethical orientation. Poetry as a vehicle for moral reflection. All readings are in English.

EALL 565b / EAST 553b, Japanese Literature after 1970 Rosa van Hensbergen

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 567a, Japan's Global Modernisms: 1880–1980 Rosa van Hensbergen

This course is an introduction to Japanese literature from the 1880s to 1980s. Our reading is guided by a different “ism” each week, from nineteenth-century eroticism and exoticism, through mid-century cosmopolitanism and colonialism, to second-wave feminism and existentialism in the wake of World War II. These distinct moments in the development of Japanese modernism (*modanizumu*) are shaped by encounters with foreign cultures and by the importing of foreign ideas and vogues. All the same, we question—along with modernist writer Yū Ryūtanji—the “critique that says *modanizumu* is nothing more than the latest display of imported cosmetics” (1930). We seek to develop a correspondingly nuanced picture of the specific and changing ways in which Japan understood and figured its relationship to the rest of the world through the course of a century. Creative and comparative perspectives are especially welcome, and assignments can accommodate a range of media and presentation formats to suit. There are no prerequisites for this course, beyond an enthusiasm for reading literature. All readings are in translation, however there is an opportunity to read short stories in the original language. To facilitate this, our second class each week is structured around break-out groups that allow students to focus on one of the following: (a) comparative works of Western literature, (b) works of Japanese literary theory, and (c) original-language short stories.

EALL 569a, Topics in Modern Korean Literature Kyunghye 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 581b / FILM 873b, Japanese Cinema and Its Others Aaron Gerow

Critical inquiry into the myth of a homogeneous Japan through analysis of how Japanese film and media historically represent “others” of different races, ethnicities, nationalities, genders, and sexualities, including women, black residents, ethnic Koreans, Okinawans, Ainu, undocumented immigrants, LGBTQ minorities, the disabled, youth, and monstrous others such as ghosts.

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 608a, Sages of the Ancient World Mick Hunter

Comparative survey of the embodiment and performance of wisdom by ancient sages. Distinctive features and common themes in discourses about wisdom from China, India, the Near East, Egypt, Greece, and Rome. Topics include teaching, scheming, and dying.

EALL 707a / RLST 550a, Translation and Commentary in Early Chinese Buddhism

Eric Greene

This seminar introduces the literary sources relevant for the earliest era of Chinese Buddhism, during the (Eastern) Han and Three Kingdoms period, which primarily consist of early translations of Indian Buddhist literature and a few pioneering Chinese commentaries to them. Largely unstudied by modern scholars owing to their archaic language and vocabulary, these sources document the first recorded intellectual encounters between the Indian and East Asian worlds. Together with a careful reading of a selection of the relevant primary sources, we also take up secondary readings on

the history of early Chinese Buddhism and broader works on the problematics of translation and commentary, in the context of China and elsewhere.

EALL 745a, Readings in Medieval Chinese Thought Lucas Bender

This class considers documents pertaining to the intellectual history of medieval China, roughly from the end of the Han dynasty in 220 CE to the end of the Tang dynasty in 907. Texts change from term to term. Readings are in the original, so prospective students should have a firm background in Literary Chinese. Prerequisites: CHNS 170 and 171 or equivalent, or permission of the instructor.

EALL 804b / CPLT 802b / ENGL 804b, Transpacific Performance in the Cold War

Rosa van Hensbergen

During the Cold War, interdisciplinary artists were crisscrossing the Pacific between Japan and the US, presenting their works in exhibitions, participating in performance festivals, and engaging in experimental collaborations. These crossings and crossovers took place with varying degrees of state involvement as the US government worked to promote its version of American culture abroad. In this course, we discover a series of transpacific performances and events against the backdrop of Cold War cultural politics, from collaborations between Japanese modern dancers and American jazz musicians in the early 60s to immersive works of Japanese video art presented in New York in the 90s. The rare archival and print materials that form an essential component of this course are made available in English. Japanese and other relevant language specialisms are welcome though not required, as are comparative and creative approaches. An aim of this course is to work closely together to produce a publishable or performable piece of work – critical or creative – related to your future research and career ambitions. For those wishing to work with Japanese-language materials, please contact the instructor directly to organize additional Japanese-language workshops.

EALL 805a / FILM 871a, Readings in Japanese Film Theory Aaron Gerow

Theorizations of film and culture in Japan from the 1910s to the present. Through readings in the works of a variety of authors, the course explores both the articulations of cinema in Japanese intellectual discourse and how this embodies the shifting position of film in Japanese popular cultural history.

EALL 816a, Special Topics in Modern Chinese Literature Jing Tsu

This is an advanced graduate course geared toward preparing students to gain a specific range of expertise in different periods of modern Chinese literature. It is held as a seminar-colloquium with weekly discussions and informal presentations. For third- or fourth-year graduate students. For others, instructor approval required.

EALL 900a or b, Directed Readings Mick Hunter

Offered by permission of instructor and DGS to meet special needs not met by regular courses.

EALL 990a or b, Directed Research Mick Hunter

Offered as needed with permission of instructor and DGS for student preparation of dissertation prospectus.

JAPN 570a, Introduction to Literary Japanese James Scanlon-Canegata

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.

Chair

Hwansoo Kim (hwansoo.kim@yale.edu)

Director of Graduate Studies

Eric Greene (eric.greene@yale.edu)

Professors Daniel Botsman (*History*), Fabian Drixler (*History*), Aaron Gerow (*East Asian Languages and Literatures; Film and Media Studies*), Valerie Hansen (*History*), 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*), Denise Ho (*History*), William Honeychurch (*Anthropology*), Michael Hunter (*East Asian Languages and Literatures*), Hwansoo Kim (*Religious Studies*), Yukiko Koga (*Anthropology*)

Assistant Professors Lucas Bender (*East Asian Languages and Literatures*), Jinyi Chu (*Slavic Languages and Literatures*), Maura Dykstra (*History*), Daniel Mattingly (*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 Jonathan Feuer, Victor Fong, Marnyi Gyatso, Meghan Howard, Rio Katayama, Dilrabo Tosheva, Xiaoxiao Shen, Carolyn Wargula

Senior Lectors II Seungja Choi, Angela Lee-Smith, Ninghui Liang, Peisong Xu

Senior Lectors Hsiu-hsien Chan, Min Chen, Rongzhen Li, Fan Liu, Kumiko Nakamura, Hiroyo Nishimura, Jianhua Shen, Mari Stever, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Mika Yamaguchi, Yongtao Zhang, William Zhou

Lectors Jingjing Ao, Seunghee Back, Hyun Sung Lim

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 one-year 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://call.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://call.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 511a / RLST 598a, Modern Korean Buddhism from Sri Lanka to Japan

Hwansoo Kim

This course situates modern Korean Buddhism in the global context of the late nineteenth century to the present. Through critical examination of the dynamic relationship between Korean Buddhism and the Buddhisms of key East Asian cities—Shanghai, Tokyo, Taipei, and Lhasa—the course seeks to understand modern East Asian Buddhism in a transnational light. Discussion includes analyzing the impact of

Christian missionaries, pan-Asian and global ideologies, colonialism, Communism, capitalism, war, science, hypermodernity, and atheism.

EAST 515a / ANTH 515a, 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 nation-state, 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 542b / CPLT 525b / EALL 530b, Poetry and Ethics Amidst Imperial Collapse

Lucas Bender

Du Fu has for the last millennium been considered China's greatest poet. Close study of nearly one-sixth of his complete works, contextualized by selections from the tradition that defined the art in his age. Exploration of the roles literature plays in interpreting human lives and the ways different traditional forms shape different ethical orientation. Poetry as a vehicle for moral reflection. All readings are in English.

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 553b / EALL 565b, Japanese Literature after 1970 Rosa van Hensbergen

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 575b / ANTH 575b, Hubs, Mobilities, and Global Cities Helen Siu

Analysis of urban life in historical and contemporary societies. Topics include capitalist and postmodern transformations, class, gender, ethnicity, migration, and global landscapes of power and citizenship.

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 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 900a or b, Master’s Thesis Eric Greene

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 Eric Greene

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

Thomas Near

Director of Graduate Studies

Martha Muñoz

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, & 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*), James Noonan (*Genetics*), Carla Staver, Alison Sweeney

Assistant Professors Jennifer Coughlan, Nathan Grubaugh (*Public Health*), 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 including molecular evolution, phylogenetics, molecular population genetics, developmental evolution, and evolutionary theory.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Each entering student, in consultation with the director of graduate studies (DGS), 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*, 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 (H) 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 must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

By the middle of the fourth term of study, each student organizes a formal pre-prospectus 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 remaining requirements 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 cases where the dissertation committee decides that preliminary field work during the summer after the fourth term is necessary prior to the prospectus, 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 Satisfactory/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 course work 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: Required courses are: E&EB 500 and E&EB 501, Advanced Topics in Ecology and Evolutionary Biology; E&EB 545, Responsible Conduct of Research; E&EB 901, Research Rotation I; and E&EB 902, Research Rotation II. These courses are taken Sat/Unsat. A minimum of three additional graduate-level, elective courses are required and must be taken for a grade. Students must earn Honors in at least two courses and maintain an overall average of High Pass.

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://ceb.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 510a / S&DS 501a, Introduction to Statistics: Life Sciences Jonathan Reuning-Scherer

Statistical and probabilistic analysis of biological problems, presented with a unified foundation in basic statistical theory. Problems are drawn from genetics, ecology, epidemiology, and bioinformatics.

E&EB 520a, General Ecology Carla Staver

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 523Lb, Laboratory for Evolution, Functional Traits, and the Tree of Life Marta Wells

Experimental approaches to organismal and population biology, including study of the diversity of life.

E&EB 545b, Responsible Conduct of Research Staff

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 550a, Biology of Terrestrial Arthropods Marta Wells

Evolutionary history and diversity of terrestrial arthropods (body plan, phylogenetic relations, fossil record); physiology and functional morphology (water relations, thermo-regulation, energetics of flying and singing); reproduction (biology of reproduction, life cycles, metamorphosis, parental care); behavior (migration, communication, mating systems, evolution of sociality); ecology (parasitism, mutualism, predator-prey interactions, competition, plant-insect interactions).

E&EB 551La, Laboratory for Biology of Terrestrial Arthropods Marta Wells

Comparative anatomy, dissections, identification, and classifications of terrestrial arthropods; specimen collection; field trips.

E&EB 555a, Invertebrates Casey Dunn

An overview of animal diversity that explores themes including animal phylogenetics (evolutionary relationships), comparative studies of evolutionary patterns across species, organism structure and function, and the interaction of organisms with their environments. Most animal lineages are marine invertebrates, so marine invertebrates are the focus of most of the course. Concurrent enrollment in E&EB 556L is not required.

E&EB 556La, Laboratory for Invertebrates Casey Dunn

The study of invertebrate anatomy and diversity in a laboratory and field setting. Activities include examination of live animals and museum specimens, as well as local field trips. Some field trips fall on weekends. Must be taken concurrently with E&EB 555. ½ Course cr

E&EB 620b, Community Ecology David Vasseur

This course covers core questions in community ecology related to species interactions, species coexistence theory, species-environment interactions, the consequences of biological diversity, spatial ecology, food webs, and eco-evolutionary interactions. Lectures emphasize the theoretical and conceptual foundations of these topics and incorporate the empirical and experimental evidence supporting and confronting contemporary views.

E&EB 622a, Evolutionary Genetics Jennifer Coughlan

Genetic variation is the currency by which natural selection is translated into evolutionary change. In this course we dissect patterns of genetic variation using an evolutionary mindset to ultimately understand what shapes genetic variation in nature and the potential for species to adapt to new and changing environments. This class unites two foundational fields of evolutionary genetics: quantitative genetics (the study of the genetic basis of complex traits) and population genetics (the study of gene variant frequencies across time and space), with an ultimate goal of understanding evolutionary change in nature. Although this course is lecture based, there is much opportunity for hands-on learning. Students use real-life and simulated genetic data to map the genetic basis of traits and investigate the evolutionary forces responsible for shaping genetic variation in nature. We also discuss how quantitative and population genetics theory are applied to the modern genomic era, particularly in the context of detecting genomic signatures of adaptation. Last, we discuss the application of evolutionary genetics to human populations, including the usefulness and missteps of these applications for science and society.

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 712a, Foundations of Ecology David Vasseur

This seminar course familiarizes students with foundational concepts and themes in ecology and how they have changed over time. Each week we read and discuss two papers: one classic paper selected from the recently published volume *Foundations of Ecology II: Classic Papers with Commentaries* (Eds. Miller and Travis, 2022) covering the period 1970–1995, and one related contemporary paper published after 2010. We discuss how the concepts and themes introduced in classic papers have influenced the field of ecology and consider how new tools, data, and insights have advanced, diminished, or changed their impact. The *Foundations* book covers many topics, arranged into six core areas. Readings cover all six areas, but the included content varies depending on the interests of the class. Students are responsible for choosing one classic paper from *Foundations*, pairing it with one contemporary paper and leading the discussion during the class meeting. Students also submit short weekly “reflections” in response to a prompt.

E&EB 721a, Foundations of Terrestrial Ecology Michelle Wong

Intended for graduate students, this seminar course brings a historical perspective to understanding current questions and approaches in terrestrial ecology, ranging

from evolutionary, community, landscape, to ecosystem ecology. We read and discuss foundational papers and related current papers, and we identify future directions, opportunities, and challenges for the different sub-fields. The course allows students to critically examine and engage with some scientific work that has laid the findings and concepts that are foundational as they develop conceptual and methodological approaches to their own research. Starting in weeks three or four, each student takes a turn leading discussion and selecting a relevant current paper to that week's topic. Students write a total of seven précis on the topics of their choosing, with at least two completed by week six.

E&EB 830b, The Ecology of the Great Pandemics Brandon Ogbunu

In this course we examine principles of the ecology of infectious disease in light of three pandemics: the 1918 influenza pandemic, the HIV/AIDS pandemic, and the COVID-19 pandemic. The course covers principles of zoonoses, disease emergence, herd immunity, basic vaccinology, and other fundamental concepts. It also focuses on social and cultural factors that fomented these pandemics.

E&EB 856a, Special Topics in the Ecology and Evolution of Infectious Diseases

Vanessa Ezenwa

Historically, pathogens and the diseases they cause were viewed largely from a biomedical perspective focused on interactions between pathogens and their human hosts. However, in the last few decades, the importance of studying pathogens from an ecological and evolutionary perspective has gained significant traction. These perspectives inform our understanding of almost all aspects of pathogen-host interactions from transmission dynamics and zoonotic disease spillover to the evolution of virulence and drug resistance. In this seminar, we dissect current and classic literature on the ecology and evolution of infectious diseases. Specifically, we: (i) discuss fundamental concepts in the field; (ii) identify persistent knowledge gaps; and (iii) explore opportunities for linkages between ecological, evolutionary, and biomedical perspectives.

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 Vytlačil, 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 lunch or reading group, and at least one must be a "formal" research 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.

Who designs a combined degree program 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 rationale 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 and ECON 501b, General Economic Theory: Microeconomics Staff
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 and ECON 511b, General Economic Theory: Macroeconomics Staff
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 Ernesto Rivera Mora
A formal introduction to game theory and information economics. Alternative non-cooperative solution concepts are studied and applied to problems in oligopoly, bargaining, auctions, strategic social choice, and repeated games.

ECON 521b, Advanced Microeconomic Theory II Staff
Contracts and the economics of organization. Topics may include dynamic contracts (both explicit and implicit), career concerns, hierarchies, Bayesian mechanism design, renegotiation, and corporate control.

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 Michael Peters and Zhen Huo
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 526b, Advanced Macroeconomics II Staff
Macroeconomic equilibrium in the presence of uninsurable labor income risk. Implications for savings, asset prices, unemployment.

ECON 530a, General Equilibrium Foundations of Finance and Macroeconomics John Geanakoplos

The course gives a careful mathematical description of the general equilibrium underpinnings of the main models of finance and the new macroeconomics of collateral and default. Part I is a review of Walrasian general equilibrium, including the mathematical techniques of fixed points and genericity, both taught from an elementary point of view. Part II covers general equilibrium with incomplete markets (GEI). Part III focuses on the special case of the capital asset pricing model (CAPM), including extensions to multi-commodity CAPM and multifactor CAPM. Part IV focuses on the Modigliani-Miller theorem and generic constrained inefficiency. Part V describes collateral equilibrium and the leverage cycle. Part VI covers default and punishment and adverse selection and moral hazard in general equilibrium. Part VII describes monetary equilibrium.

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 547b, Social Networks and Economic Development Kaivan Munshi

The objective of this course is to study the emerging literature on social networks and economic development. Both theoretical and empirical research papers are covered, at a level that is suitable for the advanced undergraduate or graduate student. The course is divided into three sections: (1) Labor Markets and Migration: how community networks support their members in the labor market and how they support their spatial and occupational mobility during the process of development; (2) Commitment: how communities use social ties to solve commitment problems in developing economics, both in theory and in practice; (3) Inter-Group Interactions: community networks do not operate independently, and a nascent literature is starting to investigate the nature of these group interactions. Time permitting, we examine the role played by networks in the diffusion of information at the end of the course. Prerequisites: intermediate microeconomics, introductory econometrics, and data analysis. Students are expected to be familiar with calculus, basic microeconomics, and basic econometrics.

ECON 548b / PLSC 721b, Political Economy of Development Rohini Pande and Gerard Padro

This course analyzes empirically and theoretically the political, institutional, and social underpinnings of economic development. We cover an array of topics ranging from power structures to corruption, state capacity, social capital, conflict, democratization, and democratic backsliding. We focus on recent advances to identify open areas for further research.

ECON 549b, Economic Development Policy in the Twenty-First Century Pinelopi Goldberg and Amit Khandelwal

The twenty-first century presents new challenges for the global economy including rising global and within-country inequalities, slowing globalization, the deployment of new technologies, and climate change. This course examines the design of economic policy to meet these challenges. Some of the questions we analyze include: What is the future role of manufacturing versus services in economic development? How large are the distortions caused by unequal access in labor markets for women? Why do firms in developing economies remain small, and what are their constraints on growth? Which policies distort and which improve the allocation of a country's resources? Although these topics appear disparate, the course provides a unifying framework to tackle them. Specifically, we adopt a markets-based approach that views economic development through the functioning of markets. Emphasis is placed on learning how to draw implications for economic policy from state-of-the-art research in economics.

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 551b, Econometrics II Staff

Provides a basic knowledge of econometric theory, and an ability to carry out empirical work in economics. Topics include linear regression and extensions, including regression diagnostics, generalized least squares, statistical inference, dynamic models, instrumental variables and maximum likelihood procedures, simultaneous equations, nonlinear and qualitative-choice models. Examples from cross-section, time series, and panel data applications.

ECON 552b, Econometrics III Yuichi Kitamura

The treatment of the subject is rigorous, attentive to modern developments, and proceeds to research level in several areas. Linear models from core curriculum. Topics include linear estimation theory, multiple and multivariate regressions, Kruskal's theorem and its applications, classical statistical testing by likelihood ratio, Lagrange multiplier and Wald procedures, bootstrap methods, specification tests, Stein-like estimation, instrumental variables, and an introduction to inferential methods in simultaneous stochastic equations.

ECON 554b, Econometrics V Xiaohong Chen

The first half of this course is about nonlinear parametric models. Specification, estimation, and testing within the Likelihood and Generalized Method of Moments frameworks. First-order asymptotics for both smooth and non-smooth objective functions. Efficiency and robustness. A short account of high-order asymptotics for smooth problems. The second part is on nonparametric and semiparametric methods. Nonparametric estimation by kernels, series, splines, and other methods. Bias reduction and bandwidth selection. The course of dimensionality and additive models. Specification and estimation of semiparametric models. U-statistics and asymptotic properties. Efficiency and adaptation.

ECON 556a, Topics in Empirical Economics and Public Policy Charles Hodgson and Yusuke Narita

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 559b, Development Econometrics (IDE) Michael Boozer

ECON 565b / CPSC 563b, Algorithms for Convex Optimization Nisheeth Vishnoi
Convex optimization has played a major role in the recent development of fast algorithms for problems arising in areas such as theoretical computer science, discrete optimization, and machine learning. The approach is to first formulate the problem as a continuous (convex) optimization problem, even if the problem may be over a discrete domain, adapt or develop deterministic or randomized continuous-time dynamical systems to solve it, and then design algorithms for the problem via appropriate discretizations. The goal of this course is to design state-of-the-art algorithms for various classical discrete problems through the use of continuous optimization/sampling. The algorithmic applications include maximum flow in graphs, maximum matching in bipartite graphs, linear programming, submodular function minimization, and counting problems involving discrete objects such as matroids. We present approaches gradient descent, mirror descent, interior-point methods, and cutting plane methods. Prerequisite: CPSC 365 or permission of the instructor. S&DS 630 and a solid background in calculus, linear algebra, probability, and algorithms are recommended.

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 581b, American Economic History Jose-Antonio Espin-Sanchez

This course examines both the long-term factors (such as industrialization and the development of markets) and the epochal events (such as the Revolution, Civil War, and Great Depression) that have shaped the development of the American economy. The objectives of this course are to familiarize students with the major topics and debates in American economic history. Prerequisites: concurrent enrollment in or successful completion of ECON 501 and ECON 510.

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 Charles Hodgson and Steven Berry

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 601b, Industrial Organization II Philip Haile and Katja Seim

Examination of alternative modes of public control of economic sectors with primary emphasis on antitrust and public utility regulation in the U.S. economy. Public policy issues in sectors of major detailed governmental involvement.

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 and ECON 631b, Labor Economics Staff

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 670a / MGMT 740a, 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.

ECON 674a, Financial Crises Gary Gorton

An elective doctoral course covering theoretical and empirical research on financial crises. The first half of the course focuses on general models of financial crises and historical episodes from the nineteenth and twentieth centuries. The second half of the course focuses on the recent financial crisis. Prerequisites: MGMT 740 and 741 (doctoral students in Economics may substitute the core microeconomics sequence), and permission of the instructor.

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 Costas Arkolakis and Lorenzo Caliendo

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 721b, International Trade II Amit Khandelwal and Samuel Kortum

The course covers empirical topics in international trade with particular emphasis on current research areas. Topics include tests of international trade theories; studies of the relationship between international trade, labor markets, and income distribution; recent trade liberalization episodes in developing countries; empirical assessment of various trade policies, such as VERs and Anti-Dumping; productivity (and its relation to international trade liberalization); and exchange rates, market integration, and international trade. Methodologically, the course draws heavily on empirical models used in the fields of industrial organization and to a lesser degree labor economics; taking these courses is thus recommended though not required.

ECON 724a, International Finance Staff

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 731b, Economic Development II Lauren Bergquist

Analysis of development experiences since World War II. Planning and policy making across countries and time. Models of development, growth, foreign trade, and investment. Trade, capital, and technology flows and increasing interdependence. The political economy of policy making and policy reform.

ECON 732b, Advanced Economic Development Michael Boozer

Examines the models of classical and modern economists to explain the transition of developing economies into modern economic growth, as well as their relevance to income distribution, poverty alleviation, and human development.

ECON 733a, Urban and Environmental Economics Mushfiq Mobarak and Costas Arkolakis

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 794b, International Trade Policy Giovanni Maggi

Theoretical and empirical research in international trade policy. The course focuses on welfare analysis of trade policies under perfect completion and under oligopoly; the political economy of trade policy; and the economics and political economy of international trade agreements. Prerequisites: ECON 500 and 501.

ECON 899a or b, Individual Reading and Research Staff

By arrangement with faculty.

Electrical Engineering

17 Hillhouse Avenue, 203.432.4220

M.S., M.Phil., Ph.D.

Chair

Jung Han

Director of Graduate Studies

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Associate Professors Amin Karbasi, Jakub Szefer

Assistant Professors Dionysis Kalogierias, Mengxia Liu, Priyadarshini Panda

* 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

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Vidvuds Ozolins

Director of Graduate Studies

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Associate Professors Michael Choma (*Biomedical Engineering*), Peter Rakich

Assistant Professors Yu He, Owen Miller, Shruti Puri

BIOMEDICAL ENGINEERING

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Assistant Professors Sanjay Aneja,* Julius Chapiro,* Daniel Coman,* Nicha Dvornek,* Ansel Hillmer,* Michael Mak, John Onofrey, Cristina Rodriguez, Dustin Scheinost,* Gregory Tietjen*

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

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CHEMICAL & ENVIRONMENTAL ENGINEERING

Chair

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Associate Professor Drew Gentner

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Lecturer Yehia Khalil

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COMPUTER SCIENCE

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Rokhlin,† Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao, Avi Silberschatz, Daniel Spielman, Phillipp Strack,* Leandros Tassioulas,* Nisheeth Vishnoi, Y. Richard Yang, Lin Zhong, Steven Zucker†

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Senior Lecturers James Glenn, Andrew Sherman, 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, Andrew Sherman,* Inyoung Shin, Alan Weide, Cecillia Xie

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

† A joint appointment with another department.

ELECTRICAL ENGINEERING

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Associate Professors Amin Karbasi, Jakub Szefer

Assistant Professors Dionysis Kalogerias, Mengxia Liu, Priyadarshini Panda

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MECHANICAL ENGINEERING & MATERIALS SCIENCE

Chair

Udo Schwarz

Director of Graduate Studies

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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 & ENVIRONMENTAL ENGINEERING

Fields of Study

Fields include nanomaterials, soft matter, interfacial phenomena, energy, water and air quality, 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 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 & 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, and poroelasticity.

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.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in Applied Physics, Biomedical Engineering, Chemical & Environmental Engineering, and Mechanical Engineering & 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.

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 & 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 up to 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 & Environmental Engineering (Chemical track) ENAS 500, and two of the following three courses: ENAS 521, ENAS 602, ENAS 603.

Chemical & 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 & 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 ENAS 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 ENAS 990, and maintain an average of at least High Pass.

Teaching Students are required to serve as a teaching fellow for up to 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/degree-program-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: ENAS 526, ENAS 527, ENAS 528, ENAS 529, and two terms of ENAS 532 or ENAS 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 & 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.

ENAS 500b, Mathematical Methods I Paul Van Tassel

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 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 510a, Physical and Chemical Basis of Bioimaging and Biosensing Douglas Rothman, Ansel Hillmer, and Fahmeed Hyder

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 511b, Photonics and Optical Electronics Jung Han

A survey of the enabling components and devices that constitute modern optical communication systems. Focus on the physics and principles of each functional unit, its current technological status, design issues relevant to overall performance, and future directions.

ENAS 517b / MB&B 517b / MCDB 517b / PHYS 517b, Methods and Logic in Interdisciplinary Research Corey O'Hern

This half-term 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). Counts as 0.5 credit toward graduate course requirements. ½ Course cr

ENAS 518a / MB&B 635a, Quantitative Approaches in Biophysics and Biochemistry Julien Berro and Yong Xiong

The course offers an introduction to quantitative methods relevant to analysis and interpretation of biophysical and biochemical data. Topics covered include statistical testing, data presentation, and error analysis; introduction to dynamical systems; analysis of large datasets; and Fourier analysis in signal/image processing and macromolecular structural studies. The course also includes an introduction to basic programming skills and data analysis using MATLAB. Real data from research groups in MB&B are used for practice. 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. 0 Course cr

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 523b, 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 provides the requisite background for physiology and assumes a basic understanding of AI/ML but has no strict prerequisites.

ENAS 526a, Clinical Knowledge for an Engineer Steven Tommasini and Daniel Wiznia

An eight-week summer clinical immersion session provides students with early hands-on learning and shadowing of the current 3D innovation landscape. Students are assigned to a clinical mentor. They shadow their mentor in the clinics and operating rooms, observing how they incorporate personalized medicine into the treatments of patients. This course is only open to graduate students enrolled in the M.S. in Personalized Medicine and Applied Engineering.

ENAS 527a, Personalized Medicine Seminar Sanjay Aneja, Kimberly Hieftje, Asher Marks, and Frank Buono

Students learn about the healthcare legal landscape, anatomy and pathology, medical imaging modalities, image acquisition and 3D model creation, surgical planning tools, computer navigation, robotics. Topics explored include PACS, DICOM, model creation, model validation, use of CAD with 3D models, image processing algorithm development. In addition, there is an introduction to surgical suite and clinical environment, sterile processing, and YSM simulation center. This course is only open to graduate students enrolled in the M.S. in Personalized Medicine and Applied Engineering.

ENAS 528a, Advanced Personalized Medicine Techniques Steven Tommasini, Julius Chapiro, and Daniel Wiznia

This course incorporates an apprenticeship in the Yale Orthopaedics 3D Printing Lab or in a bioprinting lab within Biomedical Engineering or YSM assisting the in-house clinical engineer with the development and production of clinician requested patient specific 3D prints, custom surgical guides and molds. The curriculum explores 3D printing technologies (pros/cons, post processing requirements), FDA regulation, quality management, common 3D printer design and setup, preparing parts for the printer, printer maintenance and troubleshooting, post-processing, 3D printer validation. Students have a bioprinting lab in which they 3D print tissues and learn about 4D printing and incorporation of biologics. This course is only open to graduate students enrolled in the M.S. in Personalized Medicine and Applied Engineering.

ENAS 529b, Medical Device Design and Innovation Daniel Wiznia and Steven Tommasini

The engineering design, project planning, prototype creation, and fabrication processes for medical devices that improve patient conditions, experiences, and outcomes. Students develop viable solutions and professional-level working prototypes to address clinical needs identified by practicing physicians. Some attention to topics such as

intellectual property, the history of medical devices, documentation and reporting, and regulatory affairs. o Course cr

ENAS 532a or b, Industry-Sponsored 3D Design Project Staff

Teams of two to three students are paired to work on 3D medical innovation projects with biomedical engineering companies, industry leaders of personalized medicine. This course serves as a potential “route to employment” by providing students with a year-long internship / “internal interview” with a biomedical technology company’s engineering team. These projects may involve the student developing novel software, hardware, manufacturing validations, medical devices, surgical instruments, or 3D printing modalities. This course is only open to graduate students enrolled in the M.S. in Personalized Medicine and Applied Engineering.

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 541a / CB&B 523a / MB&B 523a / PHYS 523a, Biological Physics Yimin Luo
The course has two aims: (1) to introduce students to the physics of biological systems and (2) to introduce students to the basics of scientific computing. The course focuses on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, protein folding, macromolecular crowding, cell motion, and tissue development using computational tools and methods. Intensive tutorials are provided for MATLAB including basic syntax, arrays, for-loops, conditional statements, functions, plotting, and importing and exporting data.

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 554b, Continuum Biomechanics Jay Humphrey

This course is designed to enable students to learn advanced and state-of-the-art methods of continuum and computational biomechanics, especially related to the need to formulate new theories of soft tissue growth, remodeling, disease progression, healing, and aging. 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 Joe Howard

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 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 translation aspect as well as new understandings in immunology and how they can be translated to the clinic and eventually to the market. Prerequisites: ENAS 553, differential equations, and advanced calculus.

ENAS 569a, Single-Cell Biology, Technologies, and Analysis Rong Fan

This course teaches the principles of single-cell heterogeneity in human health and disease as well as the cutting-edge wet-lab and computational techniques for single-cell analysis, with a particular focus on omics-level profiling and data analysis. Topics covered include single-cell-level morphometric analysis, genomic alteration analysis, epigenomic analysis, mRNA transcriptome sequencing, small RNA profiling, surface epitope, intracellular signaling protein and secreted protein analysis, metabolomics, multi-omics, and spatially resolved single-cell omics mapping. We also teach computational methods for quantification of cell types, states, and differentiation trajectories using single-cell high-dimensional data. Finally, case studies are provided to show the power of single-cell analysis in therapeutic target discovery, biomarker research, clinical diagnostics, and personalized medicine. Prerequisite: physiological systems, molecular biology, or biochemistry.

ENAS 570b / C&MP 560b / MCDB 560b / PHAR 560b, Cellular and Molecular**Physiology: Molecular Machines in Human Disease** Emile Boulpaep

The course focuses on understanding the processes that transfer molecules across membranes at the cellular, molecular, biophysical, and physiological levels. Students learn about the different classes of molecular machines that mediate membrane transport, generate electrical currents, or perform mechanical displacement. Emphasis is placed on the relationship between the molecular structures of membrane proteins and their individual functions. The interactions among transport proteins in determining the physiological behaviors of cells and tissues are also stressed. Molecular motors are introduced and their mechanical relationship to cell function is explored. Students read papers from the scientific literature that establish the connections between mutations in genes encoding membrane proteins and a wide variety of human genetic diseases.

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 576b / AMTH 667b / CPSC 576b, Advanced Computational Vision Steven Zucker

Advanced view of vision from a mathematical, computational, and neurophysiological perspective. Emphasis on differential geometry, machine learning, visual psychophysics, and advanced neurophysiology. Topics include perceptual organization, shading, color, and texture.

ENAS 585b / INP 585b, Fundamentals of Neuroimaging Fahmeed Hyder, Elizabeth Goldfarb, 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 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 602b, 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 603a, Energy, Mass, and Momentum Processes Amir Haji-Akbari

Application of continuum mechanics approach to the understanding and prediction of fluid flow systems that may be chemically reactive, turbulent, or multiphase.

ENAS 638b, Environmental Organic Chemistry John Fortner

This course examines the major physical and chemical attributes and processes affecting the behavior of organic compounds in environmental systems, including volatilization, sorption/attachment, diffusion, and reactions. Emphasis is on anthropogenic hydrophobic organic compounds (e.g., TCE, PCBs, DDT) and less hydrophobic emerging contaminants of concern (e.g., pharmaceuticals, explosives, etc.). The course reviews basic concepts from physical chemistry and examines the relationships between chemical structure, properties, and environmental behavior of organic compounds. Physical and chemical processes important to the fate, treatment, and transformation of specific organic compounds are addressed, including solubility, volatilization, partitioning, sorption/attachment, bioaccumulation, and bulk environmental transformation pathways. Equilibrium and kinetic models based on these principles are used to predict the fate and transport of organic contaminants in the environment.

ENAS 640b / ENV 708b, Aquatic Chemistry Jordan Peccia

A detailed examination of the principles governing chemical reactions in water. Emphasis is on developing the ability to predict the aqueous chemistry of natural and perturbed systems based on a knowledge of their biogeochemical setting. Focus is on inorganic chemistry, and topics include elementary thermodynamics, acid-base equilibria, alkalinity, speciation, solubility, mineral stability, redox chemistry, and surface complexation reactions. Illustrative examples are taken from the aquatic chemistry of estuaries, lakes, rivers, wetlands, soils, aquifers, and the atmosphere. A standard software package used to predict chemical equilibria may also be presented.

ENAS 642a, 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 648a, 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 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 second-year MEMS Ph.D. students. o Course cr

ENAS 703b, 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 Staff

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 Electron 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 748a, Applied Numerical Methods for Differential Equations Beth Anne Bennett

The derivation, analysis, and implementation of numerical methods for the solution of ordinary and partial differential equations, both linear and nonlinear. Additional topics such as computational cost, error estimation, and stability analysis are studied in several contexts throughout the course. ENAS 747 is not a prerequisite.

ENAS 755b, Electronic and Optical Properties of Energy Materials Diana Qiu

This course explores the electronic and optical properties of materials from the perspective of electronic and molecular structure with a special focus on the microscopic origin and design of properties of interest for energy harvesting, storage, and transport. The course begins by briefly introducing concepts in quantum mechanics, such as wave functions and the time-independent Schrödinger equations. Then, we explore electronic structure in the context of designing materials for energy harvesting and generation, such as photovoltaics, thermoelectrics, and piezoelectrics. We also study dynamical processes, such as hot electron relaxation, multi-exciton generation, charge transport, and energy transport at a phenomenological level. Finally, we overview common energy storage materials, with a focus on solid-state batteries and solar fuels.

ENAS 773a, Fundamentals of Robot Modeling and Control Ian Abraham

This course introduces fundamental concepts for modeling and controlling robotic systems. The course is divided into two components: Part 1 introduces mathematical tools for modeling and simulating complex robot dynamics, and Part 2 formulates various ways to control robots through comprehensive analysis of dynamics and a deep dive into control theory. Specific lecture topics cover an introduction to variational calculus, state representation, kinematics and dynamics, manipulator equations, contact

dynamics and collision detection, observability and controllability, control of fully actuated and underactuated robots, model-based methods for control, and control for manipulation and locomotion. The course focuses on connecting mathematical topics with concrete algorithmic implementation where the mid-term project assignment has students model the dynamics of a robot of their choosing. Coding assignments throughout the term provide experience setting up and interfacing with URDF's, automatic differentiation math libraries in python, and algorithmic implementation of state-of-the-art control methods. Students finish with a codebase and foundational knowledge for simulating and controlling general robotic systems. Special topic lectures focus on recent developments in the field of robotics and highlight core research areas. A final class project takes place instead of a final exam where students leverage the mid-term robot simulation to control the robot to perform a task of their choosing. Prerequisites: The course is designed for incoming graduate students (and advanced senior undergraduates). Experience with differential equations, linear algebra, PID control, and numerical methods for solving ordinary differential equations is required. Functional and object-oriented coding experience in e.g., python, C/C++ is also required.

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 788b, Thermodynamics, Kinetics, and Structure of Materials Jan Schroers

This advanced-level course focuses on the thermodynamic and kinetic aspects of materials and how they define structure and properties. We first discuss thermodynamics relevant to materials. This includes thermodynamic laws, auxiliary functions to develop convenient equations of state to describe equilibrium, Gibbs Free Energy (G), experimental determination of G , model calculations of G such as ideal solutions and regular solutions, using G curves to construct equilibrium conditions, phase diagram constructions, reading of phase diagrams. We then focus

on solidification which we develop from the phenomena of undercooling, nucleation and growth. Combining both allows us to predict microstructures formed during solidification far and close to equilibrium. We also discuss glass formation, the case when nucleation and growth can be suppressed, and the liquid freezes upon cooling into a glass.

ENAS 800a, Science and Technology of the Internet of Things Andrei Khurshudov

The Internet of Things refers to a global network of connected machines, devices, sensors, communication networks and protocols, and decision-making algorithms that enable a new wave of the industrial revolution. IoT is the foundation for a new world of connected and intelligent devices operating together to improve our lives. This course covers underlying technologies found in IoT devices and applications, major IoT applications and their practical implementations, the origin and types of IoT data and IoT Big Data Analytics, main technological and economic drivers, as well as inhibitors, of past, present, and future IoT trends and directions. It also discusses how the world's leading corporations adopt IoT. The course also addresses the following subjects: how startups work and what can make them successful, how corporations work and how to succeed in the corporate world, what skills can help you advance your corporate career, and many similar topics.

ENAS 820b / CPSC 520b, Computer Architecture Abhishek Bhattacharjee

This course offers a treatment of computer architectures for high-performance and power/energy-efficient computer systems. Topics include the foundations of general-purpose computing, including instruction set architectures, pipelines, superscalar and out-of-order execution, speculation, support for precise exceptions, and simultaneous multi-threading. We also cover domain-specific hardware (e.g., graphics processing units), and ongoing industry efforts to elevate them to the status of first-class computing units. In tandem, we cover topics relevant to both general-purpose and domain-specific computing, including memory hierarchies, address translation and virtual memory, on-chip networks, machine learning techniques for resource management, and coherence techniques. If time permits, we study the basics of emerging non-classical computing paradigms like neuromorphic computing. Overall, this course offers insights on how the computing industry is combating the waning of traditional technology scaling via acceleration and heterogeneity. Prerequisites: Courses similar to CPSC 323, 223, and 202. This is a programming-intensive course, so comfort with large programming projects is essential.

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 840a, Detection and Estimation Dionysis Kalogerias

Detection and Estimation refers to the development and study of statistical theory and methods in settings involving stochastic signals and, more generally, stochastic processes or stochastic data, where the goal is (optimal) testing of possibly multiple hypotheses regarding the generative model of the data, (optimal) signal estimation from potentially noisy measurements/observations, and parameter estimation whenever parametric signal/data models are available. Although these problems

often come up in the context of signal processing and communications, the concepts are fundamental to the basic statistical methodologies used broadly across science, medicine, and engineering. The course has been designed from a contemporary perspective, and includes new and cutting-edge topics such as risk-aware statistical estimation and intrinsic links with stochastic optimization and statistical learning.

ENAS 850a / APHY 548a / PHYS 548a, Solid State Physics I Yu He

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 Sohrab Ismail-Beigi

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 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 912a, Biomedical Image Processing and Analysis James Duncan and Lawrence Staib

This course is an introduction to biomedical image processing and analysis, covering image processing basics and techniques for image enhancement, feature extraction, compression, segmentation, registration, and motion analysis including traditional and machine-learning techniques. Students learn the fundamentals behind image processing and analysis methods and algorithms with an emphasis on biomedical applications.

ENAS 924b, Computer Hardware Security Jakub Szefer

This course provides an in-depth examination of computers and their hardware-based 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 co-design 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 963b, Network Algorithms and Stochastic Optimization Leandros Tassioulas

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 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 991a / MB&B 591a / MCDB 591a / PHYS 991a, Integrated Workshop Corey O'Hern

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 Madhusudhan Venkadesan

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; 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 (*on leave*)

Acting Chair

Marc Robinson

Directors of Graduate Studies

Catherine Nicholson [F]

Jonathan Kramnick [Sp] (106a LC, 203.432.2226)

Professors Jessica Brantley, Leslie Brisman, David Bromwich, Ardis Butterfield, Jill Campbell, Joe Cleary, Jacqueline Goldsby, Langdon Hammer, Margaret Homans, Cajetan Iheka, Jonathan Kramnick, Lawrence Manley, Stefanie Markovits, Feisal Mohamed, Stephanie Newell, Catherine Nicholson, John Durham Peters, David Quint, Marc Robinson, Caleb Smith, Katie Trumpener, Shane Vogel, Michael Warner, Ruth Bernard Yeazell

Associate Professors Marta Figlerowicz, Jill Richards, Emily Thornbury, R. John Williams

Assistant Professors Anastasia Eccles, Marcel Elias, Ben Glaser, Jonathan Howard, Elleza Kelley, Naomi Levine, Ernest Mitchell, Priyasha Mukhopadhyay, Joseph North, Sunny Xiang

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 990). 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.
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 990) and one course in each of four 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 six fields, including three 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 519b / MDVL 519b / MHHR 500b, Medieval Manuscripts and Literary Forms

Jessica Brantley

This course investigates the relation between manuscript studies and literary criticism. It includes an introduction to working with medieval manuscripts (no prior experience required) and continues with a series of case studies that examine what thinking about material texts can contribute to scholarship in medieval—or any—literature. Manuscripts to be considered include the *Beowulf* MS, the St Albans Psalter, the Ellesmere Chaucer, Cotton Nero A.x. (the *Gawain* MS), the *Book of Mergery Kempe*, and the manuscript of the N-Town plays.

ENGL 535a / CPLT 555a / MDVL 535a, Postcolonial Middle Ages Marcel Elias

This course explores the intersections and points of friction between postcolonial studies and medieval studies. We discuss key debates in postcolonialism and medievalists' contributions to those debates. We also consider postcolonial scholarship that has remained outside the purview of medieval studies. The overall aim is for students, in their written and oral contributions, to expand the parameters of medieval postcolonialism. Works by critics including Edward Said, Homi Bhabha, Leela Gandhi, Lisa Lowe, Robert Young, and Priyamvada Gopal are read alongside medieval romances, crusade and jihād poetry, travel literature, and chronicles.

ENGL 578b / EMST 563b, Poetry and Poetics, 1500–1645 Catherine Nicholson

Between 1500 and 1645, vernacular verse was reinvented—by poets, pedagogues, literary theorists, publishers, and readers—as a self-conscious and self-authorizing national literary tradition. This seminar explores the celebrated achievements, failed

experiments, forgotten controversies, and historical accidents that conspired to make rude rhyme newly legible (and audible) as English poetry.

ENGL 695a, The Bible as a Literature Leslie Brisman

Study of the Bible as a literature—a collection of works exhibiting a variety of attitudes toward the conflicting claims of tradition and originality, historicity and literariness.

ENGL 723a / CPLT 646a / EMST 546a / GMAN 646a, Rise of the European Novel

Rudiger Campe and Katie Trumpener

In the eighteenth century, the novel became a popular literary form in many parts of Europe. Yet now-standard narratives of its “rise” often offer a temporally and linguistically foreshortened view. This seminar examines key early modern novels in a range of European languages, centered on the dialogue between highly influential eighteenth-century British and French novels (Montesquieu, Defoe, Sterne, Diderot, Laclos, Edgeworth). We begin by considering a sixteenth-century Spanish picaresque life history (Lazarillo de Tormes) and Madame de Lafayette’s seventeenth-century secret history of French court intrigue; contemplate a key sentimental Goethe novella; and end with Romantic fiction (an Austen novel, a Kleist novella, Pushkin’s historical novel fragment). These works raise important issues about cultural identity and historical experience, the status of women (including as readers and writers), the nature of society, the vicissitudes of knowledge—and novelistic form. We also examine several major literary-historical accounts of the novel’s generic evolution, audiences, timing, and social function, and historiographical debates about the novel’s rise (contrasting English-language accounts stressing the novel’s putatively British genesis, and alternative accounts sketching a larger European perspective). The course gives special emphasis to the improvisatory, experimental character of early modern novels, as they work to reground fiction in the details and reality of contemporary life. Many epistolary, philosophical, sentimental, and Gothic novels present themselves as collections of “documents”—letters, diaries, travelogues, confessions—carefully assembled, impartially edited, and only incidentally conveying stories as well as information. The seminar explores these novels’ documentary ambitions; their attempt to touch, challenge, and change their readers; and their paradoxical influence on “realist” conventions (from the emergence of omniscient, impersonal narrators to techniques for describing time and place).

ENGL 778b, Sentimentalism and its Critics Anastasia Eccles

This course explores the long history and enduring force of sentimentalism as a cultural mode, with a particular focus on its complex relationship with its critics. Perhaps the paradigmatic object of aesthetic derision, sentimentalism also has a peculiar tendency to anticipate and feed off its own critique and disavowal. Tracking the entangled careers of sentimentalism and anti-sentimentalism from the “*Pamela* media event” to recent scholarly debates over the cultural work of sentimentality, we consider its function as a limit case for theories of the aesthetic and as a charged site for thinking about the politics of culture. In the process, we reckon with both the historical specificity of sentimentalism—its distinct trajectories in British, European, and American contexts—and its striking mobility and persistence as a cultural code. How does sentimentalism challenge the period and geographical boundaries that we typically use to organize our objects of study? What opportunities does it present for criticism now? Texts may include works by Jane Austen, Claire de Duras, Olaudah Equiano, Johann Wolfgang von Goethe, Henry Mackenzie, Samuel Richardson, Charlotte Smith, Laurence Sterne,

Harriet Beecher Stowe, and Mary Wollstonecraft; and critical writings by Lauren Berlant, Julie Ellison, Saadiya Hartman, Claudia Johnson, and Eve Sedgwick, among others.

ENGL 804b / CPLT 802b / EALL 804b, Transpacific Performance in the Cold War

Rosa van Hensbergen

During the Cold War, interdisciplinary artists were crisscrossing the Pacific between Japan and the US, presenting their works in exhibitions, participating in performance festivals, and engaging in experimental collaborations. These crossings and crossovers took place with varying degrees of state involvement as the US government worked to promote its version of American culture abroad. In this course, we discover a series of transpacific performances and events against the backdrop of Cold War cultural politics, from collaborations between Japanese modern dancers and American jazz musicians in the early 60s to immersive works of Japanese video art presented in New York in the 90s. The rare archival and print materials that form an essential component of this course are made available in English. Japanese and other relevant language specialisms are welcome though not required, as are comparative and creative approaches. An aim of this course is to work closely together to produce a publishable or performable piece of work—critical or creative—related to your future research and career ambitions. For those wishing to work with Japanese-language materials, please contact the instructor directly to organize additional Japanese-language workshops.

ENGL 830b / HSAR 678b, Portraiture and Character from Hogarth to Woolf

Ruth Yeazell

Case studies in the visual and verbal representation of persons in Anglo-American painting and fiction, with particular attention to novels that themselves include portraits or address relations between the two media. Novelists tentatively include Henry Fielding, Jane Austen, Henry James, Edith Wharton, Oscar Wilde, and Virginia Woolf. Painters include William Hogarth, Joshua Reynolds, Thomas Lawrence, James McNeill Whistler, John Singer Sargent, and Vanessa Bell. Selected readings in recent theories of fictional character and in the history and theory of portraiture. Whenever possible, we draw on paintings in Yale's collections.

ENGL 886b / AMST 704b / WGSS 704b, War and Everyday Life

Sunny Xiang

This course thinks together two spatiotemporal phenomena that appear opposed: war and everyday life. Why is war generally thought of as an exceptional phenomenon, a climactic event that disrupts the quotidian rhythms of the everyday? And why does everyday life so often appear parceled off from war, a placid domestic realm that soldiers depart from and return to? The study of war is often a masculine, muscular endeavor. This course's turn to the methodologies that are guided by feminist, anti-imperialist, and anti-racist critique allows us to better contemplate how militaristic logics shape everyday life and how anti-militarism might be lived at the level of daily practices. This notion of everyday militarisms is both the impetus and the frame for our engagement of the special collections at Yale Library. As an impetus, lived experience of militarism requires us to account for our specific institutional location. What has Yale's role been in war-making and empire-building? How might we analyze our own experiences at Yale and in the historical present with these flashpoints in mind? An attunement to the more quotidian aspects of militarisms also provides an alternate frame for rethinking wartime events that may at the outset seem extraordinary or exceptional. What might it mean to understand nuclear bombs, forced migrations, and

environmental disasters as ordinary crises? What do people's day-to-day experience of such crises look like? To approach such questions from different angles and at different scales, we need to consult primary source materials in tandem with an array of interdisciplinary scholarship. Considered together, these course materials help us contemplate why everyday wars tend to go undetected—whether because of new kinds of weapons, war crimes that pass as governance, the time lag of slow violence, or the representational norms of popular culture. Of course, the militarization of daily life looks different depending on one's geographical, historical, social, and disciplinary orientation. So, even though the course tries to assemble a range of materials and examples, it reflects the instructor's orientation as an Americanist scholar of twentieth-century transpacific culture and politics. But the assessment of everydayness is a matter of perception and perspective in a more general sense as well. How does militarism hide in plain sight, and for whom is it hidden? Throughout the term, the power relations embedded in discerning and analyzing everyday militarisms require us to bring an added layer of critical self-reflection to all our research endeavors.

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 899b, American Politics, the Law, and the Culture of Self-Government

Anthony Kronman and David Bromwich

This seminar examines arguments about the value and limits of democracy through an intensive study of four historical crises: the constitutional founding; the Civil War and Reconstruction; the long progressive era; the Cold War and mid-century civil rights movement. Readings include major works by Madison, Lincoln, Whitman, Douglass,

Du Bois, Bourne, James, and Dewey, as well as contemporary reporting, orthodox and revisionist history, and detailed analysis of some major Supreme Court decisions.

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

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 twenty-first 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 908b / WGSS 908b, Queer and Trans Archives Juno Richards

This course offers an introduction to archival theory and methods, with a particular emphasis on the archival turn in queer and trans studies now. Most broadly, we survey major currents in the theorization of the archive, moving through the material afterlives of slavery and colonialism to draw out questions of recovery, reparation, erasure, ephemerality, bureaucracy, and over-abundance. More specifically, the arc of the course branches into three major currents. The first highlights queer and trans authors whose collections are housed in the Beinecke Library, including Richard Bruce Nugent, Langston Hughes, Gertrude Stein, and James Baldwin. The second current turns to queer and trans archives that have been digitized, including a wide range of periodicals, photographs, scrapbooks, and newsletters now available online. Finally, a third current tracks fictional and cinematic works that reimagine or incorporate the archive as an object of knowledge, including Isaac Julien's *Looking for Langston* (1989) and Shola von Reinhold's *Lote* (2020).

ENGL 909a, Literary Criticism Now Jonathan Kramnick

This course examines and takes the temperature of the current state of literary studies. It asks, what is at stake in the practice of literary criticism today and what shapes

does contemporary criticism take? We look at some recent attempts at synthesis and polemical intervention. We then organize our discussion around treatments of reading, form, medium, experimental criticism, and public criticism.

ENGL 920a / CPLT 917a / FILM 601a, Foundations of Film and Media John MacKay

The course sets in place some undergirding for students who want to anchor their film interest to the professional discourse of this field. A coordinated set of topics in film theory is interrupted first by the often discordant voice of history and second by the obtuseness of the films examined each week. Films themselves take the lead in our discussions.

ENGL 924b / CPLT 568, Contemporary Marxist and Postcolonial Cultural Theory, 1989–Present Joe Cleary

An introduction to a selection of key late-twentieth and twenty-first century Marxist and left postcolonial theorists and texts focusing on historical and intellectual exchanges between these critical formations. After the collapse of Soviet Communism in 1989, Marxism and Marxist theory seemed to many to have lost social relevance. Similarly, new debates on “world literature” were taken by some to mark the waning of an earlier more politicized “postcolonial studies.” However, as the Western triumphalism of the post-1989 years receded in the face of multiple international challenges – notably, climate catastrophe, the 2008 financial crisis, increasingly wealth inequality and oligarchic rule, challenges to American unilateralism – Marxist and postcolonial cultural theory have not simply persisted but enjoyed wide new readerships. Focusing on questions of literature and culture in these contexts, this seminar tracks some key debates and influential lines of scholarly development in these fields in the conjuncture between 1989 and the present. Writers discussed may include Perry Anderson, Fredric Jameson, Slavov Žižek, Immanuel Wallerstein, Giovanni Arrighi, Edward Said, Franco Moretti, Pascale Casanova, Katerina Clark, Monica Popescu, Sarah Brouillette, Sianne Ngai, Hal Foster, Peter and Christina Bürger, Jasper Bernes, Peter Osborne, Julian Stallabrass, Rob Nixon, and others.

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 947b / AFAM 947b, Black Existentialisms Shane Vogel

This course is an introduction to Black existential thought as it developed in the writing of African American and Afro-Caribbean authors. Existentialism was a historical movement in philosophy and culture typically associated with mid-twentieth-century European intellectuals that asked how individuals constitute themselves within and beyond the given constraints of and possibilities of their situation. But a deep tradition of Black existentialism—or what Lewis R. Gordon calls Africana philosophies of existence—is related to but distinct from the European tradition. Throughout the course we explore key existential concepts such as freedom, authenticity, responsibility, action, struggle, situation, anguish, dread, the gaze, and the Other as they have been imagined in Black diasporic expressive cultures. Some of the questions we ask include: How have Black writers developed existential ideas in novels, poetry, and drama? How does the encounter between European and Africana existentialisms animate the literature of Black freedom struggles in the US and across the colonial and postcolonial world? How does Black existentialism understand the (im)possibility of self-making within a society structured by dominance, and what might an existentialist understanding of Black collectivity look like? How can Black existential thought provide productive opportunities to reevaluate some of the seeming binaries that have shaped conversations in Black studies (in the mid-twentieth century and again today) such as hope/despair, being/nonbeing, humanism/antihumanism, and social life/social death? Why Black existentialism, and why now? Readings include work by Frantz Fanon, Richard Wright, Lorraine Hansberry, Ann Petry, William Melvin Kelley, George Lamming, Jackie Sibbles Drury, Ralph Ellison, Lewis R. Gordon, Jean-Paul Sartre, Albert Camus, Simone de Beauvoir, and others. This is an introductory level seminar, and no previous knowledge of the course content is required.

ENGL 957a / AFAM 860a, 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).

ENGL 961a, Transformations of the Confession: Secularism, Slavery, Sexuality
Caleb Smith

The confession is a paradoxical speech act. Confessors are supposed to reveal the inmost secrets of themselves, but at the same time they are known to be performing, according to an established script, for an audience endowed with the capacity to judge and punish them. This seminar takes up the genre of the public confession. We sketch its genealogy from ancient religious styles of truth-telling (*The Confessions of St. Augustine*) to modern forms of evidence in criminal justice (*The Confessions of Nat Turner*) while giving special attention to its literary adaptations (*The Confessions of an English Opium-Eater*). We then explore the transformation of the confession during the nineteenth century under the pressures of secularization, the slavery crisis, and the emerging science of sexuality. Readings may include works by Augustine, Rousseau, De Quincey, Hogg,

Poe, Jacobs, Douglass, Plath, Lorde, and Nabokov. Critical and theoretical sources include Nietzsche, Freud, Foucault, Butler, Brooks, Hartman, and Felski. We pursue some of the themes introduced during the annual conference of the English Institute at Yale in 2018, on the theme of “truth-telling.”

ENGL 990b, The Teaching of English Benjamin Glaser and Heather Klemann

An introduction to the teaching of literature and of writing with attention to the history of the profession and to current issues in higher education such as the corporatization of the university, the role of the state in higher education, and the precarity of the humanities at the present time. Weekly seminars address a series of issues about teaching: guiding classroom discussion; introducing students to various literary genres; addressing race, class, and gender in the teaching of literature; formulating aims and assignments; grading and commenting on written work; lecturing and serving as a teaching assistant; preparing syllabuses and lesson plans.

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 Anastasia Eccles

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 or b, 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 998a and ENGL 999b, Dissertation Workshop Joseph North

This workshop gathers biweekly, throughout the academic year, to workshop chapters, articles, and prospectuses. It is intended to foster conversations among advanced graduate students across diverse historical and geographic fields. Permission of the instructor is required.

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, Graeme Berlyn, 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, 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 & 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. Aside from this requirement, there is no required curriculum of credit courses and no formal language requirement. Courses of study are individually designated through consultation between degree candidates and their advisers and dissertation committees. The amount of course work 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 (10 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.

European and Russian Studies

The MacMillan Center

242 Luce Hall, 203.432.3107

<http://europeanstudies.macmillan.yale.edu>

M.A.

Chair

Edyta Bojanowska (*Slavic Languages and Literatures*)

Director of Graduate Studies

Marci Shore (marci.shore@yale.edu, 203.432.6792)

Professors Bruce Ackerman (*Law*), Julia Adams (*Sociology*), Lauren Benton (*History; Law*), Dirk Bergemann (*Economics; Computer Science*), R. Howard Bloch (*French*), Edyta Bojanowska (*Slavic Languages and Literatures*), David Bromwich (*English*), Paul Bushkovitch (*History*), Francesco Casetti (*Humanities; Film and Media Studies*), Katerina Clark (*Comparative Literature; Slavic Languages and Literatures*), Carolyn Dean (*History; French*), Carlos Eire (*History; Religious Studies*), Paul Franks (*Philosophy; Judaic Studies; Religious Studies*), Paul Freedman (*History*), Bryan Garsten (*Political Science; Humanities*), John Geanakoplos (*Economics*), Harvey Goldblatt (*Slavic Languages and Literatures*), Bruce Gordon (*Divinity; History*), Philip Gorski (*Sociology*), Timothy Guinnane (*Economics*), Alice Kaplan (*French*), Paul Kennedy (*History*), John MacKay (*Slavic Languages and Literatures; Film and Media Studies*), Lawrence Manley (*English*), Ivan Marcus (*History; Religious Studies*), Millicent Marcus (*Italian Studies*), Isabela Mares (*Political Science*), Stefanie Markovits (*English*), John Merriman (*History*), Alan Mikhail (*History*), Samuel Moyn (*Law; History*), William Nordhaus (*Economics; School of the Environment*), Paul North (*German*), Mark Peterson (*History*), David Quint (*English; Comparative Literature*), 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*), Paola Bertucci (*History*), Molly Brunson (*Slavic Languages and Literatures*), Marcela Echeverri (*History*), Emily Erikson (*Sociology*), Isaac Nakhimovsky (*History; Humanities*), Ayesha Ramachandran (*Comparative Literature*), William Rankin (*History*), Marci Shore (*History*)

Assistant Professors Sergei Antonov (*History*), Marijeta Bozovic (*Slavic Languages and Literatures; Film and Media Studies; Women's, Gender, and Sexuality Studies*), Jinyi Chu (*Slavic Languages and Literatures*), Marcel Elias (*English*), José-Antonio Espín-Sánchez (*Economics*), Cormac O'Dea (*Economics*), Samuel Hodgkin (*Comparative Literature*), Giulia Oskian (*Political Science*), Carolyn Roberts (*African American Studies; History; History of Science and Medicine*)

Lecturers Paris Aslanidis (*Hellenic Studies; 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*), Ruth Koizim (*French*), Constantine Muravnik (*Slavic Languages and Literatures*), Julia Titus (*Slavic Languages and Literatures*), Karen von Kunes (*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 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 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 and Eastern Europe, or Western and Central Europe, as an area of primary concentration. For students focusing on Russia and East Europe, 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 and Eastern Europe. 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 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 and Eastern Europe will need to demonstrate knowledge of Russian or an East European 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 undergraduate-level 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 language proficiency degree requirement may study a non-European 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 Management, 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 joint-degree program. Refer to <http://macmillan.yale.edu/academic->

programs/joint-degree-programs and contact the European Studies DGS 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 early 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 618a / RUSS 670a, *Empire in Russian Culture* Edyta Bojanowska

Interdisciplinary exploration of Russia's modern imperial culture, especially of the nineteenth century. How did this culture reflect, shape, and challenge imperial reality? How did the multiethnic and multiconfessional empire figure in negotiations of Russian national identity? Other topics include versions of Russian and Soviet Orientalism and colonialism, representations of peripheral regions, relations between ethnic groups, and the role of gender and race in Russia's imperial imagination. Materials combine fiction, poetry, travel writing, painting, and film, with readings in postcolonial studies, history, political science, and anthropology. Most readings are assigned in translation, although students with a knowledge of Russian are encouraged to read the primary texts in the original; the language of seminar discussions will be English. Students with an interest in comparative studies of empire are welcome.

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

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 940a or b, *Independent Study* Staff

By arrangement with faculty.

E&RS 950b, Master's Thesis Staff

By arrangement with faculty.

Experimental Pathology

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*), David Rimm, David Stern, Yajaira Suarez (*Comparative Medicine*), Qin Yan

Associate Professors Demetrios Braddock, Hyung Chun (*Internal Medicine*), Karin Finberg, Joanna Gibson, Stephanie Halene (*Hematology*), Anita Huttner, Ryan Jensen (*Therapeutic Radiology*), Samuel Katz, Peggy Myung (*Dermatology*), Don Nguyen, Manoj Pillai (*Hematology*), Katerina Politi, Kurt Schalper, Yibing Qyang (*Internal Medicine*),

Assistant Professors Arnaud Augert, Mathieu Bakhoun (*Ophthalmology and Visual Sciences*), William Damsky (*Dermatology*), Salil Garg (*Lab Medicine*), Pallavi Gopal, Brian Hafler (*Neurology*), Albert Higgins-Chen (*Psychiatry*), Won Jae Huh, Jeffrey Ishizuka (*Medical Oncology*), Sathish Ramakrishnan, Silvia Vilarinho (*Internal Medicine*), Dean Yimlamai (*Pediatrics*)

FIELDS OF STUDY

Fields include molecular and cellular basis of diseases, 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 Experimental Pathology 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 are also required to complete three laboratory rotations. In their first year, 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 1 & 2 unless special circumstance and approved by the Director of Graduate Studies.

Qualifying examination The qualifying examination of the Experimental Pathology 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 on the Pathology Graduate student website, <https://medicine.yale.edu/pathology/training/graduateprogram>.

COURSES

PATH 620a and PATH 622b, Laboratory Rotations in Experimental Pathology

Themis Kyriakides

Laboratory rotations for first-year graduate students.

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

Rui Chang

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 Experimental Pathology. 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 660b / C&MP 650b / PHAR 580b / PTB 650, The Responsible Conduct of Research Barbara Ehrlich

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, Seminar in Molecular Medicine, Pharmacology, and Physiology Susumu Tomita, Titus Boggon, Don Nguyen, and Christopher Bunick

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 Ryan Jensen

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 682b, Cancer Clinical Translation Samuel Katz

This course builds on basic cancer biology knowledge to study the impact of scientific knowledge on real-world clinical oncology issues through didactic sessions, working tumor board attendance, and workshop discussions. The first half of the course emphasizes practical issues in moving research ideas into the clinic, design and execution of standard and novel forms of clinical trials, and statistical analysis of clinical trial data. The second half covers the perspectives of clinicians on the most important outstanding biological questions that should be addressed by cancer investigators. Enrollment limited, with priority given to Cancer Biology Training Program trainees. Advanced undergraduates or graduate students may be admitted with permission of the organizers. Prerequisite: PATH 681.

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.

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 Francesco Casetti, Katerina Clark, Aaron Gerow, Brian Kane, John MacKay, Millicent Marcus, Charles Musser, Fatima Naqvi, John Durham Peters, Katie Trumpener, Jing Tsu, Laura Wexler

Associate Professors Marta Figlerowicz, R. John Williams

Assistant Professor Marijeta Bozovic

Professor in the Practice Thomas Allen Harris

Senior Lecturer Camille Thomasson

Lecturers Oksana Chefranova, Brian Meacham

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.

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 a 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, one of which should be FILM 603. With the permission of the DGS, another Film and Media Studies course may be substituted for FILM 603. 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: 12 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:

1. **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.
2. **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.
3. **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 601a / CPLT 917a / ENGL 920a, Foundations of Film and Media John MacKay

The course sets in place some undergirding for students who want to anchor their film interest to the professional discourse of this field. A coordinated set of topics in film theory is interrupted first by the often discordant voice of history and second by the obtuseness of the films examined each week. Films themselves take the lead in our discussions.

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. ½ Course cr per term

FILM 614b, 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 (Arnheim, Kracauer), Middle-Europe (Báñez, 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 617a / CPLT 904a / FREN 875a / GMAN 617a / SPAN 901a, Psychoanalysis:

Key Conceptual Differences between Freud and Lacan I Moira Fradinger

This is the first section of a year-long seminar (second section: CPLT 914) designed to introduce the discipline of psychoanalysis through primary sources, mainly from the Freudian and Lacanian corpuses but including late twentieth-century commentators and contemporary interdisciplinary conversations. We rigorously examine key psychoanalytic concepts that students have heard about but never had the chance to study. Students gain proficiency in what has been called “the language of psychoanalysis,” as well as tools for critical practice in disciplines such as literary criticism, political theory, film studies, gender studies, theory of ideology, psychology medical humanities, etc. We study concepts such as the unconscious, identification,

the drive, repetition, the imaginary, fantasy, the symbolic, the real, and *jouissance*. A central goal of the seminar is to disambiguate Freud's corpus from Lacan's reinvention of it. We do not come to the "rescue" of Freud. We revisit essays that are relevant for contemporary conversations within the international psychoanalytic community. We include only a handful of materials from the Anglophone schools of psychoanalysis developed in England and the US. This section pays special attention to Freud's "three" (the ego, superego, and id) in comparison to Lacan's "three" (the imaginary, the symbolic, and the real). CPLT 914 devotes, depending on the interests expressed by the group, the last six weeks to special psychoanalytic topics such as sexualization, perversion, psychosis, anti-asylum movements, conversations between psychoanalysis and neurosciences and artificial intelligence, the current pharmacological model of mental health, and/or to specific uses of psychoanalysis in disciplines such as film theory, political philosophy, and the critique of ideology. Apart from Freud and Lacan, we will read work by Georges Canguilhem, Roman Jakobson, Victor Tausk, Émile Benveniste, Valentin Volosinov, Guy Le Gaufey, Jean Laplanche, Étienne Balibar, Roberto Esposito, Wilfred Bion, Félix Guattari, Markos Zafiroopoulos, Franco Bifo Berardi, Barbara Cassin, Renata Salecl, Maurice Godelier, Alenka Zupančič, Juliet Mitchell, Jacqueline Rose, Norbert Wiener, Alan Turing, Eric Kandel, and Lera Boroditsky among others. No previous knowledge of psychoanalysis is needed. Starting out from basic questions, we study how psychoanalysis, arguably, changed the way we think of human subjectivity. Graduate students from all departments and schools on campus are welcome. The final assignment is due by the end of the spring term and need not necessarily take the form of a twenty-page paper. Taught in English. Materials can be provided to cover the linguistic range of the group.

FILM 651b / CPLT 929b / ENGL 929, Film and Fiction in Interaction Dudley

Andrew

Beyond adaptations of complex fiction (Henry James, James Joyce) literature may underlie "original" film masterpieces (*Rules of the Game*, *Voyage to Italy*). What about the reverse? Famous novelists moonlighted in the film world (Scott Fitzgerald, Graham Greene). Others developed styles in contact with cinema (Marguerite Duras, Eileen Chang, Kazuo Ishiguro). Today are these art forms evolving in parallel and in parity under new cultural conditions?

FILM 735a and FILM 736b / AMST 832a and AMST 833b, 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 761a / GMAN 595a, German Film from 1945 to the Present Fatima Naqvi

We look at a variety of German-language feature films from 1945 to the present in order to focus on issues of trauma, guilt, remembrance (and its counterpart: amnesia), gender, Heimat or "homeland," national and transnational self-fashioning, terrorism, and ethics. How do the Second World War and its legacy inflect these films? What sociopolitical and economic factors influence the individual and collective identities that these films articulate? How do the predominant concerns shift with the passage of time and with changing media? How is the category of nation constructed and contested within the narratives themselves? Close attention is paid to the aesthetic issues and the

concept of authorship. Films by Staudte, Wolf, Kluge, Radax, Wenders, Fassbinder, Schroeter, Farocki, Haneke, Petzold, Schanelec, Seidl, Hausner, and Geyrhalter, among others. This class has an optional German section (fifty minutes a week) for students interested in counting this class for the Advanced Language Certificate. A minimum of three students is required for the section to run.

FILM 783a / AMST 783a, The Historical Documentary Charles Musser

This course looks at the historical documentary as a method for carrying out historical work in the public humanities. It investigates the evolving discourse and resonances within such topics as the Vietnam War, the Holocaust, and African American history. It is concerned with the relationship of documentary to traditional scholarly written histories as well as the history of the genre and what is often called the “archival turn.”

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 861a / CPLT 632a, Literature and Film of World War II: Homefront Narratives

Katie Trumpener

Taking a pan-European perspective, this course examines quotidian, civilian experiences of war, during a conflict of unusual scope and duration. Considering key works of wartime and postwar fiction and film alongside verbal and visual diaries, memoirs, documentaries, and video testimonies, we will explore the kinds of literary and filmic reflection war occasioned, how civilians experienced the relationship between history and everyday life (both during and after the war), women’s and children’s experience of war, and the ways that home front, occupation and Holocaust memories shaped postwar avant-garde aesthetics.

FILM 871a / EALL 805a, Readings in Japanese Film Theory Aaron Gerow

Theorizations of film and culture in Japan from the 1910s to the present. Through readings in the works of a variety of authors, the course explores both the articulations of cinema in Japanese intellectual discourse and how this embodies the shifting position of film in Japanese popular cultural history.

FILM 873b / EALL 581b, Japanese Cinema and Its Others Aaron Gerow

Critical inquiry into the myth of a homogeneous Japan through analysis of how Japanese film and media historically represent “others” of different races, ethnicities, nationalities, genders, and sexualities, including women, black residents, ethnic Koreans, Okinawans, Ainu, undocumented immigrants, LGBTQ minorities, the disabled, youth, and monstrous others such as ghosts.

FILM 900a or b, Directed Reading Staff

FILM 901a or b, Individual Research Staff

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

(1) 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. (2) 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 is thus four. (Core faculty are faculty appointed in French, as opposed to affiliated faculty.) (3) 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. (4) 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 language-teaching 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 610a / MDVL 615a, Old French R Howard Bloch

An introduction to the Old French language, medieval book culture, and the prose romance via study of manuscript Yale Beinecke 229, *The Death of King Arthur*, along with a book of grammar and an Old French dictionary. Primary and secondary materials are available on DVD. Work consists of a weekly in-class translation and a final exam comprised of a sight translation passage, a familiar passage from Yale 229, and a take-home essay. No previous study of Old French necessary, although a knowledge of French is essential. Conducted in English.

FREN 670b / ITAL 570b, Methods and Techniques in the Italian and French Language Classroom Anna Iacovella

This course creates a substantial apprenticeship program for second-year graduate students. Rising teaching fellows are exposed to a variety of methodologies and perspectives historically and currently applied in teaching Italian and French with reference to global education. In order to maximize all learning opportunities, students analyze and discuss several methods without dismissing or favoring some over others. The intent is to encourage students to develop their own teaching styles, drawn from a number of important approaches to language pedagogy. At the same time, far from focusing only on methodologies and practices, the course strives to integrate other aspects of language education as well, and students have the chance both to observe classes and to develop and teach several classes of their own during the term.

FREN 700a / HIST 654a, Readings in Modern European Cultural History Carolyn Dean

This course covers readings in European cultural history from 1789 to the present, with a focus on Western Europe.

FREN 836b, Laziness at Work and the Work of Laziness in the Sixteenth and Seventeenth Centuries Dominique Brancher

To each era, its indolence. In its contemporary meaning, “paresse” or laziness tends to be evoked in relation to work and is inseparable from the question of productivity (consider recent debates regarding “burnout”). The purpose of this seminar is to bring to light more complex issues related to laziness by returning to the origins of “paresse” as it is represented in France in the texts and iconography of the Early Modern period. Our goal is to recover the spiritual, ethical, and medical repercussions of laziness, as well as its philosophical, cultural, and more specifically literary implications. Was it simply conceived in opposition to work, or did it propose a more protean category for thinking about the relationship to time and space? We consider the mechanisms of subjection of the idle body (“corps libertin,” “corps mondain”), as well as its modalities of “resistance,” a notion that will prove to be somewhat different to that propounded by Foucault. Primary texts include Erasmus's *Adagia*, a humanist reappropriation of ancient traditions, to representations of the supposed laziness of so-called “exotic” peoples in travel literature, “epic” laziness in Ronsard's unfinished *La Franciade*, libertine laziness in *L'Isle des hermpahrodites*, lazy gallantry in Madeleine de Scudéry's “De la Paresse,” and, of course, Montaigne's “nonchalance.” Readings and discussions in French. Prerequisites: ability to read, speak, and write in French.

FREN 841a, Plant, Animal, Man: The Necessary “Art of Conference” Dominique Brancher

This seminar examines the relationships between three terms: man, animal, and plant. Cultural history has long privileged the man-animal dyad. We try to understand how in early modern Europe discursive representations, sensitive to the dynamic interactions between these three communities, have built a shared history. We are brought back to the etymology of the term “ecology”: these three areas of life interact in the same medium, *oikos*, that can be physical as well as textual. Our investigation thus attempts to sketch an archaeology of Western thought on life, the challenge being to reconstitute a forgotten model of reflection on the community between humanity and other forms of life. Readings in a multidisciplinary corpus that includes medical, legal, and theological productions; agronomic and hunting literature; herbaria; natural history books (Belon, Rondelet, Aldrovandi); travel accounts (Jean de Léry, Thevet); poetry (Ronsard, Baïf, Madeleine and Catherine des Roches); fiction (Alberti, Rostand, Sorel); autobiographical texts (Montaigne, Agrippa d'Aubigné); treatises (Du Bellay, Henri Estienne). Conducted in French.

FREN 875a / CPLT 904a / FILM 617a / GMAN 617a / SPAN 901a, Psychoanalysis:

Key Conceptual Differences between Freud and Lacan I Moira Fradinger

This is the first section of a year-long seminar (second section: CPLT 914) designed to introduce the discipline of psychoanalysis through primary sources, mainly from the Freudian and Lacanian corpuses but including late twentieth-century commentators and contemporary interdisciplinary conversations. We rigorously examine key psychoanalytic concepts that students have heard about but never had the chance to study. Students gain proficiency in what has been called “the language of psychoanalysis,” as well as tools for critical practice in disciplines such as literary criticism, political theory, film studies, gender studies, theory of ideology, psychology, medical humanities, etc. We study concepts such as the unconscious, identification, the drive, repetition, the imaginary, fantasy, the symbolic, the real, and jouissance. A

central goal of the seminar is to disambiguate Freud's corpus from Lacan's reinvention of it. We do not come to the “rescue” of Freud. We revisit essays that are relevant for contemporary conversations within the international psychoanalytic community. We include only a handful of materials from the Anglophone schools of psychoanalysis developed in England and the US. This section pays special attention to Freud's “three” (the ego, superego, and id) in comparison to Lacan's “three” (the imaginary, the symbolic, and the real). CPLT 914 devotes, depending on the interests expressed by the group, the last six weeks to special psychoanalytic topics such as sexualization, perversion, psychosis, anti-asylum movements, conversations between psychoanalysis and neurosciences and artificial intelligence, the current pharmacological model of mental health, and/or to specific uses of psychoanalysis in disciplines such as film theory, political philosophy, and the critique of ideology. Apart from Freud and Lacan, we will read work by Georges Canguilhem, Roman Jakobson, Victor Tausk, Émile Benveniste, Valentin Volosinov, Guy Le Gaufey, Jean Laplanche, Étienne Balibar, Roberto Esposito, Wilfred Bion, Félix Guattari, Markos Zafiroopoulos, Franco Bifo Berardi, Barbara Cassin, Renata Salecl, Maurice Godelier, Alenka Zupančič, Juliet Mitchell, Jacqueline Rose, Norbert Wiener, Alan Turing, Eric Kandel, and Lera Boroditsky among others. No previous knowledge of psychoanalysis is needed. Starting out from basic questions, we study how psychoanalysis, arguably, changed the way we think of human subjectivity. Graduate students from all departments and schools on campus are welcome. The final assignment is due by the end of the spring term and need not necessarily take the form of a twenty-page paper. Taught in English. Materials can be provided to cover the linguistic range of the group.

FREN 880a, Le poème en prose Thomas Connolly

This seminar looks at the development of the *poème en prose*, from its beginnings as a response to the inadequacy of French verse forms, which were said to lend themselves poorly to the translation of ancient epic, to its emergence as an independent genre. What constitutes a prose poem, and why do we need to distinguish it from prose, poetry, and even poetic prose? Readings include work by Fénelon, Parny, Baudelaire, Bertrand, Rimbaud, Laforgue, Nerval, Mallarmé, Jacob, Michaux, Ponge, and Char, as well as Hölderlin, Poe, and Rilke.

FREN 893b / CPLT 899b, Realism and Naturalism Maurice Samuels

This seminar interrogates the nineteenth-century French Realist and Naturalist novel in light of various efforts to define its practice. How does critical theory constitute Realism as a category? How does Realism articulate the aims of theory? And how do nineteenth-century Realist and Naturalist novels intersect with other discourses besides the literary? In addition to several works by Balzac, novels to be studied include Stendhal's *Le Rouge et le Noir*, Sand's *Indiana*, Flaubert's *Madame Bovary*, and Zola's *Nana*. Some attention also paid to Realist painting. Reading knowledge of French required.

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 945a / CPLIT 606a / SPAN 845a, Introduction to Digital Humanities I:**Architectures of Knowledge** Alexander Gil Fuentes

The cultural record of humanity is undergoing a massive and epochal transformation into shared analog and digital realities. While we are vaguely familiar with the history and realities of the analog record – libraries, archives, historical artifacts – the digital cultural record remains largely unexamined and relatively mysterious to humanities scholars. In this course students are introduced to the broad field of digital humanities, theory and practice, through a stepwise exploration of the new architectures and genres of scholarly and humanistic production and reproduction in the twenty-first century. The course combines a seminar, preceded by a brief lecture, and a digital studio. Every week we move through our discussions in tandem with hands-on exercises that serve to illuminate our readings and help students gain a measure of computational proficiency useful in humanities scholarship. Students learn about the basics of plain text, file and operating systems, data structures and internet infrastructure. Students also learn to understand, produce, and evaluate a few popular genres of digital humanities, including, digital editions of literary or historical texts, collections and exhibits of primary sources and interactive maps. Finally, and perhaps the most important lesson of the term, students learn to collaborate with each other on a common research project. No prior experience is required.

FREN 958a / WGSS 783a, Social Mobility and Migration Morgane Cadieu

The seminar examines the representation of upward mobility, social demotion, and interclass encounters in contemporary French literature and cinema, with an emphasis on the interaction between social class and literary style. Topics include emancipation and determinism; inequality, precarity, and class struggle; social mobility and migration; the intersectionality of class, race, gender, and sexuality; labor and the workplace; homecomings; mixed couples; and adoption. Works by Nobel Prize winner Annie Ernaux and her peers (Éribon, Gay, Harchi, Linhart, Louis, NDiaye, Taïa). Films by Cantet, Chou, and Diop. Theoretical excerpts by Berlant, Bourdieu, and Rancière. Students have the option to put the French corpus in dialogue with the literature of other countries. Conducted in French.

FREN 970a or b, Directed Reading Jill Jarvis

By arrangement with faculty.

FREN 971a or b, Independent Research Jill Jarvis

Genetics

Sterling Hall of Medicine I313, 203.785.5846

<http://medicine.yale.edu/genetics>

M.S., M.Phil., Ph.D.

Chair

Antonio Giraldez

Directors of Graduate Studies

James Noonan

Zhaoxia Sun

Professors Allen Bale, Susan Baserga (*Molecular Biophysics and Biochemistry*), W. Roy Breg, Jr. (*Emeritus*), Kristen Brennand (*Psychiatry*), Martina Brueckner (*Pediatrics/ Cardiology*), Keith Choate (*Dermatology*), Lynn Cooley, Chris Cotsapas (*Neurology*), Daniel DiMaio, Casey Dunn (*Ecology and Evolutionary Biology*), Patrick Gallagher (*Pediatrics*), Joel Gelernter (*Psychiatry; Neuroscience*), Antonio Giraldez, Peter Glazer (*Therapeutic Radiology*), Valentina Greco, Jeffrey Gruen (*Pediatrics*), Murat Gunel (*Neurosurgery*), Ira Hall, Arthur Horwich, Yong-Hui Jiang, Mustafa Khokha (*Pediatrics*), Kenneth Kidd (*Emeritus*), Haifan Lin (*Cell Biology*), Maurice Mahoney (*Emeritus*), Shrikant Mane, Arya Mani (*Internal Medicine*), Michael Murray, Michael Nitabach (*Cellular and Molecular Physiology*), James Noonan, Valerie Reinke, Margretta Seashore (*Emerita*), Nenad Sestan (*Neuroscience*), Stefan Somlo (*Internal Medicine/ Nephrology*), Berna Sozen, Peter Tattersall (*Laboratory Medicine*), Sherman Weissman, Hongyu Zhao (*Public Health; Biostatistics*)

Associate Professors Kaya Bilguvar, Sidi Chen, Daniel Greif (*Internal Medicine/ Cardiology*), Marc Hammarlund, Smita Krishnaswamy, Peining Li, Janghoo Lim, Jun Lu, Stefania Nicoli (*Internal Medicine/Cardiology*), Sabrina Nunez, In-Hyun Park, Curt Scharfe, Zhaoxia Sun, Andrew Xiao, Hui Zhang

Assistant Professors Grace Chen (*Immunobiology*) Nada Derar, Nadya Dimitrova (*Molecular, Cellular, and Developmental Biology*), Rama Kastury, Monkol Lek, Bluma Lesch, Diyendo Massilani, Mandar Muzumdar, Steven Reilly, Jason Sheltzer (*Surgery/ Oncology*) Zachary Smith, Trevor Sorrells, Berna Sozen, Michele Spencer-Manzon, Kaelyn Sumigray, Siyuan Wang, Frederick Wilson (*Internal Medicine/Oncology*)

FIELDS OF STUDY

Molecular Genetics: chromosome structure and function, genetic recombination, viral genetics, DNA damage repair, ribosome biogenesis, protein folding, neurodegenerative diseases, non-coding RNA function, and the regulation of gene expression. Genomics: genome mapping, genome modification, high-throughput technology, evolutionary genetics, and functional genomics. Cellular and Developmental Genetics: limb development, kidney development, cilia function, stem cell development, genetic control of the cytoskeleton, cell death, aging, cell fate determination, cell cycle progression, cell migration, cell signaling, and growth control. Cancer Genetics: oncogenesis and tumor suppression, tumor progression and metastasis. Model Organism Genetics: forward genetic screens in *Drosophila*, *C. elegans*, yeast, zebrafish, frogs, and mouse, transposon and insertional mutagenesis, gene and protein trapping,

mosaic genetics. Medical Genetics: genetic basis of human disease, chromosome rearrangements, population and quantitative genetics.

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>.

SPECIAL 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, and population genetics. Normally this requirement is accomplished through the satisfactory completion of formal courses, many of which cover more than one of these areas. Students are required to pass at least five graduate-level courses that are taken for a grade. 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.

A qualifying examination is given during the second year of study. This examination consists of a period of directed reading with the faculty followed by the submission of two written proposals and an oral examination. Following the completion of course work and the qualifying examination, the student submits a dissertation prospectus and is admitted to candidacy for the Ph.D. degree. There is no language requirement. An important aspect of graduate training in genetics is the acquisition of communication and teaching skills. Students participate in 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 during their first 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 B&BS 503, RCR Refresher for Senior BBS Students. Students will typically take two to three courses each term and three research rotations (GENE 911, GENE 912, GENE 913) during the first year.

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

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.

Courses Four graduate-level courses taken for a grade are required. (Two Yale graduate-level courses taken for a grade during medical school may be counted toward this requirement at the discretion of the DGS.) Course work 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: Critical Analysis and Presentation of Scientific Literature (2 terms; GENE 675 and GENE 676, 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 (B&BS 503).

Recommended courses: Advanced Eukaryotic Molecular Biology (GENE 743); Biochemical and Biophysical Approaches in Molecular and Cellular Biology (MCDB 630); Molecules to Systems (CBIO 502); Science at the Frontiers of Medicine (CBIO 601).

Electives: Other courses may be taken in a wide variety of fields relevant to the biological and biomedical sciences.

Laboratory rotations One or more rotations are necessary to identify a thesis adviser. No set number of research rotations is required.

Teaching 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.

Qualifying exam M.D./Ph.D. students take their qualifying exam in the term following the completion of their course work. The structure of the qualifying exam is identical to that for other Ph.D. students in Genetics. Students read with three faculty members for five weeks, one of whom supervises the reading on the thesis research topic, but who is not the thesis adviser. The following two weeks are devoted to writing two research proposals, one on the student's thesis research. An oral exam follows in the eighth week.

Prospectus M.D./Ph.D. students submit their prospectus once their qualifying exam has been completed, but no later than the 30th of June following their exam.

Candidacy 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 submitted their dissertation prospectus.

Thesis committee M.D./Ph.D. students are required to have one thesis committee meeting per year, beginning the term after passing their qualifying exam. However,

students are strongly encouraged to consider having additional meetings if they feel their project could benefit from the assistance of members of the 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 BBS website (<https://medicine.yale.edu/bbs>), MCGD Track.

COURSES

GENE 555a / AMTH 553a / CB&B 555a / CPSC 553a, Unsupervised Learning for Big Data Staff

This course focuses on machine-learning methods well-suited to tackling problems associated with analyzing high-dimensional, high-throughput noisy data including: manifold learning, graph signal processing, nonlinear dimensionality reduction, clustering, and information theory. Though the class goes over some biomedical applications, such methods can be applied in any field. Prerequisites: knowledge of linear algebra and Python programming.

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 655a or b / CBIO 655a or b, 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 Mandar Muzumdar and Siyuan Wang

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 Brett Lindenbach

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, Wendy Gilbert, 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 Steven Reilly and Bluma Lesch

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 the 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. At a minimum, students must have basic familiarity with working in a UNIX/Linux computing environment. Prior experience with shell scripting or a scripting language such as Perl, Python, or Ruby is strongly recommended. Interested students must contact the instructor early in the fall term to discuss their prior experience and expectations for the course. Enrollment limited to twenty. Prerequisite: permission of the instructor.

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 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.

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 Chenxiang Lin

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 Staff

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 Shirin

Bahmanyar

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; visibility 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, usually beginning in the third year of study. 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.

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 is a special combined degree with Film and Media 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 will meet with appropriate advisers from both 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.

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 510a, “Sprachkrise” – Philosophies & Language Crises Sophie Schweiger

The crisis of language predates the invention of ChatGPT (who may or may not have helped write this syllabus). This course delves into the concept of language crises and its long history from a philosophical and literary perspective, examining how crises of language are represented in literature and how they reflect broader philosophical questions about language, identity, and power. We explore different philosophical approaches to language, such as the history of language and philology (Herder, Humboldt, Nietzsche), structuralism and post-structuralism (Saussure), analytical and pragmatic philosophies (Wittgenstein), phenomenology and deconstruction (Heidegger), and analyze how these theories shape our understanding of language while simultaneously evoking its crisis. The course also examines how such language crises are represented and produced in literature and the arts, how authors and artists approach the complexities of language loss, and how crises help birth alternative systems of signification. Through close readings of literary texts by Hofmannsthal, Musil, Bachmann, et. al., we analyze the symbolic and metaphorical significance of language crises as well as the ethical and political implications of language loss for (cultural) identity. Experimental use of language such as DaDa artwork, performance cultures, and “Sprachspiel” poetry by the “Wiener Gruppe,” as well as contemporary KI/AI literature, further complement the theoretical readings. By exploring language crises through the lens of philosophy and literature, we gain a deeper understanding of the role of language – and its many crises – in shaping our understanding of ourselves and our communities.

GMAN 515a / CPLT 547a, Zählen und Erzählen: On the Relation Between Mathematics and Literature Anja LEMKE

Mathematical and literary practices of signs have numerous connections, and despite current debates on digital humanities, algorithm and the “end of the book”, the relation between calculus and writing can be traced back to around 3000 BC, when the graphé was split up into figure and character. The seminar explores this relationship by focusing on four different fields, which can be discussed separately but do exhibit numerous overlappings: a) Leibniz’ invention of infinitesimal calculus and its relation to the idea of narration from the Baroque to romanticism through to the twentieth century novel, (b) the relation between probability calculus, statistics, and novel writing in the nineteenth and early twentieth century, (c) the role of cypher for aesthetic and poetic questions starting with Schiller’s *Letters on the esthetic education of men*, to Robert Walser’s *Jakob von Gunten*, and Jenny Erpenbeck’s *The old child*, and (d) the economic impact of computation on poetic concepts, e.g. the role of double entry bookkeeping or models of circulation in romantic theories of money and signs. We discuss Leibniz’ *Theodizee*, texts on the infinitesimal calculus and his concept of an ars combinatoria, novels like *The Fortunatus*, Novalis’s *Heinrich von Ofterdingen*, Stifter’s “The gentle law”, Gustav Freytag’s *Debit and Credit*, and Musil’s *Man without content*, Novalis’s notes on mathematical questions of his time, and economic texts such as Adam Müller’s *Attempt on a theory of money*.

GMAN 531a / CPLT 617a, The Short Spring of German Theory Kirk Wetters

Reconsideration of the intellectual microclimate of German academia 1945–1968. A German prelude to the internationalization effected by French theory, often in dialogue with German sources. Following Philipp Felsch's *The Summer of Theory* (English 2022): Theory as hybrid and successor to philosophy and sociology. Theory as the genre of the philosophy of history and grand narratives (e.g. secularization). Theory as the basis of academic interdisciplinarity and cultural-political practice. The canonization and aging of theoretical classics. Critical reflection on academia now and then. Legacies of the inter-War period and the Nazi past: M. Weber, Heidegger, Husserl, Benjamin, Kracauer, Adorno, Jaspers. New voices of the 1950s and 1960s: Arendt, Blumenberg, Gadamer, Habermas, Jauss, Koselleck, Szondi, Taubes. German reading and some prior familiarity with European intellectual history will be helpful but not essential.

GMAN 595a / FILM 761a, German Film from 1945 to the Present Fatima Naqvi

We look at a variety of German-language feature films from 1945 to the present in order to focus on issues of trauma, guilt, remembrance (and its counterpart: amnesia), gender, Heimat or “homeland,” national and transnational self-fashioning, terrorism, and ethics. How do the Second World War and its legacy inflect these films? What sociopolitical and economic factors influence the individual and collective identities that these films articulate? How do the predominant concerns shift with the passage of time and with changing media? How is the category of nation constructed and contested within the narratives themselves? Close attention is paid to the aesthetic issues and the concept of authorship. Films by Staudte, Wolf, Kluge, Radax, Wenders, Fassbinder, Schroeter, Farocki, Haneke, Petzold, Schanelec, Seidl, Hausner, and Geyrhalter, among others. This class has an optional German section (fifty minutes a week) for students interested in counting this class for the Advanced Language Certificate. A minimum of three students is required for the section to run.

GMAN 604a / CPLT 510a, 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 617a / CPLT 904a / FILM 617a / FREN 875a / SPAN 901a, Psychoanalysis:**Key Conceptual Differences between Freud and Lacan I** Moira Fradinger

This is the first section of a year-long seminar (second section: CPLT 914) designed to introduce the discipline of psychoanalysis through primary sources, mainly from the Freudian and Lacanian corpuses but including late twentieth-century commentators and contemporary interdisciplinary conversations. We rigorously examine key psychoanalytic concepts that students have heard about but never had the chance to study. Students gain proficiency in what has been called “the language of psychoanalysis,” as well as tools for critical practice in disciplines such as literary criticism, political theory, film studies, gender studies, theory of ideology, psychology

medical humanities, etc. We study concepts such as the unconscious, identification, the drive, repetition, the imaginary, fantasy, the symbolic, the real, and *jouissance*. A central goal of the seminar is to disambiguate Freud's corpus from Lacan's reinvention of it. We do not come to the "rescue" of Freud. We revisit essays that are relevant for contemporary conversations within the international psychoanalytic community. We include only a handful of materials from the Anglophone schools of psychoanalysis developed in England and the US. This section pays special attention to Freud's "three" (the ego, superego, and id) in comparison to Lacan's "three" (the imaginary, the symbolic, and the real). CPLT 914 devotes, depending on the interests expressed by the group, the last six weeks to special psychoanalytic topics such as sexualization, perversion, psychosis, anti-asylum movements, conversations between psychoanalysis and neurosciences and artificial intelligence, the current pharmacological model of mental health, and/or to specific uses of psychoanalysis in disciplines such as film theory, political philosophy, and the critique of ideology. Apart from Freud and Lacan, we will read work by Georges Canguilhem, Roman Jakobson, Victor Tausk, Émile Benveniste, Valentin Volosinov, Guy Le Gaufey, Jean Laplanche, Étienne Balibar, Roberto Esposito, Wilfred Bion, Félix Guattari, Markos Zafiroopoulos, Franco Bifo Berardi, Barbara Cassin, Renata Salecl, Maurice Godelier, Alenka Zupančič, Juliet Mitchell, Jacqueline Rose, Norbert Wiener, Alan Turing, Eric Kandel, and Lera Boroditsky among others. No previous knowledge of psychoanalysis is needed. Starting out from basic questions, we study how psychoanalysis, arguably, changed the way we think of human subjectivity. Graduate students from all departments and schools on campus are welcome. The final assignment is due by the end of the spring term and need not necessarily take the form of a twenty-page paper. Taught in English. Materials can be provided to cover the linguistic range of the group.

GMAN 646a / CPLT 646a / EMST 546a / ENGL 723a, Rise of the European Novel

Rudiger Campe and Katie Trumpener

In the eighteenth century, the novel became a popular literary form in many parts of Europe. Yet now-standard narratives of its "rise" often offer a temporally and linguistically foreshortened view. This seminar examines key early modern novels in a range of European languages, centered on the dialogue between highly influential eighteenth-century British and French novels (Montesquieu, Defoe, Sterne, Diderot, Laclos, Edgeworth). We begin by considering a sixteenth-century Spanish picaresque life history (Lazarillo de Tormes) and Madame de Lafayette's seventeenth-century secret history of French court intrigue; contemplate a key sentimental Goethe novella; and end with Romantic fiction (an Austen novel, a Kleist novella, Pushkin's historical novel fragment). These works raise important issues about cultural identity and historical experience, the status of women (including as readers and writers), the nature of society, the vicissitudes of knowledge – and novelistic form. We also examine several major literary-historical accounts of the novel's generic evolution, audiences, timing, and social function, and historiographical debates about the novel's rise (contrasting English-language accounts stressing the novel's putatively British genesis, and alternative accounts sketching a larger European perspective). The course gives special emphasis to the improvisatory, experimental character of early modern novels, as they work to reground fiction in the details and reality of contemporary life. Many epistolary, philosophical, sentimental, and Gothic novels present themselves as collections of "documents" – letters, diaries, travelogues, confessions – carefully assembled, impartially edited, and only incidentally conveying stories as well as

information. The seminar explores these novels' documentary ambitions; their attempt to touch, challenge, and change their readers; and their paradoxical influence on "realist" conventions (from the emergence of omniscient, impersonal narrators to techniques for describing time and place).

GMAN 701a / CPLT 610a / PLSC 601a / SOCY 701a, Theories of Freedom: Schelling and Hegel Paul North

In 1764 Immanuel Kant noted in the margin of one of his published books that evil was "the subjection of one being under the will of another," a sign that good was coming to mean freedom. But what is freedom? Starting with early reference to Kant, we study two major texts on freedom in post-Kantian German Idealism, Schelling's 1809 *Philosophical Investigations into the Essence of Human Freedom and Related Objects* and Hegel's 1820 *Elements of the Philosophy of Right*.

History

Humanities Quadrangle, 2nd floor, 203.432.1366

<http://history.yale.edu>

M.A., M.Phil., Ph.D.

Chair

Alan Mikhail

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, Naomi Rogers, Edward Rugemer, Paul Sabin, Stuart Schwartz, 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, Denise Ho, Andrew Johnston, Isaac Nakhimovsky, Vanessa Ogle, Joanna Radin, William Rankin, Marci Shore, Elli Stern, Jonathan Wrytzen

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, Southeast Asia, Middle East, Africa, Jewish history; and diplomatic, environmental, ethnic, intellectual, labor, 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; or (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.

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.

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 in their third year. 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.

By the end of their fifth term, students are strongly recommended to take comprehensive examinations. 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 advisor 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 Omnia El Shakry

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 and Sunil Amrith

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 503b / CLSS 861b, Recent Trends, Current Problems, and New Approaches to Ancient History Joseph Manning

Current trends in the field and an examination of recent work, new theory, and new material. An overview of theory and method in ancient history. Each week is devoted to a case study or a recent monograph in the field.

HIST 521a / CLSS 880a, Roman Law Noel Lenski

A graduate-level extension of CLCV 236/HIST 225. The course inculcates the basic principles of Roman law while training students in advanced topics in the subject and initiating them into research methods.

HIST 525a or b / HSHM 525a or b, Field Studies Lauren Benton and Staff

This course does not count toward the coursework requirements for the Ph.D. or M.A.
½ Course cr

HIST 570b / AMST 836b, American Religion in the Archives Tisa Wenger

An advanced seminar on archival research methods for historians of American religion. The class begins with readings that theorize the archive, particularly for the study of American religion. What counts as an archive? How are archives constituted and by whom? What are the limits and pitfalls of archives – and the construct of “the archive” – for research in this field? Over the course of the term, students are guided through the process of writing an archivally grounded research paper using Yale Divinity School Library Special Collections and the Beinecke Rare Book and Manuscript Library. Enrollment capped at fifteen; meets at YDS Library L104.

HIST 574a, Methods and Sources of Religious History Bruce Gordon

This course introduces students to the historiography of religious history; to the history of methods, approaches, and problems in the field; and to techniques for using and citing primary and secondary sources in the study of religion. Seminars include lectures, common readings, writing exercises, and presentations by students and visiting scholars. Students develop research proposals related to their specific areas of interest.

HIST 590b / JDST 764b / MDVL 590b / RLST 777b, Jews in Muslim Lands from the Seventh through the Sixteenth Century Ivan Marcus

Introduction to Jewish culture and society in Muslim lands from the Prophet Muhammad to Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire.

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 597b / JDST 861b / RLST 797b, Twentieth-Century Jewish Politics David Sorkin

This seminar explores major aspects of twentieth-century Jewish politics with an emphasis on new forms of political practice.

HIST 603b / JDST 806b / MDVL 603b / RLST 616b, How the West Became Antisemitic: Jews and the Formation of Europe, 800–1500 Ivan Marcus

This seminar explores how medieval Jews and Christians interacted as religious societies between 800 and 1500.

HIST 616a, History of British Empire Nurfadzilah Yahaya

This reading and discussion seminar focuses on the history of British Empire in the nineteenth and twentieth centuries. We explore recently published works and older texts that have significantly shaped the field. Major themes include law, mobility, race, labor, and gender across time and space.

HIST 622a, Global Cross-Cultural Encounters in the Early Modern Era Stuart Schwartz

An examination of the encounters between Europeans and other peoples of the world, c. 1450–1850, with attention to the role of perception, preconceptions, and events on both sides of such meetings. Both the history of such encounters as well as the historical methods best used for the study of a global history of alterity and cultural perceptions are discussed.

HIST 654a / FREN 700a, Readings in Modern European Cultural History Carolyn Dean

This course covers readings in European cultural history from 1789 to the present, with a focus on Western Europe.

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 677a, Russia in the Age of Peter the Great Paul Bushkovitch

An introduction to the principal events and issues during the transformation of Russia in the years 1650 to 1725. Topics include political change and the court; Russia in Europe and Asia; religion and the revolution in Russian culture.

HIST 682b, Mass Incarceration in the Soviet Union and the United States Timothy Snyder

An investigation of the experience and purposes of mass incarceration in the Soviet Union and the United States in the twentieth century. Incarceration is central to the understanding, if not usually to the self-understanding, of a society. It is thus a crucial aperture into basic questions of values and practices. This course proposes a frontal approach to the subject, by investigating two of the major carceral systems of the twentieth century, the Soviet and the American. Intensive reading includes first-person accounts of the Gulag and American prison as well as scholarly monographs on the causes of mass incarceration in different contexts. Brief account is taken of important comparative cases, such as Nazi Germany and communist China. Guest lectures and guest appearances are an important element of our teaching.

HIST 683a, Global History of Eastern Europe Timothy Snyder

A thematic survey of major issues in modern east European history, with emphasis on recent historiography. A reading course with multiple brief writing assignments.

HIST 687b, Russia, the USSR, and the World, 1855–1945 Paul Bushkovitch

Political and economic relations of Russia/Soviet Union with Europe, the United States, and Asia from tsarism to socialism.

HIST 688a, New Approaches to Russian and Eurasian History: The Archival Revolution Sergei Antonov

A reading seminar addressing recent work on Russian and Soviet history grounded in the ongoing “archival revolution” that began in the late 1980s. After reviewing the major earlier paradigms, we examine how they were overturned or significantly modified by archival-based evidence. Topics include the development of government and the law; historical actors and places marginalized by the earlier historiography, such as non-capital regions, the middle classes, conservatism, religion, and (more generally) non-state structures; and Russia’s position in the imperial, Soviet, and post-Soviet periods as a vast and complex multiethnic political entity. Class discussions in English. Readings in English with Russian options available.

HIST 700b / AMST 801b, U.S. Colonial Present Lisa Lowe

Settler colonialism, slavery, racialized immigration, and military empire have been integral to the emergence of the U.S. nation, state, and economy, and their historical consequences continue today. In this interdisciplinary seminar, we study the relevance of these historical and ongoing formations to the founding and development of the United States, giving attention to the independence of each, as well as to their differences, convergences, and contestations. We consider the strengths and limits of given analytic frames for understanding our current historical crises of public health, economic austerity, and racial state violence. Despite the differentiated histories of settler colonialism, slavery, and empire, contemporary struggles and solidarities can identify links and convergences that colonial logics may disallow. The seminar includes

readings in history, anthropology, political theory, and literature, as well as films and other media. Enrollment limited. Permission of the instructor required.

HIST 715a / AFAM 764a / AMST 715a, Readings in Nineteenth-Century America

David Blight

The course explores recent trends and historiography on several problems through the middle of the nineteenth century: sectionalism, expansion; slavery and the Old South; northern society and reform movements; Civil War causation; the meaning of the Confederacy; why the North won the Civil War; the political, constitutional, and social meanings of emancipation and Reconstruction; violence in Reconstruction society; the relationships between social/cultural and military/political history; problems in historical memory; the tension between narrative and analytical history writing; and the ways in which race and gender have reshaped research and interpretive agendas.

HIST 720b, U.S. Empire Alvida Akiboh

One of the most cherished pieces of national mythology is that the United States, while an incredibly powerful country, has never been an empire. Scholars in the fields of U.S. diplomatic history, U.S. foreign relations, and U.S. and the World have made it their mission to debunk that myth. This course does not seek to settle the issue of whether the United States ever was or still remains an empire. Rather, it seeks to better understand the particular ways in which the United States has historically projected power abroad since its founding and how scholars have chosen to approach this history.

HIST 725a, Topics, Themes, and Methods in U.S. History Paul Sabin 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 729a / AFAM 771a / AMST 830a, The American Carceral State Elizabeth

Hinton

This readings course examines the historical development of the U.S. carceral state, focusing on policing practices, crime control policies, prison conditions, and the production of scientific knowledge in the twentieth century. Key works are considered to understand the connections between race and the development of legal and penal systems over time, as well as how scholars have explained the causes and consequences of mass incarceration in America. Drawing from key insights from new histories in the field of American carceral studies, we trace the multifaceted ways in which policymakers and officials at all levels of government have used criminal law, policing, and imprisonment as proxies for exerting social control in communities of color throughout U.S. history.

HIST 731b / AMST 835b, Research in Recent U.S. History Joanne Meyerowitz

Students conduct research in primary sources and write original essays on post-1945 U.S. history. Readings include scholarly articles that might serve as models for students' research projects.

HIST 734b / AMST 780b / WGSS 734b, Class and Capitalism in the Twentieth-

Century United States Jennifer Klein

Reading course on class formation, labor, and political economy in the twentieth-century United States; how regionalism, race, and class power shaped development

of American capitalism. The course reconsiders the relationships between economic structure and American politics and political ideologies, and between global and domestic political economy. Readings include primary texts and secondary literature (social, intellectual, and political history; geography).

HIST 738a, Writing Political History Joanne Freeman

A graduate research seminar focused on the craft of writing political history (write large—chronologically and otherwise), geared at producing an academic journal-friendly article. Early weeks focus on the ins and outs, inclusions and exclusions, challenges, cultures, styles, modes, and strengths of political history; later weeks center on workshoping student articles in process.

HIST 740b / AFAM 774b, Slavery and Abolition in the Atlantic World Edward Rugemer

This course explores the history and historiography of racial slavery in the Atlantic World from its emergence in the fifteenth century through its formal abolition in the nineteenth century and the processes of emancipation that followed.

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

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 749b / AMST 838b / HSHM 753b, Research in Environmental History Paul Sabin

Students conduct advanced research in primary sources and write original essays over the course of the term. Readings and library activities inform students' research projects. Interested graduate students should contact the instructor with proposed research topics.

HIST 751a / AFAM 687a / AMST 701a, Race in American Studies Matthew Jacobson

This reading-intensive seminar examines influential scholarship across disciplines on "the race concept" and racialized relations in American culture and society. Major topics include the cultural construction of race; race as both an instrument of oppressions and an idiom of resistance in American politics; the centrality of race in literary, anthropological, and legal discourse; the racialization of U.S. foreign policy; "race mixing" and "passing," vicissitudes of "whiteness" in American politics; the centrality

of race in American political culture; and “race” in the realm of popular cultural representation. Writings under investigation include classic formulations by such scholars as Lawrence Levine and Ronald Takaki, as well as more recent work by Saidiya Hartman, Robin Kelley, and Ann Fabian. Seminar papers give students an opportunity to explore in depth the themes, periods, and methods that most interest them. Permission of the instructor required.

HIST 754b, Indigenous Activism in North America Ned Blackhawk

This seminar explores the outpouring of recent scholarly work in the field of Native American activism and invites students to contribute to it. Organized on the 100th anniversary of the passage of the Indian Citizenship Act of 1924, this seminar expands current approaches within Native American and Indigenous Studies that often emphasize questions of structure vs. agency; domination vs. resistance; or continuity over adaptation. It seeks to explore alternative possibilities to the binaries that occasionally obscure the under-recognized intellectual traditions motivating Native American and Indigenous activism.

HIST 758a, Advanced Property and Legal History: Directed Research Claire Priest

This course is an opportunity for students individually to write research papers on topics of their choice within the areas of property (broadly defined) or legal history. Students have periodic individual meetings with the instructor through the fall to develop their projects. Students meet as a group between three to five times during the term to brainstorm topics and workshop each other's drafts. Admission to the course is by permission of the instructor. *Course Application Information:* In addition to listing this course among permission-of-instructor selections, students should submit a one-to-two-paragraph statement explaining their topic for the research paper. Please do not email the instructor about the course prior to August 15.

HIST 763a, Readings in Latinx History Stephen Pitti

Histories of Mexican American, Puerto Rican, Central American, Dominican, and Cuban American communities in the United States, with a focus on transnational and labor politics, cultural expression, print culture, and social movements. Many readings locate Latinx historical experiences alongside African American and Asian American histories and within broader patterns of U.S. and Latin American history.

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 794b, Histories of Global Development David Engerman

This is a graduate reading seminar that explores recent approaches to the history of global development. While the focus is on scholarship written by historians, we also examine works in the social sciences that have shaped—or should shape—historical scholarship. The seminar is designed for students pursuing graduate work in history; undergraduates and students outside the History Department should meet with the instructor by the end of the first week of the semester to discuss their interests.

HIST 798a and HIST 799b, Global and International History Workshop Vanessa Ogle

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. ½ Course cr per term

HIST 808a, Readings in Modern Latin American History Greg Grandin

A readings course for doctoral students. It is geared especially for students in preparation for their exams or who are writing their prospectuses. Readings are selected according to the students' interests, geared to help them move forward in the program.

HIST 821a / AFAM 820a, A Greater Caribbean: New Approaches to Caribbean History Anne Eller

We engage with new work emerging about the Greater Caribbean in the context of Latin America, the African diaspora, Atlantic history, global history, comparative emancipation from chattel slavery, and the study of global revolutions. Students make in-class presentations that locate these titles in a deeper historiography with classic texts. This course crosses imperial boundaries of archives and historiography in order to consider the intersecting allegiances, identities, itineraries, and diaspora of peoples, in local, hemispheric, and global context. Some central questions include: What is the lived geography of the Caribbean at different moments, and how does using different geographic and temporary frameworks help approach the region's history? What role did people living in this amorously demarcated region play in major historical transformations of the eighteenth and nineteenth centuries? How did the varied but interconnected processes of Caribbean emancipation impact economic and political systems throughout the Atlantic and beyond?

HIST 833a, Agrarian History of Africa Robert Harms

The course examines changes in African rural life from precolonial times to the present. Issues to be examined include land use systems, rural modes of production, gender roles, markets and trade, the impact of colonialism, cash cropping, rural-urban migration, and development schemes.

HIST 852b, Egypt since 1500 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 868a, Documents in Tang, Song, and Yuan Dynasties Valerie Hansen

A survey of the historical genres of premodern China: the dynastic histories, other chronicles, gazetteers, literati notes, and Buddhist and Daoist canons. How to determine what different information these sources contain for research topics in different fields. Prerequisite: at least one term of classical Chinese.

HIST 872a, Sources and Methods in the History of the People's Republic of China

Denise Ho

This graduate research seminar introduces students to archival and other sources used in PRC history. Students learn how to read and use such sources and complete an independent research paper. Chinese reading knowledge and instructor permission required.

HIST 876a / EAST 676, Empires of the Ming and Qing Maura Dykstra

This seminar is an introduction to the logistics, strategy, and rationale of the China's late empires. Readings on the political economy, organization, and administration of the Ming Empire and former Ming territories later ruled by the Qing will introduce participants to the general considerations of the last two dynasties to rule over the territory now known as China. A working knowledge of both classical Chinese and modern academic Chinese will be necessary to participate in the course.

HIST 878a, Readings in Japanese History to 1900 Fabian Drixler

A critical introduction to debates in the history of Japan up to about 1900, with particular emphasis on the Tokugawa period but some coverage of earlier times as well. Readings are in English but, depending on student interest, supplemental materials may also be assigned in Japanese.

HIST 881b, China's Age of Exploration Valerie Hansen

Study of China's maritime history focusing on the period 1000–1500, culminating with the Zheng He voyages and their cancellation. English-language readings in secondary sources and primary sources in translation; examination of relevant maps in Beinecke's collection. Separate section for those with a reading knowledge of classical Chinese.

HIST 883a, Urban Japan Workshop: Cities and Society, c. 1500–2000 Daniel

Botsman

Japan is not only home to the largest and, by some measures, most livable, city in the world today, but also it boasts one of the richest archives for the study of urban history. The Urban Japan Workshop offers graduate students and advanced undergraduates the opportunity to explore the rich scholarly literature on Japanese cities across time, while also developing their own individual research projects.

HIST 884a, Readings in the History of Modern Japan Hannah Shepherd

This course offers students an opportunity to explore recent English-language scholarship on the history of modern Japan (post-1868).

HIST 925a or b / HSHM 749a or b, Visual and Material Cultures of Science Paola Bertucci

The seminar discusses recent works that address the visual and material cultures of science. Visits to Yale collections, with a particular emphasis on the History of Science and Technology Division of the Peabody Museum. Students may take the course as a reading or research seminar.

HIST 930a / HSHM 701a, Problems in the History of Medicine and Public Health John Warner

An examination of the variety of approaches to the social and cultural history of medicine and public health. Readings are drawn from recent literature in the field, sampling writings on health care, illness experiences, and medical cultures in Asia, Latin America, Europe, and the United States from antiquity through the twenty-first century. Topics include the role of gender, class, ethnicity, race, religion, and region in the experience of sickness and healing; the intersection of lay and professional understandings of the body; and the role of the marketplace in shaping cultural authority, professional identities, and patient expectations.

HIST 931a / HSHM 702a, 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 / HSHM 761b, Medicine 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 943b / HSHM 736b / WGSS 730b, Health Politics, Body Politics Naomi Rogers

A reading seminar on struggles to control, pathologize, and normalize human bodies, with a particular focus on science, medicine, and the state, both in North America and in a broader global health context. Topics include disease, race, and politics; repression and regulation of birth control; the politics of adoption; domestic and global population control; feminist health movements; and the pathologizing and identity politics of disabled people.

HIST 950b / HSHM 765b, Workshop for Article Publication Bill Rankin
Writing a seminar paper is something quite different from revising it, polishing it, incorporating feedback, and ultimately publishing it. These are crucial skills, especially given the benefits of having a stand-alone article in press before the dissertation

is complete. This writing seminar is open to all students in History, HSHM, and allied fields who have previously written an article-length research paper. Working together and individually, the goal of the term is to revise the paper in preparation for submission to an academic journal (of the student's choice). We address common writing dilemmas—including structure, argument, introductions, scale, evidence, and intervention—as well as strategies for choosing a journal, writing within and beyond a subfield, and (eventually) responding to peer review. Similar to the Mellon writing-in-residence program, we prioritize collegial support and constructive exchange. Open to all topics, time periods, and methodological approaches.

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 Paul Sabin and Sunil Amrith

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 Wyrzten and Marcela Echeverri Munoz

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 971a / EMST 671a, Research Seminar in Intellectual History Isaac Nakhimovsky

The primary aim of this seminar is to provide a venue for writing research papers on individually chosen topics. While most of the term is devoted to the research and writing process, discussion of select readings will examine approaches to intellectual history methodologically but also historiographically, asking when and why inquiries into ways of thinking in the past have taken the forms they have. The seminar is intended not only for those with direct interests in early modern or modern intellectual history but also for those pursuing other areas of historical inquiry who would like to explore further conceptual resources for interpreting their sources.

HIST 997a or b / HSHM 997a or b, Pedagogy Seminar Staff

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

HIST 998a or b, 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 or b, 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. (Loria 654, 203.432.2724, edward.cooke@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, Cécile Fromont, Jennifer Raab

Assistant Professors Joanna Fiduccia, Subhashini Kaligotla, Morgan Ng, Quincy Ngan

FIELDS OF STUDY

African art; African American art; Byzantine art and architecture; Caribbean art; contemporary art; early modern art and architecture; East Asian art; eighteenth-century 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.

Course work 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 990) and one course in each of four 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 six fields, including three 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 (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 Art Gallery and Peabody Museum to Beinecke Library. Center activities will focus upon one particular theme each year and will include hosting one or more visiting American Art and Material Culture Fellows to teach a course each term and interact with Yale colleagues; 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 Cecile Fromont

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 529a / AMST 630a / RLST 819a, 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? Permission of the instructor required; qualified undergraduates are welcome.

HSAR 536a, Scale Joanna Fiduccia

Art history has conventionally maintained a curious “scale blindness” — a cultivated insensitivity to the influence of scale on the operations of perception and the work of interpretation. We are often similarly blind when it comes to scaling technologies woven into art history's basic practices, from the slide lecture to the textbook's reproductions. This course brings the subject into focus by examining theories of scale alongside recent art historical writing. We ask: Is an artwork's relation to scale different from other objects'? How have technologies of scaling, from photography to GIS mapping, confronted the materiality of artworks? How have theories of scale in other disciplines informed our descriptions of the scale of artworks? And how does the attempt to conduct art history at a “global scale” expose the cultural and ideological specificity of scale?

HSAR 542b, Global Materiality of Color Quincy Ngan

This seminar explores a global phenomenon wherein color makes meaning beyond sheer coloration and complements the function and meaning of artworks, inseparable

from their conceptual properties. The seminar has two fundamentally different but reciprocal inquiries. The first is to study how pigments and dyes entangle with the wider world, reconstructing the history of their production and circulation along with the worldview of minerals and dyes in a given civilization. This inquiry leads to a better understanding of the history of trade, economy, science, medicine, chemistry, technology, and culture. The second inquiry, which fundamentally concerns art historians, studies how the production and circulation of pigments and dyes, as well as views on the material, permeate the conceptual property of artworks, such as paintings and murals, and colored objects, such as textiles and sculptures. Together, we explore the multivalent significance of colors—cochineal, indigo, Maya blue, malachite, azurite, lapis lazuli, and gold—across cultures. For the final paper, students write about the materiality of color in their own field. Major texts include *Pigments and Power in the Andes* (2011), *Colors Between Two Worlds* (2011), *The Materiality of Color* (2012), *Colour, Art, and Empire* (2013), *A Red Like No Other* (2015), *Color in Ancient and Medieval East Asia* (2015), *Color in the Age of Impressionism* (2017), and *Colour and Light in Ancient and Medieval Art* (2018).

HSAR 551b, Art. Race. Violence. Cecile Fromont

This seminar investigates the many entanglements between art, race, and violence in the early modern Atlantic world and the long shadow these entanglements have cast on the contemporary era. Readings, class discussions, assignments, and invited speakers address topics such as racial construction in colonial Latin America; the visual culture of slavery; race and the advent of photography; the memorialization of slavery and colonialism; and race, piety, and aesthetics.

HSAR 553a, Embodied Artisanal Knowledge Edward Cooke

The development and transmission of knowledge during the early modern European world has lately been a dynamic subject of scholarly inquiry. Much of this work has focused upon the work of royal academies' explorations of natural philosophy and the mechanical arts. This seminar seeks to move beyond that narrow geographic focus and descriptive taxonomies to consider embodied artisanal knowledge throughout the world in the period from 1500 to 1800. As Tim Ingold reminds us, embodied knowledge is a skilled, socially generated practice distinct from the innate talents of mechanical execution. It is a cognitive skill that prizes resourcefulness; efficiency of effort; and informed, intensive use of tools. This tacit knowledge, the intellect of the hand, is experienced and felt rather than written about and illustrated. Making things depends upon constant attention to the transmission of ideas from brain to hand and from tool to material, with feedback channeled back through the tool to the body and mind of the maker. This seminar combines reading, object-driven inquiry, and hands-on exercises to explore the role of materials, techniques, and human agency in the making of objects. Students expand their own approaches to the study of artisans and objects from many periods and places.

HSAR 584a / MDVL 955a, The Cult of Saints in Early Christianity and the Middle

Ages Vasileios Marinis and Felicity Harley

For all its reputed (and professed) disdain of the corporeal and earthly, Christianity lavished considerable attention and wealth on the material dimension of sainthood and the “holy” during its formative periods in late antiquity and the Middle Ages. Already in the second century Christian communities accorded special status to a select few “friends of God,” primarily martyrs put to death during Roman persecutions.

Subsequently the public and private veneration of saints and their earthly remains proliferated, intensified, and became an intrinsic aspect of Christian spirituality and life in both East and West until the Reformation. To do so, it had to gradually develop a theology to accommodate everything from fingers of saints to controversial and miracle-working images. This course investigates the theology, origins, and development of the cult of saints in early Christianity and the Middle Ages with special attention to its material manifestations. The class combines the examination of thematic issues, such as pilgrimage and the use and function of reliquaries (both portable and architectural), with a focus on such specific cases as the evolution of the cult of the Virgin Mary.

HSAR 646a, Readings in Art and Empire Tim Barringer

This course encourages students to engage with recent thinking on questions of art and empire and to mobilize decolonial methodologies in a research project relating to a specific object in Yale's collections. The first half of the term is spent discussing key texts, beginning with Ariella Aïsha Azoulay's *Potential History* (2019), John Giblin et al "Dismantling the Master's House" (2019), and "Decolonizing Art and Empire" by Charlene Villaseñor Black and Tim Barringer (2022). It looks at the possibilities for new studies of art and empire that undermine, rather than replicating imperial structures of power and knowledge. Issues under discussion include slavery and representation, indigeneity and art history, orientalism, theories of hybridity, the colonial uncanny, the representation of landscape and the body in the colony, and science and visual representation. Particular attention is paid to recent work on the British Empire as manifest in the collection of the Yale Center for British Art. The curriculum is shaped to accommodate the research interests of the seminar's members (to include any and all empires across space and time); in the second half of the term students develop a research paper, generating a methodological approach for the analysis of a single object in Yale's collections.

HSAR 678b / ENGL 830b, Portraiture and Character from Hogarth to Woolf Ruth Yeazell

Case studies in the visual and verbal representation of persons in Anglo-American painting and fiction, with particular attention to novels that themselves include portraits or address relations between the two media. Novelists tentatively include Henry Fielding, Jane Austen, Henry James, Edith Wharton, Oscar Wilde, and Virginia Woolf. Painters include William Hogarth, Joshua Reynolds, Thomas Lawrence, James McNeill Whistler, John Singer Sargent, and Vanessa Bell. Selected readings in recent theories of fictional character and in the history and theory of portraiture. Whenever possible, we draw on paintings in Yale's collections.

HSAR 716b / AMST 716b / ANTH 769b / ARCG 769b, Landscapes of Meaning: Museums and Their Objects Anne Underhill

This seminar explores how museums convey various meanings about ethnographic, art, and archaeological objects through the processes of collecting, preparing exhibitions, and conducting research. Participants also discuss broader theoretical and methodological issues such as the roles of museums in society, relationships with source communities, management of cultural heritage, and various specializations valuable for careers in art, natural history, anthropology, history, and other museums.

HSAR 746a, Research Seminar in the Art of the Americas Allison Caplan

This graduate seminar provides a forum for participants to workshop issues surrounding research and publishing, particularly as they relate to art historical research on the Americas. Topics covered are shaped by participants' specific interests but may include archival and museum-based research, early modern paleography, and approaches to publishing scholarly articles and books.

HSAR 783a / EMST 748a, Circa 1600 Kishwar Rizvi

This seminar focuses on the art, architecture, and urbanism of early modern empires across West, Central and South Asia, namely, the Ottoman, Safavid, Mughal, and Shibanid, and their political and economic ties across the world. The year 1600 is an important temporal hinge, at the height of socio-political migrations and before the realization of full-scale European colonial ambitions. It is also the period of absolutism and millenarian activity, of slavery and the novel, and the institution of new religious and ethnic allegiances. In this manner art and architectural history served at the nexus of commensurability and competition, where artists, merchants, and missionaries crossed geographic and disciplinary borders in order to imagine a new world and their place within it.

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 Paul Sabin and Sunil Amrith

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 credit 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 Liciskai, 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 graduate seminars in the history of science or medicine. Two of the four must be graduate research seminars. The remaining five courses can be taken in history of science or medicine, history, science, or any other field of demonstrated special relevance to the student's scholarly objectives.

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>.

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. Accordingly, as part of their exam preparation, students may be asked to draft a syllabus for an undergraduate course based on each exam field.

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).

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 dissertation writing process. 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. 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 Lauren Benton and 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 Paul Sabin and Sunil Amrith

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 credit per term

HSHM 701a / HIST 930a, Problems in the History of Medicine and Public Health John Warner

An examination of the variety of approaches to the social and cultural history of medicine and public health. Readings are drawn from recent literature in the field, sampling writings on health care, illness experiences, and medical cultures in Asia, Latin America, Europe, and the United States from antiquity through the twenty-first century. Topics include the role of gender, class, ethnicity, race, religion, and region in the experience of sickness and healing; the intersection of lay and professional understandings of the body; and the role of the marketplace in shaping cultural authority, professional identities, and patient expectations.

HSHM 702a / HIST 931a, 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 736b / HIST 943b / WGSS 730b, Health Politics, Body Politics Naomi Rogers

A reading seminar on struggles to control, pathologize, and normalize human bodies, with a particular focus on science, medicine, and the state, both in North America and in a broader global health context. Topics include disease, race, and politics; repression and regulation of birth control; the politics of adoption; domestic and global population control; feminist health movements; and the pathologizing and identity politics of disabled people.

HSHM 749a or b / HIST 925a or b, Visual and Material Cultures of Science Paola Bertucci

The seminar discusses recent works that address the visual and material cultures of science. Visits to Yale collections, with a particular emphasis on the History of Science

and Technology Division of the Peabody Museum. Students may take the course as a reading or research seminar.

HSHM 753b / AMST 838b / HIST 749b, Research in Environmental History Paul Sabin

Students conduct advanced research in primary sources and write original essays over the course of the term. Readings and library activities inform students' research projects. Interested graduate students should contact the instructor with proposed research topics.

HSHM 761b / AFAM 752b / HIST 937b, Medicine 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 765b / HIST 950b, Workshop for Article Publication Bill Rankin

Writing a seminar paper is something quite different from revising it, polishing it, incorporating feedback, and ultimately publishing it. These are crucial skills, especially given the benefits of having a stand-alone article in press before the dissertation is complete. This writing seminar is open to all students in History, HSHM, and allied fields who have previously written an article-length research paper. Working together and individually, the goal of the term is to revise the paper in preparation for submission to an academic journal (of the student's choice). We address common writing dilemmas—including structure, argument, introductions, scale, evidence, and intervention—as well as strategies for choosing a journal, writing within and beyond a subfield, and (eventually) responding to peer review. Similar to the Mellon writing-in-residence program, we prioritize collegial support and constructive exchange. Open to all topics, time periods, and methodological approaches.

HSHM 775b / AFAM 929b, The Afterlives of Slavery, Health, and Medicine Carolyn Roberts

This graduate reading course is limited to a small number of graduate and professional school students who are interested in studying historical and contemporary texts that explore the history of slavery and its afterlives from the perspective of health and medicine. Graduate and professional school students co-create the course based on their interests. All students serve as co-teachers and co-learners in a supportive, compassion-based learning community that prioritizes values of deep listening, presence, and care.

HSHM 782b / AMST 696b / ENGL 906b / ER&M 696b / RLST 630b / WGSS 696b, 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 twenty-first 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 790a or b, HSHM Program Seminar Deborah Coen

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 920a or b, Independent Reading Staff

By arrangement with faculty.

HSHM 930a or b, Independent Research Staff

By arrangement with faculty.

HSHM 997a or b / HIST 997a or b, Pedagogy Seminar Staff

Faculty members instruct their Teaching Fellows on the pedagogical methods for teaching specific subject matter. 0 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

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Director of Graduate Admissions

Carrie Lucas (TAC 625D, 203.785.7158, carrie.lucas@yale.edu)

Student Services Officer

Caroline Lieber (TAC S625, 203.785.3857, caroline.lieber@yale.edu)

Professors Jeffrey Bender (*Internal Medicine*), Marcus Bosenberg (*Dermatology*), Alfred Bothwell, 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*), Ruslan Medzhitov, Markus Müschen (*Hematology*), Jordan Pober, Carla Rothlin, Craig Roy (*Microbial Pathogenesis*), David Schatz

Associate Professors Ann Haberman, John MacMicking (*Microbial Pathogenesis*), Eric Meffre, Noah Palm, João Pereira, Kevin O'Connor (*Neurology*), Lauren Sansing (*Neurology*)

Assistant Professors Grace Chen, Ellen Foxman (*Laboratory Medicine*), Jeffrey Ishizuka (*Medical Oncology*), Daniel Jane-Wit (*Internal Medicine*), Nikhil Joshi, Carrie Lucas, Aaron Ring, Andrew Wang (*Rheumatology*), Craig Wilen (*Laboratory Medicine*)

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 Yale 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 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
2. IBIO 611, IBIO 612, IBIO 613, Research Rotations (short research projects are taken under the guidance of three Yale professors)
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 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.

M.D./PH.D. STUDENTS MAJORING IN IMMUNOBIOLOGY

Required 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 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.)

Also required *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.

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.

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.

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, see <https://medicine.yale.edu/immuno/programs/courses/>

IBIO 530a / MBIO 530a / MCDB 530a, Biology of the Immune System Nikhil Joshi, Ann Haberman, Carla Rothlin, Kevin O'Connor, Carrie Lucas, Ellen Foxman, Craig Wilen, Grace Chen, Jeffrey Ishizuka, Markus Müschen, Daniel Jane-Wit, Andrew Wang, David Schatz, Peter Cresswell, Jordan Pober, Joao Pereira, Craig Roy, Joseph Craft, Paula Kavathas, and Noah Palm

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 Staff

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

Charles Greer (*Neurosurgery; Neuroscience*)

(LH 412, 203.785.4034, charles.greer@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*), Marina Picciotto (*Psychiatry; Pharmacology; Neuroscience*), 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*), Eyiymisi Damisah (*Neurosurgery; Neuroscience*), Carolyn Fredericks (*Neurology*), Dylan Gee (*Psychology*), Jason Gerrard (*Neurosurgery; Neuroscience*), Matthew Girenti (*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 McDougale (*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 course work, 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 course of study and for monitoring the student's progress. This committee will be subsequently 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 five core required courses: Bioethics in Neuroscience (INP 580), Principles of Neuroscience (INP 701), Foundations of Cellular and Molecular Neurobiology (INP 702), Foundations of Systems Neuroscience (INP 703), and Comparative Neuroanatomy (INP 704), all completed in the first year of enrollment. During the second or third year of enrollment, students are required to take an advanced course on quantitative techniques. Collectively, these courses are designed to ensure broad competence in modern neuroscience. Students are also required to complete at two additional elective courses from a broad set of neuroscience-related courses. The Graduate School uses grades of Honors, High Pass, Pass, and Fail and requires two term 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 Rotation for First-Year Students (INP 511, INP 512); both terms of Second-Year Thesis Research (INP 513, INP 514); and RCR Refresher for Senior BBS Students (B&BS 503), completed during the fourth year of enrollment. This will ensure that degree candidates obtain a solid background in systems, cellular, and molecular approaches to neuroscience. 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. In accordance with the expectations of the BBS program, Ph.D. students are expected to participate in two terms (or the equivalent) of teaching. Thesis committee meetings are required at six-month intervals. Also required is 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 five required courses plus two 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 512a, Lab Rotation for First-Year Students Charles Greer

Required of all first-year Neuroscience track graduate students. Rotation period is one term. Grading is Satisfactory/Unsatisfactory.

INP 514a, Second-Year Thesis Research Charles Greer

Required of all second-year INP graduate students. Grading is Satisfactory/Unsatisfactory.

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

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, Elizabeth Goldfarb, 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 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
<http://ide.yale.edu>
M.A.

Director of Graduate Studies

Michael Boozer

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 ECON 732, Advanced 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 <http://ide.yale.edu>. 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, 203.785.6842
<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*), 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 select 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 senior 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 in the setting of a Clinical Research Center.
3. Exploring the molecular basis of a disease from the laboratory standpoint.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The minimum overall course requirements for the doctorate program are completion of nine (9) courses. Intensive course work will extend for twelve months, starting in July. The majority of the course requirements are to be completed by the end of the first year of study. Prior to registering for a second year of study, students must successfully complete IMED 630, Ethical Issues in Biomedical Research. In addition to IMED 655, electives are often taken in the second year, with the expectation that they be completed by the end of the second year. To be eligible to take the comprehensive qualifying examination, students must achieve the grade of Honors in two courses (one course if a full-year course), have a minimum grade average of High Pass, and have completed a minimum of six courses. When requirements are met (typically by December 31 of the second year), students submit their thesis proposal and undertake

the comprehensive qualifying examination. In order to be admitted to candidacy, students must pass both the written and oral comprehensive qualifying examinations 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 most 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 for Laboratory-Based Patient-Oriented Research

IMED 625, Principles of Clinical Research

IMED 630, Ethical Issues in Biomedical Research

IMED 635, Directed Reading in Investigative Medicine

IMED 645, Introduction to Biostatistics in Clinical Investigation

IMED 655 *or* IMED 665 *or* IMED 670: Writing Your K- or R-Type Grant Proposal

IMED 680, Topics in Human Investigation

CBIO 601, Science at the Frontiers of Medicine

CB&B 740, Clinical and Translational Informatics

Elective (1)

Course Requirements for Clinically Based Patient-Oriented Research

IMED 630, Ethical Issues in Biomedical Research

IMED 635, Directed Reading in Investigative Medicine

IMED 655 *or* IMED 665 *or* IMED 670: Writing Your K- or R-Type Grant Proposal

IMED 660, Methods in Clinical Research, Part I

IMED 661, Methods in Clinical Research, Part II

IMED 662, Methods in Clinical Research, Part III

IMED 680, Topics in Human Investigation

Electives (2)

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 and Eugene Shapiro

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 655b, Writing Your K- or R-Type Grant Proposal (I) 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 K-type 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 660a, Methods in Clinical Research, Part I Eugene Shapiro

This yearlong course (with IMED 661 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 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 662b, Methods in Clinical Research, Part III Eugene Shapiro

This yearlong course (with IMED 660 and 661), 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, 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 K-type 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 670b, Writing Your K- or R-Type Grant Proposal (II) Eugene Shapiro

In this term-long course, students gain intensive, practical experience in evaluating and preparing grant proposals, including discussion of NIH study section format. The course is particularly designed to help investigators in the “K to R” transition period. The course is intended for students who plan to submit grant proposals (for either a K-type career development award or an R-type investigator-initiated award, as well as VA and foundation grant proposals). Attendance and active participation are required.

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

Jane Tylus

Director of Graduate Studies

Millicent Marcus (HQ524, 203.432.0599)

Professors Millicent Marcus, Jane Tylus

Professor in the Practice Amara Lakhous

Assistant Professor Serena Bassi, Alessandro Giammei, Christiana Purdy Moudarres

Lecturer Alejandro Cuadrado

Senior Lectors I Michael Farina, Anna Iacovella, Simona Lorenzini

Lector 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 language-for-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 552a / MDVL 525, Italian Lyric Poetry from the Middle Ages to the Renaissance Staff

An exploration of Italy's vernacular lyric tradition from its emergence in the thirteenth century through its flowerings in the sixteenth, with special attention to the emergence of the genre of the autobiographical Canzoniere and to the ascendance of the modern authorial self. Poets studied may include those of the Scuola Siciliana and Dolce stil novo, Boccaccio, Petrarca, Poliziano, Lorenzo de' Medici, Sannazaro, Boiardo, Bembo, Vittoria Colonna, Gaspara Stampa, Veronica Franca, and Michelangelo.

ITAL 570b / FREN 670b, Methods and Techniques in the Italian and French **Language Classroom** Anna Iacovella

This course creates a substantial apprenticeship program for second-year graduate students. Rising teaching fellows are exposed to a variety of methodologies and perspectives historically and currently applied in teaching Italian and French with reference to global education. In order to maximize all learning opportunities, students analyze and discuss several methods without dismissing or favoring some over others. The intent is to encourage students to develop their own teaching styles, drawn from a number of important approaches to language pedagogy. At the same time, far from focusing only on methodologies and practices, the course strives to integrate other aspects of language education as well, and students have the chance both to observe classes and to develop and teach several classes of their own during the term.

ITAL 691a, Directed Reading Alessandro Giammei

ITAL 948a, Theorizing the Modern Subject Jane Tylus

This class introduces graduate students in the Humanities and the Social Sciences to Italian critical theory from the 15th century to the present by focusing on different ways of thinking about the emergence of the modern subject, subjectivity and subjection. We read political thinkers and cultural critics like Machiavelli, Vico, Leopardi, Gramsci, Negri, Federici, Lazzarato, Agamben, Braidotti, and Eco. The theorists we read ask us to think about the multiple ways in which one becomes a modern subject by being hailed by particular ideas of what it means to be human, as well as by the State and by capitalism. Our journey into Italian thought is structured through four units: 1) Beyond the Modern Subject: Theorizing the Post-Human; 2) Subjectivity: Theorizing the Modern State; 3) Subjection: Theorizing Modern Economies; 4) The Modern Subject Before Modernity: Italian Renaissance Thought and the Human. During the course, students also draft, redraft, write, and edit a publishable article-length original piece of research working with one or more sources they have read in the class.

ITAL 999a, Preparing for Doctoral Exams and Prospectus Writing Jane Tylus

The aim of this seminar is to give third-year students the opportunity to work together on the three projects that will occupy them throughout Year 3: the oral comprehensive

exam (for early November), the written exam on the three topics lists (for March–April), and the writing of the prospectus, to be defended in September of Year 4. Weekly meetings are run and coordinated by a faculty member in Italian, generally the graduate adviser. Each week of the first nine weeks is devoted to a specific topic on the comprehensive lists requested by the students themselves. Students are in conversation with each other, with the presiding faculty member, and with an additional guest lecturer who is an expert in the areas under discussion. Following the ninth week, there is a dry run of the oral exam. The remaining four weeks are devoted to discussing the composition of the topics lists and to the writing of the prospectus. Informal meetings may continue through the spring to discuss these issues as well. Prerequisite: completion of all other graduate course work (15 credits).

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) and as many as four additional courses. Students may take other courses 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 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 director of graduate studies (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 director of graduate studies (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); 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, 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 (\$790 per term for the 2023–24 academic year). (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>. 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., M.Phil., Ph.D.

Chair

Raffaella Zanuttini

Director of Graduate Studies

Veneeta Dayal

Professors Claire Bower, Veneeta Dayal, Robert Frank, Laurence Horn (*Emeritus*), Frank Keil, * Zoltán Szabó, * Petronella Van Deusen-Scholl (*Adjunct; Center for Language Study*), Douglas Whalen (*Adjunct; Haskins Laboratories*), Raffaella Zanuttini

Associate Professors Maria Piñango, Kenneth Pugh (*Adjunct; Haskins Laboratories*), Jason Shaw

Assistant Professors Natalie Weber, Jim Wood

* 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

Course Work

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. During their first five terms students must complete a minimum of eleven additional term courses at the graduate level. 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 six courses in four or more subfields of linguistics. The following courses satisfy this requirement: LING 612, Language Change; LING 636, Articulatory Phonology; LING 631, Neurolinguistics, or LING 617, Language and Mind; LING 635, Phonology II; LING 654, Syntax II; LING 664, Semantics II; LING 680, Morphology; LING 796, Semantic Investigations in an Unfamiliar Language.

Students will 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.

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; LING 619, The Evolution of Language and Culture; LING 624, Mathematics of Language; LING 627, Language and Computation I; LING 631, Neurolinguistics; LING 636, Articulatory Phonology; LING 641, Field Methods; an advanced course in statistics (e.g., S&DS 538, S&DS 563, S&DS 661, or PSYC 518).

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.

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 areas (as listed above). 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 or working papers. 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:

1. 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 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 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, Perspectives on Grammar Veneeta Dayal

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. ½ Course cr

LING 525b / SKRT 520b, Introductory Sanskrit II Aleksandar Uskokov

Continuation of SKRT 510/LING 515. Focus on the basics of Sanskrit grammar; readings from classical Sanskrit texts written in the Indian Devanagari script. Prerequisite: SKRT 510/LING 515.

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 546b, Language, Sex, and Gender Natalie Weber

Sex-based asymmetries in language structure and language use. Role of language in encoding, reflecting, or reinforcing social attitudes and behavior. The “he-man” lexicon: sex-marking, reform, and resistance. Gender and sexual diversity as linguistic variables. Genderlects: differences (real and perceived) between male and female speech, conversational styles, and linguistic communities.

LING 600a, 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 602b, The Mystery of the Voynich Manuscript Claire Bownen

Introduction to basic ideas of linguistics and cryptography through study of the Voynich Manuscript (MS 408), a mysterious medieval manuscript held in the Beinecke Library. Review of major hypotheses about the manuscript, ranging from the fake, to code, to undeciphered language.

LING 612a, Linguistic Change Claire Bownen

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 620a, Phonetics I Jason Shaw

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 624a, Mathematics of Language Robert Frank

Study of formal systems that play an important role in the scientific study of language. Exploration of a range of mathematical structures and techniques; demonstrations of their application in theories of grammatical competence and performance including set theory, graphs and discrete structures, algebras, formal language, and automata theory. Evaluation of strengths and weaknesses of existing formal theories of linguistic knowledge.

LING 627b, Language and Computation I Staff

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 632b, Phonology I Jason Shaw

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 Claire Bower

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 636a, Articulatory Phonology Jason Shaw

Introduction to phonology as a system for combining units of speech (constriction gestures of the vocal organs) into larger structures. Analysis of articulatory movement data; modeling using techniques of dynamical systems. Emphasis on universal vs. language-particular aspects of gestural combination and coordination. Prerequisite: LING 520 or permission of the instructor.

LING 639b, Phonetics II: Speech Production and Perception Jason Shaw

This course introduces theoretical tools for explaining physical aspects of speech, including speech articulation, acoustics, audition, and perception. Acoustic properties of speech sounds are derived from first principles, following acoustic theories of speech production. The course covers articulatory kinematics alongside contemporary theories of motor coordination and speech planning. Audition and speech perception are introduced in the context of signal processing and statistical tools for mapping the continuous phonetic signal to phonological representations. These topics are pursued in the context of speech examples from a wide range of natural languages, preparing students to engage with primary literature in the field of phonetics.

LING 641b, Field Methods Edwin Ko

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 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 Claire Bowers

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 664b, Semantics II Jim Wood

The model-theoretic approach to semantics and its treatment of core linguistic phenomena. Topics include quantification, tense/aspect/modality, context and interpretation, and the semantics-pragmatics interface. Prerequisite: LING 663 or permission of the instructor.

LING 675b / PHIL 669b, Pragmatics Laurence Horn

Context-dependent aspects of meaning and inference. Speech act theory, presupposition, implicature. Role of pragmatics in the lexicon and in meaning change. The semantics-pragmatics distinction from different perspectives; the position of pragmatics in linguistic theory.

LING 685a, Topics in Computational Linguistics: Language Models and Linguistic Theory Robert Frank

A linguistically-guided exploration of the strengths and weaknesses of large language models (such as GPT-4 and its brethren), which form the foundation of current AI systems. What is the structure of these models, and how are they trained? What do they know about language, and how can we assess it? To what degree is the existence of these models cause for a re-evaluation of existing theories of linguistic structure? Prerequisites: at least one course covering the foundations of deep learning (CPSC 452, CPSC 477, EENG 439, LING 680, S&DS 565) and at least one course on linguistic theory (LING 632, LING 653, LING 663).

LING 724a, Sound Change Claire Bowers

Topics in the foundations of sound change. Perception, production, and social factors. Seeds of sound change, mechanisms, and means of study. Overview of sound change research, including experimental, computational, simulation, and comparative methods. Prerequisite: LING 612 or permission of the instructor.

LING 791a, The Syntax of Coordination Jim Wood

We discuss the syntax of coordination itself, along with a sample of the myriad constructions that coordination gives rise to, such as across-the-board dependencies, right-node raising, coordinate object drop, conjunction reduction and others. We discuss the special licensing of null arguments in coordinate structures, and whether heads can be coordinated, at or below the word level.

LING 794b, Asserting, Asking, Answering Veneeta Dayal and Zoltan Szabo

This course introduces students to some of the current debates in the literature on questions. It articulates the relationship between declarative/interrogative structures and the speech acts of asserting and asking. It also probes the status of an assertion as an answer to a question. Some of the main approaches to the semantics of questions are introduced, with special attention to linguistic phenomena. These include pair-list answers, quantificational variability effects, scope marking, alternative questions, and polar question particles. The left periphery of interrogative clauses is explored by studying the behavior of interrogatives under different embedding predicates, and by locating the points at which direct question intonation and pragmatic bias in questioning can enter the derivation. Prerequisite: LING 663 or permission of the instructor.

LING 798a, Plurality, Optional Plurality, Pluractionality Veneeta Dayal

The concept of singularity vs. plurality is arguably universal, yet its morpho-syntactic expression is subject to a great deal of cross-linguistic variation. Many

languages have one form for singular reference and another for plural. English, for example, canonically uses the unmarked form of a noun for singular reference and a plural marked form for plural reference, at least with count nouns: *dog* vs. *dog+s*. In many languages, the base form itself can be used to refer to a plurality but there is nevertheless a form that can be added to ensure plurality. Mandarin, for example, uses the base form itself to refer to singularities as well as pluralities but the addition of the plural marker rules out the possibility of singular reference: *gou* “the dog/the dogs” vs. *gou-men* “the dogs”. Finally, there are languages, such as Cuzco Quechua, in which the verb has a singular and a plural form, such that the singular form refers to a single event while the plural form refers to a plurality of events. In this course we discuss the semantic underpinnings of these three types of plural morphology, plural marking as in English *-s*, optional plurality as in Mandarin *-men*, and pluractionality as in Quechua plural marked verbs. Prerequisite: LING 263/LING 663 or permission of the instructor.

Management

Edward P. Evans Hall, Rm. 5125A, 203.432.6002

<https://som.yale.edu/programs/phd>

M.A., M.Phil., Ph.D.

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Associate Professors: Saed Alizamir, Tristan L. Botelho, Jason Dana, Julia DiBenigno, Balázs Kovács, Michael Kraus, Vineet Kumar, Song Ma, Vahideh Manshadi, Aniko Öry, Taly Reich, Thomas Steffen, Kosuke Uetake, Tauhid Zaman

Participating faculty from the School of Management: Laura Adler, Alexander Burnap, Christopher Clayton, Corey Cusimano, Jennifer E. Dannals, Raphael Duguay, Paul Fontanier, Oriane A.M. Georgeac, Soheil Ghili, Paul Goldsmith-Pinkham, Zeqiong Huang, Ivana V. Katic, Joowon Klusowski, Cameron S. LaPoint, Lesley Meng, Anya Nakhmurina, Jayanti Owens, Edward Watts, Alexander K. 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 pre-seminar (MGMT 782-02) every term in the program,
- Register for the Finance pre-seminar (MGMT 782-01) in years 1 through 4,
- 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 faculty-written 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 full-time 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 closed-note; 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 defense. After the defense, the faculty in attendance will meet to discuss the 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 pre-seminars.

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 (from 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 have to 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 Ph.D. Student Research Workshop 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 a paper is always required to be submitted for distribution at the Student Research Workshop, but it need not be the final paper.

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 Ph.D. Student Research Workshop 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: two core courses (ECON 500, Microeconomics; and ENAS 649, Policy Modeling), five required methods courses (STAT 541, Probability Theory; ENAS 502, Stochastic Processes; STAT 542, Theory of Statistics; ENAS 530, Optimization Techniques; and ECON 501, Choice/Game Theory), two operations modeling courses (MGMT 720, Models of Operations Research and Management; and MGMT 721, Modeling Operational Processes), and at least three 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. 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. Beginning in their third year, students are also expected to present in the seminar once per year.

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.

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.

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 MEaN or MOB 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. 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 MEaN or MOB 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 first- and 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. second-year 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 702a, Seminar in Accounting Research III Staff

Study of empirical accounting research that covers topics such as valuation, pricing of accounting information, earnings management, reporting issues, accounting regulation, analyst forecasts, and auditing.

MGMT 708a, Frontiers of Disclosure & RepResrc Staff

MGMT 721a, Modeling Operational Processes Nils Rudi

MGMT 730a, Organizational Behavior in Development Staff

A series of presentations of their latest research by top organizations and Management scholars from the United States and abroad. o Course cr

MGMT 734a / SOCY 506a, Designing Social Research Balazs Kovacs

This is a course in the design of social research. The goal of research design is “to ensure that the evidence obtained enables us to answer the initial [research] question as unambiguously as possible” (de Vaus 2001: 9). A good research design presupposes a well-specified (and hopefully interesting) research question. This question can be stimulated by a theoretical puzzle, an empirical mystery, or a policy problem. With the research question in hand, the next step is to develop a strategy for gathering the empirical evidence that will allow you to answer the question “as unambiguously as possible.”

MGMT 740a / ECON 670a, 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, Financial Econometrics and Machine Learning Bryan Kelly

TBD ½ Course cr

MGMT 746a, Financial Crises Gary Gorton

An elective doctoral course covering theoretical and empirical research on financial crises. The first half of the course focuses on general models of financial crises and historical episodes from the nineteenth and twentieth centuries. The second half of the course focuses on the recent financial crisis. Prerequisites: MGMT 740 and 741 (doctoral students in Economics may substitute the core microeconomics sequence), and permission of the instructor.

MGMT 754a / PSYC 554a, Behavioral Decision-Making II: Judgment Nathan Novemsky and Ravi Dhar

This seminar examines research on the psychology of judgment. We focus on identifying factors that influence various judgments and compare them to which factors individuals want and expect to drive their judgments. Topics of discussion include judgment heuristics and biases, confidence and calibration, issues of well-being including predictions and experiences, regret and counterfactuals. The goal is threefold: to foster a critical appreciation of existing research on individual judgment, to develop the students’ skills in identifying and testing interesting research ideas, and to explore research opportunities for adding to existing knowledge. Students generally enroll from a variety of disciplines, including cognitive and social psychology, behavioral economics, finance, marketing, political science, medicine, and public health.

MGMT 757a, Designing and Conducting Experimental Research Gal Zauberman

This course discusses how to effectively generate, design, evaluate, report, and present behavioral research. Topics include theory development, idea generation, increasing statistical power, internal vs. external validity, between vs. within-subjects designs, psychological measurement, survey research methods, the publication process, writing high-quality abstracts and journal articles, and presenting research findings. This course offers a very practical, learning-by-doing approach. In addition to discussing the weekly readings, class sessions offer students ample opportunity to practice (1) generating appropriate and effective experimental designs, (2) generating high-quality survey questions, (3) critiquing and reviewing existing research, and (4) presenting research findings. This course is primarily for Ph.D. students intent on

pursuing an academic career conducting behavioral research in psychology, marketing, organizational behavior, or a related field.

MGMT 762a / ECON 678a, Macro Finance Alp Simsek

MGMT 781a, Workshop Staff

781-01, Accounting/Finance Workshop; 781-03, Marketing Workshop; 781-04, Organizations and Management Workshop; 781-05, Operations Workshop.

MGMT 782a, Doctoral Student Pre-Workshop Seminar Staff

782-01, Accounting Doctoral Student Pre-Workshop Seminar; 782-02, Financial Economics 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, Independent Reading and Research Staff

By arrangement with individual faculty.

Mathematics

10 Hillhouse Avenue, 203.432.7058

<http://math.yale.edu>

M.S., M.Phil., Ph.D.

Chair

Wilhelm Schlag

Director of Graduate Studies

Ivan Loseu

Professors Richard Beals (*Emeritus*), Jeffrey Brock, Andrew Casson (*Emeritus*), Ronald Coifman, Igor Frenkel, Howard Garland (*Emeritus*), Anna Gilbert, Alexander Goncharov, Roger Howe (*Emeritus*), Peter Jones, Richard Kenyon, Ivan Loseu, Alexander Lubotzky (*Adjunct*), 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 & 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; 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; algebraic number theory and algebraic geometry; mathematical physics, relativity; numerical analysis; combinatorics and discrete mathematics.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

In order to qualify for the Mathematics Ph.D., all students are required to:

1. Complete eight term courses at the graduate level, at least two with Honors grades.
2. Pass qualifying examinations on their general mathematical knowledge;
3. Submit a dissertation prospectus;
4. Participate in the instruction of undergraduates;
5. Be in residence for at least three years;
6. 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 Ivan Loseu

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 Ebru Toprak

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 Or Landesberg

Construction and limit theorems for measures and integrals on general spaces; product measures; L_p spaces; integral representation of linear functionals.

MATH 525b, Introduction to Functional Analysis Wilhelm Schlag

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 Subhadip Dey

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 543a / CPSC 543a, Optimal Transport: Theory, Algorithms, and Applications to Data Science Smita Krishnaswamy

Optimal transport started with Gaspard Monge in the 1700s when he stated the problem of moving a large pile of sand (whose shape is a probability distribution) to a target pile with minimal effort. The optimal transport plan not only gives a coupling between distributions but also a metric between such probability measures, which has found use in everything from modern neural networks to economic resource allocation problems, to shape matching in computer vision. This course covers the theoretical foundations as well as computational aspects of optimal transport starting with the original formulations as maps between discrete measures and extending to general measures as well as the key Kantorovich relaxation as a coupling between measures and its metric properties. We also cover algorithmic foundations of optimal transport using linear programs that have recently been sped-up via entropic regularizations. In addition to the primal form, we cover the dual form and relaxations which lead to integral probability metrics. We vary the ground space of optimal transport from Euclidean, to arbitrary metrics, to graphs. We move from static to dynamic formulations of optimal transport, which can provide paths of flow for dynamics that are energy-constrained. Finally, we cover important extensions such as unbalanced optimal transport which allows for transport between generic measures (without the same volume) and for Gromov-Wasserstein distances between measures on different metric spaces. Prerequisites: MATH 241, CPSC 202, CPSC 223, and CPSC 365. Knowledge of Python programming is also required.

MATH 544a, Introduction to Algebraic Topology Sebastian Hurtado - Salazar

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 619a, Foundations of Algebraic Geometry Sam Raskin

This course provides an introduction to the language of basic ideas of algebraic geometry. We study affine and projective varieties, and introduce the more general theory of schemes. Our main references are Robin Hartshorne's book and Ravi Vakil's lecture notes. Prerequisite: commutative algebra at the level of MATH 500/501.

MATH 640a / AMTH 640a or b / CPSC 640a or b, 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 710a / AMTH 710a, Harmonic Analysis on Graphs and Applications to Empirical Modeling Ronald Coifman

The goal of this graduate-level class is to introduce analytic tools to enable the systematic organization of geometry and analysis on subsets of \mathbb{R}^n (data). In particular, extensions of multi-scale Fourier analysis on graphs and optimal graph constructions for efficient computations are studied. Geometrization of various Neural Net architectures and related challenges are discussed. Topics are driven by students goals.

MATH 713a, Poisson Algebras and Poisson Geometry Nicholas Ovenhouse

Poisson Geometry is, in some sense, a generalization of symplectic geometry and is the formalism used to describe classical mechanics. We discuss basic definitions, properties, and structural results about Poisson structures and look at many well-known examples. Beyond the basic theory, more advanced topics may include: R-matrix Poisson structures, integrable systems, Poisson structures on character varieties, and connections to cluster algebras. Prerequisites are basic algebra and differential geometry (such as in a first-year graduate course).

MATH 727a, Vertex Operator Algebras and Related Structures Igor Frenkel

Vertex operator algebras (VOA) is an algebraic formulation of two-dimensional conformal field theory. This course is dedicated to general theory of VOAs and fundamental examples related to representation theory of affine Kac-Moody algebras, Virasoro algebra, and the Monster group. Modular forms and functions is an important

class of structures that naturally appear in VOA theory. Various realizations of modular forms and functions also suggest the relation of VOA with the universal quantum Teichmüller space and a mathematical construction of three-dimensional quantum gravity.

MATH 728a, Kleinian Groups and Dynamics Hee Oh

We discuss various topics on dynamics on hyperbolic manifolds.

MATH 729a, Topics in Teichmüller Theory and Mapping Class Groups Yair Minsky

Surfaces and their geometric structures play roles throughout mathematics. Of particular interest in this course are aspects of low-dimensional topology and geometry, as well as geometric group theory, but complex analysis plays a role as well. Depending on participant and lecturer interest, we cover aspects of the “classical” theory (Thurston compactification for example), coarse geometry of mapping class groups (and perhaps generalization to hierarchical hyperbolicity), and perhaps assorted topics like the study of infinite-type surfaces and their mapping class groups.

MATH 827b, Lang Teaching Seminar Brett Smith and Su Ji Hong

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

o Course cr

Mechanical Engineering & 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, and poroelasticity.

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; biomechanics; motor control; animal locomotion; cell and tissue mechanics; biomaterials and therapeutics; human health and orthopaedics; bio-inspired computation and design.

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

Medieval Studies

Humanities Quadrangle, Rms. 431 & 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, Raymond Clemens, Stephen Davis, Maria Doerfler, Adam Eitel, Marcel Elias, Hussein Fancy, Paul Freedman, Frank Griffel, Valerie Hansen, 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 Adel Allouche (*Emeritus*), Felisa Baynes-Ross, Gerhard Bowering (*Emeritus*), Marcia Colish (*Emerita*), Orgu Dalgic, John Dillon, Carlos Eire, Roberta Frank (*Emerita*), Walter Goffart (*Emeritus*), Harvey Goldblatt (*Emeritus*), Eric Greene, Dimitri Gutas (*Emeritus*), Peter Hawkins (*Emeritus*), Subhashini Kaligotla, Christina Kraus, Traugott Lawler (*Emeritus*), Noel Lenski, Ahuva Liberles, Giuseppe Mazzotta (*Emeritus*), Alastair Minnis (*Emeritus*), Robert Nelson (*Emeritus*), Carla Neuss, Morgan Ng, 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.

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, 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 two 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 519b / ENGL 519b / MHHR 500b, Medieval Manuscripts and Literary Forms

Jessica Brantley

This course investigates the relation between manuscript studies and literary criticism. It includes an introduction to working with medieval manuscripts (no prior experience required) and continues with a series of case studies that examine what thinking about material texts can contribute to scholarship in medieval—or any—literature. Manuscripts to be considered include the *Beowulf* MS, the St Albans Psalter, the Ellesmere Chaucer, Cotton Nero A.x. (the *Gawain* MS), the *Book of Mergery Kempe*, and the manuscript of the N-Town plays.

MDVL 535a / CPLT 555a / ENGL 535a, Postcolonial Middle Ages Marcel Elias

This course explores the intersections and points of friction between postcolonial studies and medieval studies. We discuss key debates in postcolonialism and medievalists' contributions to those debates. We also consider postcolonial scholarship that has remained outside the purview of medieval studies. The overall aim is for students, in their written and oral contributions, to expand the parameters of medieval postcolonialism. Works by critics including Edward Said, Homi Bhabha, Leela Gandhi, Lisa Lowe, Robert Young, and Priyamvada Gopal are read alongside medieval romances, crusade and jihād poetry, travel literature, and chronicles.

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 590b / HIST 590b / JDST 764b / RLST 777b, Jews in Muslim Lands from the Seventh through the Sixteenth Century Ivan Marcus

Introduction to Jewish culture and society in Muslim lands from the Prophet Muhammad to Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire.

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 603b / HIST 603b / JDST 806b / RLST 616b, How the West Became Antisemitic: Jews and the Formation of Europe, 800–1500 Ivan Marcus

This seminar explores how medieval Jews and Christians interacted as religious societies between 800 and 1500.

MDVL 611a, A Survey of Medieval Latin John Dillon

This is an introductory reading course in Late Antique and Medieval Latin that is intended to help students interested in Christian Latin sources improve their reading ability. The primary objective is to familiarize students with Medieval Latin and improve their proficiency in reading and translating Medieval Latin texts. Students come to recognize the features (grammatical and syntactical) that make Medieval Latin distinct, improve their overall command of Latin by reviewing grammar and syntax, and gain an appreciation of the immense variety of texts written in Medieval Latin. Prerequisite: basic knowledge of Latin grammar and syntax, equivalent to the elementary Latin grammar courses offered by the Classics department (LATN 110, LATN 120).

MDVL 615a / FREN 610a, Old French R Howard Bloch

An introduction to the Old French language, medieval book culture, and the prose romance via study of manuscript Yale Beinecke 229, *The Death of King Arthur*, along with a book of grammar and an Old French dictionary. Primary and secondary materials are available on DVD. Work consists of a weekly in-class translation and a final exam comprised of a sight translation passage, a familiar passage from Yale 229, and a take-home essay. No previous study of Old French necessary, although a knowledge of French is essential. Conducted in English.

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 712a, History of Early Christianity: Origins and Growth Teresa Morgan

This course introduces students to early Christianity from apostolic times through the eighth century. It examines the social, political, and religious context of early Christianity; its expansion and Imperial adoption; the character of its life, worship, and mission; the formation of the Christian scriptures; the articulation and defense of a central body of doctrine; church councils and creeds; the monastic movement; and early Christian art. In conversation with influential theologians of the period, we ask questions about ways in which early Christian identities are formed and explore

how power is used and distributed in this process. Students are exposed to a range of primary sources and modes of historical study. This course serves as essential preparation for the study of Christian history and theology in later historical periods. Above all, it provides an opportunity to consider early Christianity on its own terms and to discover how it continues to shape the lives of Christian communities today.

MDVL 745a, Byzantine Art and Architecture Vasileios Marinis

This lecture course explores the art, architecture, and material culture of the Byzantine Empire from the foundation of its capital, Constantinople, in the fourth century to the fifteenth century. Centered around the Eastern Mediterranean, Byzantium was a dominant political power in Europe for several centuries and fostered a highly sophisticated artistic culture. This course aims to familiarize students with key objects and monuments from various media – mosaic, frescoes, wooden panels, metalwork, ivory carvings – and from a variety of contexts – public and private, lay and monastic, imperial and political. We give special attention to issues of patronage, propaganda, reception, and theological milieu, as well as the interaction of architecture and ritual. More generally, students become acquainted with the methodological tools and vocabulary that art historians employ to describe, understand, and interpret works of art.

MDVL 955a / HSAR 584a, The Cult of Saints in Early Christianity and the Middle

Ages Vasileios Marinis and Felicity Harley

For all its reputed (and professed) disdain of the corporeal and earthly, Christianity lavished considerable attention and wealth on the material dimension of sainthood and the “holy” during its formative periods in late antiquity and the Middle Ages. Already in the second century Christian communities accorded special status to a select few “friends of God,” primarily martyrs put to death during Roman persecutions. Subsequently the public and private veneration of saints and their earthly remains proliferated, intensified, and became an intrinsic aspect of Christian spirituality and life in both East and West until the Reformation. To do so, it had to gradually develop a theology to accommodate everything from fingers of saints to controversial and miracle-working images. This course investigates the theology, origins, and development of the cult of saints in early Christianity and the Middle Ages with special attention to its material manifestations. The class combines the examination of thematic issues, such as pilgrimage and the use and function of reliquaries (both portable and architectural), with a focus on such specific cases as the evolution of the cult of the Virgin Mary.

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*), Andrew Goodman (*Microbial Pathogenesis*), Eduardo Groisman (*Microbial Pathogenesis*), Margaret Hosstetter (*Department of 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*), Brett Lindenbach (*Microbial Pathogenesis*), 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*), Ellen F. Foxman (*Laboratory Medicine; Immunobiology*), Stavroula Hatzios (*Molecular, Cellular, and Developmental Biology*), Caroline H. Johnson (*Environmental Health Sciences*), Yelizaveta Konnikova (*Pediatrics/Neonatology*), Maudry Laurent-Rolle (*Infectious Diseases*), Michael P. O'Donnell (*Molecular, Cellular and Developmental Biology*), Craig B. 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.

To enter the Ph.D. program, students apply to the Microbiology track within the interdepartmental graduate program in the Biological and Biomedical Sciences (BBS), <https://medicine.yale.edu/bbs>.

SPECIAL 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

Course work 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.

Courses

MBIO 530a / IBIO 530a / MCDB 530a, Biology of the Immune System Nikhil Joshi, Ann Haberman, Carla Rothlin, Kevin O'Connor, Carrie Lucas, Ellen Foxman, Craig Wilen, Grace Chen, Jeffrey Ishizuka, Markus Müschen, Daniel Jane-Wit, Andrew Wang, David Schatz, Peter Cresswell, Jordan Pober, Joao Pereira, Craig Roy, Joseph Craft, Paula Kavathas, and Noah Palm

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 or b and MBIO 672b 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 Eduardo Groisman

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 Ya-Chi Ho

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 Brett Lindenbach

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

Enrique De La Cruz

Director of Graduate Studies

Mark Solomon (Bass 218, 203.436-9053, mark.solomon@yale.edu)

Graduate Registrar

(Bass 334A, 203.432.5662, mbb.gradregistrar@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, Nigel Grindley (*Emeritus*), Sharon Hammes-Schiffer (*Chemistry*), Mark Hochstrasser, Jonathon Howard, Michael Koelle, Anthony Koleske, William Konigsberg, 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*), Robert Shulman (*Emeritus*), Fred Sigworth (*Cellular and Molecular Physiology; Biomedical Engineering*), Dieter Söll, Mark Solomon, Joan Steitz, Scott Strobel, Kenneth Williams (*Adjunct; Research*), Yong Xiong, Carl Zimmer (*Adjunct*)

Associate Professors Julien Berro, Titus Boggon (*Pharmacology*), Wendy Gilbert, Erdem Karatekin (*Cellular and Molecular Physiology*), Christian Schlieker, Matthew Simon, Seyedtaghi Takyar (*Internal Medicine/Pulmonary*), Yongli Zhang (*Cell Biology*)

Assistant Professors Franziska Bleichert, Allison Didychuk, Lilian Kabeche, Nikhil Malvankar, Wei Mi (*Pharmacology*), Candice Paulsen, Sarah Slavoff (*Chemistry*), 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 B&BS 503, RCR Refresher for Senior BBS 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; this rule was established in 2020 and applies to all students matriculating in 2019 or later. 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 Ronald Breaker and 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

This half-term 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). Counts as 0.5 credit toward graduate course requirements. ½ Course cr

MB&B 520a, Boot Camp Biology Corey O'Hern

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. ½ Course cr

MB&B 523a / CB&B 523a / ENAS 541a / PHYS 523a, Biological Physics Yimin Luo

The course has two aims: (1) to introduce students to the physics of biological systems and (2) to introduce students to the basics of scientific computing. The course focuses on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, protein folding, macromolecular crowding, cell motion, and tissue development using computational tools and methods. Intensive tutorials are provided for MATLAB including basic syntax, arrays, for-loops, conditional statements, functions, plotting, and importing and exporting data.

MB&B 561a / MCDB 561a / PHYS 561a, Modeling Biological Systems I Thierry Emonet

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: (i) gene expression, including the kinetics of RNA and protein synthesis and degradation; (ii) activators and repressors; (iii) the lysogeny/lysis switch of lambda phage; (iv) network motifs and how they shape response dynamics; (v) cell signaling, MAP kinase networks and cell fate decisions; and (vi) 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 Joe Howard

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 or b, Intensive Research for B.S./M.S. Candidates Michael Koelle

Required of students in the joint B.S./M.S. program with Yale College. 2 Course cr

MB&B 591a / ENAS 991a / MCDB 591a / PHYS 991a, Integrated Workshop Corey O'Hern

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. 0 Course cr

MB&B 601b, Principles of Biochemistry II Christian Schlieker 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 / MCDB 602a, Molecular Cell Biology Thomas Melia, Martin Schwartz, Shawn Ferguson, Malaiyalam Mariappan, Nadya Dimitrova, Xiaolei Su, Valerie Horsley, Megan King, Patrick Lusk, Christopher Burd, David Breslow, Shaul Yogeve, and Min Wu

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. Prerequisites: none, but 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).

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 Ronald Breaker, Julien Berro, and Karin Reinisch

This course introduces the theory and application of biochemical and biophysical methods to study the structure and function of biological macromolecules. The course considers the basic physical chemistry required in cellular and molecular biology but does not require a previous course in physical chemistry. One class per week is a lecture introducing a topic. The second class is a discussion of one or two research papers utilizing those methods. Does not count for graduate course credit for BQBS graduate students.

MB&B 635a / ENAS 518a, Quantitative Approaches in Biophysics and Biochemistry Julien Berro and Yong Xiong

The course offers an introduction to quantitative methods relevant to analysis and interpretation of biophysical and biochemical data. Topics covered include statistical testing, data presentation, and error analysis; introduction to dynamical systems; analysis of large datasets; and Fourier analysis in signal/image processing and macromolecular structural studies. The course also includes an introduction to basic programming skills and data analysis using MATLAB. Real data from research groups in MB&B are used for practice. 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 Susan Baserga, Christian Schlieker, Erdem Karatekin, Wendy Gilbert, Candie Paulsen, Gary Brudvig, Mark Solomon, Yongli Zhang, Enrique De La Cruz, and Mark Hochstrasser

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.

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

Determination Jack Zhang

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. ½ Course cr

MB&B 711b / C&MP 711b, Practical cryo-EM Workshop Jack Zhang, 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. ½ Course cr

MB&B 720a, Macromolecular Structure and Biophysical Analysis Yong Xiong and Joe Howard

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 Mark Solomon, Candie Paulsen, Matthew Simon, and Tony Koleske

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 Brett Lindenbach

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, Wendy Gilbert, 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 800a, Advanced Topics in Molecular Medicine Susan Baserga and William Konigsberg

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 and MB&B 901b, Reading Course in Biophysics Mark Solomon

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://mcd.b.yale.edu>
M.S., Ph.D.

Chair

Scott Holley

Director of Graduate Studies

Farren Isaacs

Professors Ronald Breaker, John Carlson, Lynn Cooley,* Craig Crews, Stephen Dellaporta, Thierry Emonet, Paul Forscher, Mark Hochstrasser,* Scott Holley, Vivian Irish, Farren Isaacs, Akiko Iwasaki,* Douglas Kankel, Paula Kavathas,* Haig Keshishian, Mark Mooseker, Anna Pyle, Hugh Taylor*

Associate Professors Shirin Bahmanyar, Damon Clark, Joshua Gendron, Valerie Horsley, Yannick Jacob, Megan King,* Kathryn Miller-Jensen,* Weimin Zhong

Assistant Professors David Breslow, Nadya Dimitrova, Stavroula Hatzios, Yannick Jacob, Binyam Mogessie, Jacob Musser, Sigrid Nachtergaele, Michael O'Donnell, Josien van Wolfswinkel, Jing Yan

Lecturers Robert Bazell, 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 B&BS 503, 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 Ronald Breaker and 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

This half-term 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). Counts as 0.5 credit toward graduate course requirements. ½ Course cr

MCDB 530a / IBIO 530a / MBIO 530a, Biology of the Immune System Nikhil Joshi, Ann Haberman, Carla Rothlin, Kevin O'Connor, Carrie Lucas, Ellen Foxman, Craig Wilen, Grace Chen, Jeffrey Ishizuka, Markus Müschen, Daniel Jane-Wit, Andrew Wang, David Schatz, Peter Cresswell, Jordan Pober, Joao Pereira, Craig Roy, Joseph Craft, Paula Kavathas, and Noah Palm

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 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.

MCDB 560b / C&MP 560b / ENAS 570b / PHAR 560b, Cellular and Molecular Physiology: Molecular Machines in Human Disease Emile Boulpaep

The course focuses on understanding the processes that transfer molecules across membranes at the cellular, molecular, biophysical, and physiological levels. Students learn about the different classes of molecular machines that mediate membrane transport, generate electrical currents, or perform mechanical displacement. Emphasis is placed on the relationship between the molecular structures of membrane proteins and their individual functions. The interactions among transport proteins in determining the physiological behaviors of cells and tissues are also stressed. Molecular motors are introduced and their mechanical relationship to cell function is explored. Students read papers from the scientific literature that establish the connections between mutations in genes encoding membrane proteins and a wide variety of human genetic diseases.

MCDB 561a / MB&B 561a / PHYS 561a, Modeling Biological Systems I Thierry Emonet

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: (i) gene expression, including the kinetics of RNA and protein synthesis and degradation; (ii) activators and repressors; (iii) the lysogeny/lysis switch of lambda phage; (iv) network motifs and how they shape response dynamics; (v) cell signaling, MAP kinase networks and cell fate decisions; and (vi) 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 Joe Howard

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 570b, Biotechnology Craig Crews

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 Staff

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 Corey O'Hern

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 or b and MCDB 596a or b, Intensive Research in MCDB for B.S./M.S. Candidates Staff

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, Molecular Cell Biology Thomas Melia, Martin Schwartz, Shawn Ferguson, Malaiyalam Mariappan, Nadya Dimitrova, Xiaolei Su, Valerie Horsley, Megan King, Patrick Lusk, Christopher Burd, David Breslow, Shaul Yogeve, and Min Wu

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. Prerequisites: none, but 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).

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.

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 Ronald Breaker, Julien Berro, and Karin Reinisch

This course introduces the theory and application of biochemical and biophysical methods to study the structure and function of biological macromolecules. The course considers the basic physical chemistry required in cellular and molecular biology but does not require a previous course in physical chemistry. One class per week is a lecture introducing a topic. The second class is a discussion of one or two research papers utilizing those methods. Does not count for graduate course credit for BQBS graduate students.

MCDB 650a, Epigenetics Yannick Jacob and Josien van Wolfswinkel

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 680a, Advances in Plant Molecular Biology Yannick Jacob, Josh Gendron, and Vivian Irish

The study of basic processes in plant growth and development to provide a foundation for addressing critical agricultural needs in response to a changing climate. Topics include the latest breakthroughs in plant sciences with emphasis on molecular, cellular, and developmental biology; biotic and abiotic plant interactions; development, genomics, proteomics, epigenetics, and chemical biology in the context of plant biology; and the current societal debates about agrobiotechnology.

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, Wendy Gilbert, 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 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, 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 Chenxiang Lin

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 Staff

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 Shirin

Bahmanyar

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, Second-Year Research Staff

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

Brian Kane (Stoeckel, 203.432.2986, dgs.music@yale.edu)

Professors Ardis Butterfield, Richard Cohn, Daniel Harrison, Gundula Kreuzer, Richard Lalli (*Adjunct*), Ian Quinn, Markus Rathey (*Adjunct*), Gary Tomlinson, Michael Veal

Associate Professors Robert Holzer (*Adjunct*), Brian Kane, Braxton Shelley, Anna Zayaruznaya

Assistant Professor Jessica Peritz, Ameera Nimjee, 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 course work, 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 studies (DGS), history and theory students may elect 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 511a, Sounding Contemporary Ameera Nimjee

What does it mean to “sound contemporary”? Conversely, what does “contemporary” sound like? Why does this matter? The premise for this seminar is that making sense of contemporary discourse is an avenue into how and why people make performance, which includes music, dance, and spaces that are created from sound and movement. Course texts and material come from theoretical writings, experiential commentaries, performances, and ethnography, inciting topical study on how contemporary performance interacts and is produced by structures of power, including race, gender, class, and caste. Students are expected to create connections between assigned course materials and topics in class discussions, with the goal of constructing larger dialogues on epistemologies and consequences of sounding contemporary.

MUSI 699a, Proseminar: Musicology Jessica Peritz

A historiographical survey of major topics, issues, and techniques of musicological research. We consider the position of musicology in the broader context of historical thought and provide a conceptual foundation for further work in the field.

MUSI 714b, 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 Brian Kane**MUSI 814a or b, Directed Studies: History of Music** Brian Kane

By arrangement with faculty.

MUSI 829b, Musical Pan-Africanisms Michael Veal

This is a "one book per week" seminar that is structured around book-length studies that use music to examine the post-World War II cultural interactions between cultures of sub-Saharan Africa and the African diaspora.

MUSI 838a, Music and Posthumanism Gary Tomlinson

Several years ago, in an essay positing directions for a musical posthumanism, I wrote that "the posthumanist's aim must be to destabilize the human enclosure, shaping posthumanist theory as something like a novel *type* or *engine* of critique, not another *object* for it" ("Posthumanism," *The Oxford Handbook of Western Music and Philosophy*, 2020). The puzzle of musical posthumanism is a deep one if we are to take seriously this destabilizing move. This seminar investigates from several vantages—transspecies, technological, critical, and philosophical—varieties of musical posthumanism. How has the human organism been technologically and molded to musicking and recorded sound? What might the future of such molding hold, and what role will AI engines play in this? What, conversely, is the posthumanist potential of deep, evolutionary histories of music? What kind of theoretical purchase might enable us to move beyond conventional humanisms in considering music, reaching out to communication systems—putative musics—of nonhuman species? Can we approach in musical posthumanism a universal musicology, parallel to a universal biology? If so, what is the relation of such an approach to a musicology that has been for at least forty years determined to understand human cultural difference and particularity. Readings include, *inter alia*, work by Abbate, Chua and Rehding, Cox, Kane, Steingo, Tomlinson, Trippett, van der Schyff, and Watkins.

MUSI 901b, Music Analysis after Schenker Daniel Harrison

This seminar reexamines techniques of harmonic-contrapuntal analysis first proposed by Heinrich Schenker (1868–1935) and traces them to their sources in historical music theory and pedagogy. In addition, various derivative practices that explicitly addressed limitations in Schenker's aesthetics are appraised (Felix Salzer, et al.), as are the more strenuous critiques (and suggestions for improvement) of his system-concept

(Matthew Brown) and graphical consistency (Steve Larson). All inform a reengineered technique of music analysis.

MUSI 909a, Arts of Fugue Daniel Harrison

The seminar examines theoretical and analytical issues associated with fugal procedures, ca. 1650–1950, with special focus on the work of J.S. Bach. Harmonic-contrapuntal (e.g., Schenker) and hermeneutical (e.g., rhetorical) explorations of individual works are examined and tested, supported by readings modeling both approaches. Work consists of background reading in analysis and history, structural analysis of individual works, and, optionally, the composition of a fugue à 3 on a given subject.

MUSI 914a or b, Directed Studies: Theory of Music Brian Kane

By arrangement with faculty.

MUSI 998a, Prospectus Workshop Lindsay Wright

MUSI 999b, Dissertation Colloquium Ameera Nimjee

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, Jonas Elbousty, Shiri Goren, Randa Muhammed, Dina Roginsky, Farkhondeh Shayesteh, Kathryn Slanski, Orit Yeret

Lecturers and Lectors Ozgen Felek, Agnete Lassen, Gregory Marouard, Jane Mikkelsen, 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 course work, 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. Course work 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 Parker Zane

Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 501b, Elementary Akkadian II Parker Zane

Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 503b, Advanced Akkadian: Akkadian Literary Texts Eckart Frahm

This course focuses on the Babylonian *Erra* Epic.

AKKD 505a, Historical and Archival Texts from First-Millennium Assyria Eckart Frahm

Reading and discussion of inscriptions, letters, and documents pertaining to the history of the Assyrian empire. Prerequisite: knowledge of Akkadian.

AKKD 552b / NELC 552b, Advanced Akkadian: Women in Ancient Mesopotamia
Eckart Frahm

Study and interpretation of historical inscriptions, letters, legal treatises, and religious and literary texts related to the life of women in ancient Mesopotamia.

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 Randa Muhammed

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 Randa Muhammed

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 Sarab Al Ani

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 Sarab Al Ani

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 542b, 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 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) 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: Rihlah Shawkat Toorawa

Study and interpretation of classical Arabic texts for graduate students. The focus this term is on Arabic prose texts.

ARBC 561b, Graduate Arabic Seminar: Scientific Writing Kevin van Bladel

Study and interpretation of classical Arabic texts for graduate students.

ARBC 567a, Modern Arab Writers Muhammad Aziz

Study of novels and poetry written by modern Arab writers, including Taha Hussein, Zaid Dammaj, Hoda Barakat, Nizar Qabbani, al-Maqalih, and Mostaghanimi. Prerequisite: ARBC 504 or permission of the instructor.

EGYP 500a, Introduction to Classical Hieroglyphic Egyptian I Vincent Morel

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 Mike Tritsch

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 510a, Elementary Biblical Coptic I David Baldi

The native Egyptian language in the Roman and Byzantine periods. Thorough grounding in grammar and vocabulary of the Sahidic dialect as a basis for reading biblical, monastic, and Gnostic texts. Credit only on completion of EGYP 520.

EGYP 520b, Elementary Biblical Coptic II Camille Angelo

Continuation of EGYP 510. Prerequisite: EGYP 510.

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 540a, Ancient Egyptian Epistolography John Darnell

Readings (in hieroglyphic and hieratic scripts) of Egyptian letters, from the Old Kingdom through the Third Intermediate Period, including the *Letters to the Dead*, *Kahun Letters*, and *Late Ramesside Letters*.

EGYP 541b, Intermediate Egyptian II: Historical Texts Vincent Morel

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 546b, Old Egyptian: Texts from the Age of the Pyramids Vincent Morel

This course provides an overview of Old Kingdom (c. 2650–2150 BCE) Egypt’s language and material, textual, and religious culture. Students with a solid foundation in Middle Egyptian delve into the grammar of Old Egyptian using primary sources, such as administrative documents, tomb texts (including ideal and event autobiographies, *Reden und Rufe*, and appeals to the living), and *Pyramid Texts*. Lectures cover the unique aspects of Old Kingdom society and culture, and workshops allow students to develop their epigraphy and hieratic knowledge. Prerequisite: Intermediate Egyptian I (EGYP 131/533) or three semesters of Classical Hieroglyphic Egyptian (or permission of the instructor) to enroll in this course. This is considered an L-4 course.

EGYP 590a, Egyptian Coffin Texts John Darnell

Readings of the religious texts of Middle Kingdom coffins. Focus on creation accounts, the Shu texts, spells of transformation, and the *Book of the Two Ways*. Readings in both normalized hieroglyphic transcription and original cursive hieroglyphic writing. Study of coffin panels in the collection of the Yale Art Gallery. Prerequisite: EGYP 501.

EGYP 599a, Directed Readings: Egyptology John Darnell**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 Shiri Goren

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 504a, Advanced Modern Hebrew: Daily Life in Israel Orit Yeret

An examination of major controversies in Israeli society. Readings include newspaper editorials and academic articles as well as documentary and historical material. Advanced grammatical structures are introduced and practiced.

HEBR 506b, Dynamics of Israeli Culture Shiri Goren

The course explores contemporary controversies of Israeli society by examining recent cultural production such as novelistic writing, films, poetry, newspaper articles, new media, advertisement, and television shows. Discussions include migration and the construction of the Sabra character; ethnicity and race: the emergence of Mizrahi voice; women in Israeli society; private and collective memory; minority discourse: Druze, Russian Jews; Israeli masculinity and queer culture. Conducted in Hebrew. Prerequisite: HEBR 502 or permission of the instructor.

HEBR 513a, Intermediate Biblical Hebrew I Staff

A two-term review and continuation of instruction in grammar and vocabulary, supplemented by readings from the Bible. Prerequisite: HEBR 510 or equivalent.

HEBR 514b, Intermediate Biblical Hebrew II Staff

Continuation of HEBR 513.

HEBR 524a / JDST 671a, Creative Writing in Hebrew Orit Yeret

An advanced language course with focus on creative writing and self-expression. Students develop knowledge of modern Hebrew, while elevating writing skills based on special interests, and in various genres, including short prose, poetry, dramatic writing, and journalism. Students engage with diverse authentic materials, with emphasis on Israeli literature, culture, and society.

HEBR 578a / JDST 674a, Languages in Dialogue: Hebrew and Arabic Dina Roginsky

Hebrew and Arabic are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Arabic and Hebrew have been in cultural contact in various places and in different aspects. This advanced Hebrew language class explores linguistic similarities between the two languages as well as cultural comparisons of the communities, built on mutual respect. Students benefit from a section in which they gain a basic exposure to Arabic, based on its linguistic similarity to Hebrew. Conducted in Hebrew. Prerequisite: HEBR 503, or placement test, or permission of the instructor.

NELC 501a, Beginning Sumerian I Klaus Wagensohnner

Introduction to Sumerian language.

NELC 502b, Beginning Sumerian II Klaus Wagensohnner

Continuation of Beginning Sumerian I.

NELC 503a, Advanced Sumerian I Benjamin Foster
Advanced Sumerian course.

NELC 521a, History of Mesopotamia: Third Millennium Benjamin Foster
This course studies the history of the third millennium in Mesopotamia.

NELC 525a, Ancient Mesopotamia: The First Half of History Eckart Frahm
An introduction to the history and culture of the peoples and societies of ancient Iraq, from 3500 BCE to 75 CE, with a focus on Sumer, Babylonia, and Assyria. Students explore the origins of core features of Mesopotamian civilization, many still with us, from writing, literature, law, science, and organized religion to urbanism, long-distance trade, and empire. In addition to secondary sources, readings (all in English) include the Epic of Gilgamesh, the Babylonian Epic of Creation, liver omens from the world's first universal library, cuneiform letters and legal documents, as well as the world's earliest cookbooks, housed in the Yale Babylonian Collection.

NELC 552b / AKKD 552b, Advanced Akkadian: Women in Ancient Mesopotamia
Eckart Frahm
Study and interpretation of historical inscriptions, letters, legal treatises, and religious and literary texts related to the life of women in ancient Mesopotamia.

NELC 576b, Syllabic Sumerian Klaus Wagensohnner
The course deals with Sumerian orthography from different periods and places. The main aim is to look at texts which are written in an orthography different from the mainstream orthography found, e.g., at Nippur. Thus (literary) texts are dealt with, which originate from peripheral sites such as Me-Turan or Susa, and which are often written syllabically. The understanding of such texts without knowledge of versions written in normal orthography is often hampered. The syllabic spellings of Sumerian words in such texts invite comparisons to paratextual remarks such as pronunciation glosses added to literary and lexical texts. A second vantage point is the rich liturgical literature (e.g., lamentations), which is composed in the so-called Emesal register. Apart from Sumerian love songs, the course mainly draws from the corpus of the lamentation singer. A brief glance at the Early Dynastic UD.GAL.NUN orthography will round out the course.

NELC 585b, Imaging Ancient Worlds in Museum Collections Agnete Lassen and Klaus Wagensohnner
What is digitization of cultural heritage? What are its merits, challenges, and best practices? The course highlights the documentation and interpretation of archaeological artifacts, in particular artifacts from Western Asia. The primary goal of the course is the use of new technologies in computer graphics, including 3D imaging, to support current research in archaeology and anthropology. The course does put particular emphasis on the best practices of digitizing artifacts in collections. The prime study subjects are the artifacts housed in the Yale Babylonian Collection. Students engage directly with the artifacts while practicing the various imaging techniques.

NELC 617a, Medieval Arabic Travel Narratives Shawkat Toorawa
We read a selection of medieval Arabic travel accounts – including 'Abd al-Latif al-Baghdadi, Buzurg ibn Shahriyar, al-Gharnati, Ibn Fadlan, Ibn Jubayr, al-Mas'udi, and Sirat Ja'far al-Hajib – and from the body of scholarship on medieval travel. Knowledge of Arabic desirable but not required.

NELC 618a / CPLT 660a, Writing Muslims Shawkat Toorawa

We read and enjoy the works of Leila Aboulela, Nadia Davids, Aisha Gawad, Abdulrazak Gurnah, Manzu Islam, Sorayya Khan, Laila Lalami, Hisham Matar and others, and such films as *My Beautiful Laundrette*, *Surviving Sabu*, and *Ae Fond Kiss*, paying special attention to articulations of displacement, faith, history, identity, and memory. We try to develop an understanding of how the “diasporic” or “expatriate” Muslim writes herself, her world, and her condition. All material in English.

Prerequisite: Undergraduates need instructor's permission to register for this course.

NELC 680a / RLST 680a, Post-Classical Islamic Thought Frank Griffel

Whereas the classical period of Islamic theology and philosophy, with prominent movements such as Mu'tazilism, Ash'arism, *falsafa*, etc., has attracted the bulk of the attention of intellectual historians who work on Islam, research on the period after that has recently caught up and has become one of the most fertile subfields in Islamic studies. This graduate seminar aims to introduce students into the most recent developments in the study of Islam's post-classical period, which begins in the twelfth century in response to the conflict between Avicenna (d. 1037) and al-Ghazali (d. 1111). In this seminar we read Arabic texts by philosophical, theological, and scientific authors who were active after 1120, among them Abu l-Barakat al-Baghdadi (d. c. 1165), al-Suhrawardi (d. c. 1192), Fakhr al-Din al-Razi (d. 1210), Athir al-Din al-Abhari (d. 1265), Qutb al-Din al-Shirazi (d. 1311), or Shams al-Din al-Samarqandi (d. 1322). The reading of primary literature happens hand in hand with the discussion of secondary works on those texts. Class sessions are usually divided into a discussion of secondary literature and a reading of Arabic sources. Prerequisites: reading knowledge of classical Arabic and permission by the instructor.

NELC 731a / ANTH 788a / ARCG 788a, Origins of Ancient Egypt: Archaeology of the Neolithic, Predynastic, and Early Dynastic Periods Gregory Marouard

This seminar is a graduate-level course that examines, from an archaeological and material culture perspective, the origins of the Egyptian civilization from the late Neolithic period (ca. 5500 BC) to the beginning of the Early Dynastic period (ca. 2900–2800 BC). After a progressive change of the Northeastern Africa climate in the course of the sixth millennium BC, the late Neolithic populations regroup within the Nile valley and rapidly settle in several parts of this natural corridor and major axis of communication between the African continent and the Middle East. Strongly influenced by the Saharan or the Levantine Neolithic, two early Egyptian sedentary communities will arise in Lower and Upper Egypt with very distinctive material cultures and burial practices, marking the gradual development of a complex society from which emerge important societal markers such as social differentiation, craft specialization, long-distance exchange networks, emergence of writing, administration and centralization, that will slowly lead to the development of local elites and early forms of kingship controlling proto-kingdoms. From those societies and the consecutive assimilation of both into a single cultural identity, around 3200 BC, some of the main characteristics of the subsequent Egyptian civilization will emerge from this crucial phase of state formation. Most of the major archaeological sites of this period are investigated through the scope of material culture; art; funerary traditions; and the study of large settlement and cemetery complexes using, as much as possible, information from recent excavations and discoveries. This course includes in particular the study of the first Neolithic settlements (Fayum, Merimde, al-Omari, Badari),

the Lower Egyptian cultures (Buto, Maadi, Helwan and the Eastern Delta), the various phases of the Naqada cultures (at Hierakonpolis, Naqada and Ballas, Abydos), and the rise of the state (specifically in Abydos and Memphis areas). This course is suitable for graduate students (M.A. and Ph.D. programs) in the fields of Egyptology, archaeology, anthropology, and ancient history. With instructor and residential college dean approval, undergraduate students with a specialty in Egyptology or archaeology can register. No background in Egyptology is required, and no Egyptian language is taught. This course is the first in a series of chronological survey courses in Egyptian Archaeology.

NELC 744a / ARCG 642a, Ancient Egyptian Materials and Techniques: Their Histories and Socioeconomic Implications Gregory Marouard

This seminar investigates in detail ancient Egyptian materials, techniques, and industries through the scope of archaeology, history, and socioeconomical, textual, and iconographic data. When possible, ethnoarchaeological and experimental approaches of the antique *chaîne-opératoire* are discussed in order to illustrate skills and professions that have now completely disappeared. This class is organized according to various themes within a diachronical approach, from the fourth millennium BCE to the Roman period. Copper and precious metals, construction stones, hard stones and gems, glass and faience production, imported wood or ivory—we explore multiple categories of materials; where and how they were collected or exchanged; the way these products were transported, transformed, refined, or assembled; and the complex organization of the work involved and administration that was required in order to satisfy the tastes of Egyptian elites or their desires to worship their gods. Some other vernacular *savoir-faire* linked to everyday life and death is explored, through food production and mummification practices. The aim is not only to give an overview of the history of techniques for this early civilization but also, beyond how things were made, to acquire a more critical view of ancient Egyptian culture through material culture and the strong economic and sociological implications linked to objects and constructions—rather than the usual focus on Egyptian temples and tombs.

NELC 805a / JDST 670a / PERS 505a, Middle Persian Kevin van Bladel

This one-term course covers the grammar of Middle Persian, focusing on royal and private inscriptions and the Zoroastrian priestly book tradition. Permission of the instructor required.

NELC 806a or b / PERS 506a or b, Manichaean Middle Persian and Parthian Kevin van Bladel

Introduction to reading Middle Persian and Parthian, two different but closely related ancient Iranian languages, in the distinctive script employed by Manichaean scribes. Includes extensive study of the Manichaean religion through original texts and secondary readings.

NELC 841a, Introduction to Classical Persian Jane Mikkelsen

This course provides a concise and complete overview of classical Persian grammar. Designed for advanced undergraduates who intend to use classical Persian as a research language, and presuming no prior knowledge of Persian, the class borrows its method from a recent textbook by E.E. Armand and N.I. Chalisova in which classical Persian is taught from the very first unit through close engagement with premodern primary sources. The class also introduces students to major works of the classical Persian canon and acquaints them with key resources (reference grammars, dictionaries,

encyclopedias, bibliographies) that allow them to read and engage with classical Persian texts in their own research.

NELC 842b, Classical Persian Prose Jane Mikkelsen

This course acquaints students with works of classical Persian prose drawn from a wide range of eras, geographies, and genres. We read selections from theory and philosophy (Neẓāmī ‘Arūzī’s *Four Discourses*, Ebn Sīnā’s *Book of Knowledge*), didactic literature (Sa’dī’s *Golestān*, Rūmī’s *Discourses*), history (Abū’l-Faẓl’s *History of Akbar*), autobiography (Mīr Taqī Mīr’s *Remembrances*), and examples of *enshā’* (letters and state documents). 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; 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 highly flexible functions of premodern Persian prose. Our texts consistently blur hard divisions between history and propaganda, between ethics and aesthetics, and between acts of imagination and acts of state. Ornate and rule-bound, yet with ample scope for experimentation and canniness and boldness of vision, Persian prose emerges as a complex, multiform tradition that is anything but prosaic. Prerequisite: Reading knowledge of Persian (at least 1 term).

OTTM 530b, Reading and Research in Ottoman History and Literature Özgen Felek

This is a text reading course. The course aims to introduce students to a variety of historical and literary Ottoman texts and documents from the fourteenth to nineteenth centuries. We read and analyze excerpts from original Ottoman texts, such as the chronicles, heroic narratives, advice books, physiognomy texts, travel accounts, and hagiographical stories. The students participating in the course develop skills that enable them to read Ottoman Turkish texts and pursue independent work in Ottoman studies. Prerequisite: knowledge of modern Turkish is required.

OTTM 566a, Ottoman Paleography and Diplomats Özgen Felek

The Ottoman Empire, which stretched from North Africa to the Balkans, developed a highly complicated bureaucratic system, bequeathing an enormous amount of documents mainly written in Turkish with Arabic script. This course is a survey of the historical documents of the Ottoman Empire from the fifteenth to the twentieth century. It aims to introduce students to the various types of Ottoman documents and diplomats as well as their features and characteristics. By reading handwritten samples, students develop skills that enable them to understand the morphology and functions of these documents, such as *emr-i şerif*, *berât*, *hatt-ı hümayun*, *telhîs*, *irâde-i şerif*, *mektub*, *kâ’ime*, *hulasa*, *arzuhal*, *mahzar*, *mazbata*, *hüccet*, *i’lâm*, *fetvâ*, *vakfiye*, and *tezkires*. This helps them pursue independent work in Ottoman studies. Prerequisite: knowledge of Modern Turkish or permission of the 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 502b, 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 505a / JDST 670a / NELC 805a, Middle Persian Kevin van Bladel

This one-term course covers the grammar of Middle Persian, focusing on royal and private inscriptions and the Zoroastrian priestly book tradition. Permission of the instructor required.

PERS 506a or b / NELC 806a or b, Manichaean Middle Persian and Parthian Kevin van Bladel

Introduction to reading Middle Persian and Parthian, two different but closely related ancient Iranian languages, in the distinctive script employed by Manichaean scribes. Includes extensive study of the Manichaean religion through original texts and secondary readings.

PERS 580a, Reading Persian Texts Farkhondeh Shayesteh

Students are presented with opportunities to enhance their knowledge of Persian with primary focus on reading skills. The course involves reading, analyzing, and in-class discussion of assigned materials in the target language. Authentic reading excerpts from history, art, philosophy, and literature, as well as art history materials from medieval to modern times are used. This course is taught in Persian. Prerequisite: PERS 503, L4 and/or instructor permission.

PERS 859a, Directed Readings: Persian. Kevin van Bladel**SMTC 523a / RLST 848a, Intermediate Syriac I** Jimmy Daccache

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 Jimmy Daccache

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 547a / RLST 837a, Northwest Semitic Inscriptions: Official Aramaic Jimmy Daccache

Official Aramaic is the *lingua franca* of the Persian Empire during the sixth and fourth centuries BCE. This course is designed to familiarize students with texts from Achaemenid Egypt (the abundant papyri of Elephantine and Hermopolis), Bactria,

Anatolia, and Mesopotamia. The Aramaic grammar is illustrated through the texts.

Prerequisite: RLST 835, or some knowledge of Aramaic or a related Semitic language.

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.

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, Carmen Portillo, David Vlahov

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. The required core courses are: NURS 901, Quantitative Methods for Health Research; NURS 902, Qualitative Methods for Health Research; NURS 903, Measurement of Biobehavioral Phenomena; NURS 904, Mixed Methods Research; NURS 905, Intervention Development and Introduction to Implementation Science; NURS 908, Synthesis of Knowledge and Skills for Nursing Science; NURS 915, Nurse Scientist and Grant Writing; NURS 912, Knowledge Development for Nursing Science; NURS 913, Chronic Conditions: Risk Factors, Prevention, and Management of Adverse Outcomes; NURS 929, Responsible Conduct of Research; NURS 985, Achieving Population Health Equity; BIS 505, Biostatistics in Public Health II; BIS 633, Population and Public Health Informatics; EPH 505, Biostatistics in Public Health; and CDE 534, Applied Analytic Methods in Epidemiology, or S&DS 563, Multivariate Statistical Methods for the Social Sciences.

Cognates may be taken in any area related to the student's dissertation research, including appropriate methodology and statistics courses. It is recommended that one of the four cognates be a health policy course. Some examples of the disciplines that doctoral students have chosen are public health, developmental psychology,

exercise physiology, family and human relations, and sociology. Cognates may include independent study with Ph.D. program faculty.

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 one-and-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

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.

Pharmacology

Sterling Hall of Medicine B316, 203.785.7469
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 M.S., M.Phil., Ph.D.

Chair

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Associate Professors Titus Boggon, Kathryn Ferguson, Ya Ha, Benjamin Turk

Assistant Professors Claudio Alarcón, Assaf Alon, Moitrayee Bhattacharyya, Joel Butterwick, Daryl Klein, Sangwon Lee, Yansheng Liu, Wei Mi

FIELDS OF STUDY

Major emphases in the department are in the areas of molecular pharmacology, mechanisms of drug action, signal transduction, structural biology, neuropharmacology, and chemotherapy.

To enter the Ph.D. program, students should apply to an interest-based track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), <https://medicine.yale.edu/bbs>. Most students interested in a Ph.D. in Pharmacology apply through the Translational Molecular Medicine, Pharmacology, and Physiology (TMMPP) track or the Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BQBS) track.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Because the field of pharmacology encompasses many disciplines, the department's flexible program of study toward the Ph.D. degree permits students to concentrate in areas of their particular interest. Students must take both terms of the graduate seminar course (PHAR 501 and PHAR 502) or equivalents from another department. The other courses will be selected based on each student's interest but must include at least one of the following courses: PHAR 504, PHAR 528, and PHAR 529. Pharmacology students must also take PHAR 540, Developing and Writing a Scientific Research Proposal, in the spring term of their second year. Students are required to do three laboratory rotations in their first year. The Graduate School requires a grade of Honors for a minimum of two courses. Honors for rotations cannot be used toward this requirement. Students must meet the Honors requirement prior to being admitted to candidacy. Students must pass a total of five courses and maintain an overall High Pass

average. A grade of Honors or High Pass is required for the core Pharmacology courses. Student progress toward these goals is reviewed at the end of the second term.

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.

Students are also required to pass the qualifying examination by the end of their fourth term. Before the end of the third year, a thesis prospectus must be submitted and accepted for admission to candidacy. A doctoral dissertation based upon original research includes an oral presentation given only to the pharmacology faculty (pre-defense). 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 be scheduled, followed by a closed examination by the 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 faculty recognizes that some thesis-related work takes a longer time and may not yield anticipated results. As long as the student has made significant progress in parallel experiments, 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 the participation in 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, Seminar in Molecular Medicine, Pharmacology, and Physiology

Susumu Tomita, Titus Boggon, Don Nguyen, and Christopher Bunick
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 covers the molecular mechanisms of therapeutics, which are presented in a conceptual framework to increase understanding but decrease memorization. Topics include (but are not limited to) receptor affinity, efficacy, multiple equilibria, pharmacokinetics, and toxicity; enzyme kinetics and inhibition, drug discovery and design; molecular basis of antimicrobial therapy, cardiology drugs, anticancer and antiviral therapies; and therapeutics for inflammatory disorders, asthma, and allergy.

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 540b, Developing and Writing a Scientific Research Proposal

Mark Lemmon, Moitrayee Bhattacharyya, and David Calderwood
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 560b / C&MP 560b / ENAS 570b / MCDB 560b, Cellular and Molecular

Physiology: Molecular Machines in Human Disease Emile Boulpaep

The course focuses on understanding the processes that transfer molecules across membranes at the cellular, molecular, biophysical, and physiological levels. Students learn about the different classes of molecular machines that mediate membrane transport, generate electrical currents, or perform mechanical displacement. Emphasis is placed on the relationship between the molecular structures of membrane proteins and their individual functions. The interactions among transport proteins in determining the physiological behaviors of cells and tissues are also stressed. Molecular motors are introduced and their mechanical relationship to cell function is explored. Students read papers from the scientific literature that establish the connections between mutations in genes encoding membrane proteins and a wide variety of human genetic diseases.

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

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., M.Phil., Ph.D.

Chair

Paul Franks

Director of Graduate Studies

Sun-Joo Shin (sun-joo.shin@yale.edu)

Professors David Charles, Stephen Darwall, Michael Della Rocca, Keith DeRose, Paul Franks, Tamar Gendler, 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 Daniel Greco, John Pittard

Assistant Professors Robin Dembroff, 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

1. 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 logic (unless the logic 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, David Charles, 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 completed 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 508b, Advanced Introduction to Aesthetics Staff

This course offers an introduction to philosophical aesthetics through a survey of the most important texts the field's history. We begin with ancient philosophy, in particular Plato and Aristotle. Here, we focus on the question of the nature and value of the arts, their relationship to other branches of knowledge and human activity, and, finally, their ethical and political implications. Then we read eighteenth-century Enlightenment authors Hume and Kant, where our focus concerns the rationality of aesthetic judgments. In particular, we consider uniquely modern anxieties concerning "the standard of taste." Can our attitudes towards works of art credibly claim universality and objectivity? Or are they instead reflections of our own utterly contingent historical situation? Moving forward, we turn to the nineteenth century and consider approaches which, in some way, break with Enlightenment rationalism. We begin with Hegel's explicitly historicist and communitarian approach to aesthetics and the philosophy of art, focusing on his conception of the role of art in society, as well as his "end of art" thesis. We also consider the numerous currents of thought that flow into Nietzsche's *Birth of Tragedy*: romantic irrationalism, aestheticism, pessimism, and philhellenism. When we finally turn to the twentieth century, we pursue the afterlife of some of these questions, not only in philosophy but also in theory and criticism. Some attention in this final unit is paid to phenomenology and existentialism, Marxism, pragmatism, modernism in the arts, the crisis of representation, the arts and technology, and new artistic media like photography and film. This course is for graduate students in philosophy. All others should speak with the professor about whether the course is suitable for them.

PHIL 512a, Aristotle's Philosophy of Mind and Action David Charles

The main aim of the course is to understand and assess central aspects of Aristotle's psychological theory, in particular those concerned with perception, memory, and action. We also consider his discussion of the relation between psychological and physical states, processes and properties.

PHIL 515a, Truth and Relativism Zoltan Szabo

Recent philosophical work on relativism and the relationship between truth and objectivity. The possibility of objective truth; rational disagreement; relativism and moral and scientific truth; bases for taking a stand on objectivity's limits.

PHIL 528b, Nozick's Anarchy, State, and Utopia Shelly Kagan

2024 marks the fiftieth anniversary of Robert Nozick's contemporary classic *Anarchy, State, and Utopia* (ASU). ASU is a brilliant and challenging defense of libertarianism – the view in political philosophy that nothing more extensive than a minimal state is morally justified – and it is filled with original, witty, and thought-provoking arguments on a wide range of topics in moral and political philosophy (to list just a few: the nature of well-being, the basis of rights, the state of nature, animal

ethics, property rights, free markets, distributive justice, the nature of coercion, self-defense, and what utopia might be like). The seminar is devoted to reading ASU in its entirety and evaluating its various arguments. Even those who reject Nozick's conclusions—maybe especially those who do so—can profit immensely from working through Nozick's views. Prerequisite: a previous class in moral philosophy or political philosophy.

PHIL 547b, Pleasure in Plato and Aristotle Verity Harte

Pleasure is a central topic of moral psychology. This course focuses on certain central questions and the answers given them by philosophers of Classical Greek antiquity: What is pleasure? Where and how does it fit in animal and human psychology? Where and how does it fit in a good human life? Is pleasure a good, the good, or something else entirely? The main philosophers in focus are Plato and Aristotle, but the hedonist theories of Epicurus and of the Cyrenaic school are points of comparison and contrast. Our reading is supplemented by appropriate material from modern philosophical and psychological discussions of pleasure and of hedonism. All readings in translation. The course is aimed at graduates and advanced undergraduates (seniors and juniors) in philosophy or classics. Priority is given to these students for enrollment if necessary. All participants must have taken at least one prior course in the history of ancient philosophy and at least one other prior course in philosophy. Auditors are expected to attend all seminars, complete all reading assignments and participate in class discussion, but not to complete writing assignments.

PHIL 553a, Practical Reasoning and Metaphysics Michael Della Rocca

An examination of the metaphysical underpinnings of central concepts in the philosophy of practical reasoning. Among the concepts to be investigated are: action, reasons for action, irrational action, intention, the good, the right, virtue, and direction of fit. Exploration of the near-universal dogma that theoretical reasoning and practical reasoning are distinct. Skepticism about the possibility of practical reasoning is taken seriously. Authors discussed include: Anscombe, Korsgaard, Foot, Schapiro, Williams, Michael Smith, Bratman, Frankfurt, Davidson, and Thompson. Prerequisite: two courses 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 575a, Kant's Transcendental Dialectic Eric Watkins

In the "Transcendental Dialectic", which forms the bulk of the second half of the *Critique of Pure Reason*, Kant presents a powerful and sustained critique of traditional metaphysics, one that calls into question claims concerning God, freedom, and the immortality of the soul, among other things. In this seminar, we attempt to understand Kant's conception of metaphysics, how he criticizes these metaphysical claims, and what contemporary significance these criticisms have for the practice of metaphysics today. Prerequisite: previous coursework in philosophy.

PHIL 604a, Leibniz Michael Della Rocca

A close examination of Leibniz's vast, intricate, and still poorly understood philosophical system. Topics to be explored include substance, necessity, freedom, psychology, teleology, and the problem of evil. Attention to relevant philosophical and theological antecedents, including Spinoza, Descartes, Suarez, Aquinas, and Aristotle. Attention also to Leibniz's relevance to contemporary philosophy.

PHIL 620b, Philosophy of Quantum Mechanics Alexander Meehan

An examination of philosophical and theoretical issues raised by quantum mechanics. Topics include the measurement problem, superposition, nonlocality, the various "interpretations" of quantum mechanics, and the status of quantum probability. Along the way, we also touch on broader questions about the aim of scientific theory and the norms governing scientific theory choice.

PHIL 626b, Cognitive Science of Morality Joshua Knobe

Introduction to the emerging field of moral cognition. Focus on questions about the philosophical significance of psychological findings. Topics include the role of emotion in moral judgment; the significance of character traits in virtue ethics and personality psychology; the reliability of intuitions and the psychological processes that underlie them.

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 637a, 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 642b, Language and Power Jason Stanley

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 655a, 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 657b / PLSC 611b, Recent Work on Justice Thomas Pogge

In-depth study of one contemporary book, author, or debate in political philosophy, political theory, or normative economics. Depending on student interest, this might be a ground-breaking new book, the life's work of a prominent author, or an important theme in contemporary political thought.

PHIL 664a, Justice, Taxes, and Global Financial Integrity Thomas Pogge and James Henry

This seminar studies the formulation, interpretation, and enforcement of national and international tax rules from the perspective of national and global economic justice.

PHIL 669b / LING 675b, Pragmatics Laurence Horn

Context-dependent aspects of meaning and inference. Speech act theory, presupposition, implicature. Role of pragmatics in the lexicon and in meaning change. The semantics-pragmatics distinction from different perspectives; the position of pragmatics in linguistic theory.

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 684a, Teleology and Mechanism Paul Franks

Examination of teleology, with special emphasis on Aristotle, Kant, Schelling, and Hegel, as well as recent discussions of invisible hand explanations, which explain the appearance of purposiveness. Additional exploration of conceptions of mechanism, both in the history of modern philosophy and science, and in recent debates about so-called new mechanical philosophy.

PHIL 703b, Philosophy of Law: Analytical Jurisprudence Scott Shapiro

This course examines a variety of historically influential responses to basic questions concerning the nature of law and the difference (if any) between law and morality. Readings include works by legal positivists, natural lawyers, legal realists, and critical legal scholars. PHIL 715 is a companion to this course. The two together comprise a literacy course in the philosophy of law. They can be taken in either order or separately. Neither is a prerequisite for the other, but students seeking a strong background in philosophy of law are encouraged, but not required, to take both. Self-scheduled examination or paper option.

PHIL 705a, First-Year Seminar Keith DeRose and Laurie Paul

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 706a, Work in Progress I Jason Stanley

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 737a / CLSS 737a, Early Greek Philosophers Verity Harte and Brad Inwood

A study in the original language of a selection of early Greek philosophers, with special focus on the Eleatics in light of their influence on later Greek philosophy. We will attend to the sources for these philosophers and to their philosophical interpretation. Open to all graduate students in philosophy or classics who have suitable preparation in ancient Greek and some prior knowledge of ancient philosophy. Others interested in taking or attending the class must have prior permission of the instructors. Undergraduates are not normally admitted.

PHIL 739b, The Cognitive Significance of Small Experience Laurie Paul

We explore, in detail, the philosophical importance of “small experiences”: experiences of some feature of the world that we would normally think of as the backdrop to real experience. Attention to the nature of small experience involves heightened attunement to a feature of our surroundings, bringing the significance of this feature into sharper relief. Attending to small experiences disrupts one’s typical modes of perception. It can give one a fresh ability to attend to details, to appreciate the new, but also to notice absences and to apprehend the texture of those absences. The precise nature of each element or detail is noticed, assessed, and perhaps even celebrated. Importantly, this can change one’s cognitive orientation. Accompanying this change in cognitive orientation is a change in temporal consciousness: short events can seem longer. Time can be experienced differently. To implement this idea, we undertake a case study in Japanese aesthetics: the construction of temple gardens. We are particularly interested in studying the type of balance, contrast, and change exhibited by relationships between plants, objects, and the layout and structure of temple gardens that is on display at change of season. We use this case study to explore a range of philosophical ideas involving the nature of consciousness, aesthetic revelation, and the cognitive import of perceptual experience. Assessment is based on class participation, an in-class presentation, and a final paper.

PHIL 750a, Tutorial Staff

By arrangement with faculty.

PHIL 766b, Imagination Laurie Paul and Timothy Williamson

This course explores philosophical questions about the nature of the imagination, with an emphasis on aspects of its metaphysics and epistemology.

PHIL 850a, Prospectus Tutorial Sun-Joo Shin

Prospectus tutorial for Philosophy Ph.D. students.

Physics

35 Sloane Physics Laboratory, 203.432.3605

<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, Michel Devoret (*Applied Physics*), 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, 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*), Vidvut Ozolins (*Applied Physics*), Ornella Palamara (*Adjunct*), Peter Parker (*Emeritus*), Daniel Prober (*Applied Physics*), Nicholas Read, Peter Schiffer (*Applied Physics*), 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, Yu He (*Applied Physics*), Benjamin Machta, Owen Miller (*Applied Physics*), Ian Moulton, 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 atomic physics and quantum optics; nuclear physics; particle physics; astrophysics and cosmology; condensed matter; biological physics; quantum information physics; applied 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 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

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. 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 their second year of study. Part one is a qualifying event in research consisting of an oral presentation on their research completed during PHYS 990, Special Investigation. Part two is a written qualifying event, taken by all students at the beginning of the third term, consisting of four separate written components on classical mechanics, electromagnetic theory, statistical mechanics, and quantum mechanics. Students take each component; the components are marked and returned to the student, who is expected to correct any errors and resubmit in a week. For subjects the students have not yet encountered in graduate courses, the event serves as a pre-test. It is not a pass/fail exam, but rather a learning milestone. Students may take the written qualifying event before the research qualifying event. Both events must be completed by the end of the student's second year.

Before the end of students' 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 admission 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. Admitted students who fall below this threshold will be required to take an ESL class 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 the fourth term, 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 requirements and have not already received the M.Phil. degree. 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.

Program materials are available upon request to the Director of Graduate Studies, Department of Physics, Yale University, PO Box 208120, New Haven CT 06520-8120; email, stacey.watts@yale.edu (graduatephysics@yale.edu).

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 504b, Modern Physics Measurements Laura Newburgh and Sidney Cahn

A laboratory course with experiments and data analysis in soft and hard condensed matter, nuclear and elementary particle physics.

PHYS 506a, Mathematical Methods of Physics Walter Goldberger

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, renormalization group, irreversible processes, fluctuations.

PHYS 515a, Topics in Modern Physics Research Charles Brown and 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

This half-term 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). Counts as 0.5 credit toward graduate course requirements. ½ Course cr

PHYS 522a, Introduction to Atomic Physics Nir Navon

The course is intended to develop basic theoretical tools needed to understand current research trends in the field of atomic physics. Emphasis is given to laser-spectroscopic methods including laser cooling and trapping. Experimental techniques discussed when appropriate.

PHYS 523a / CB&B 523a / ENAS 541a / MB&B 523a, Biological Physics Yimin Luo

The course has two aims: (1) to introduce students to the physics of biological systems and (2) to introduce students to the basics of scientific computing. The course focuses on studies of a broad range of biophysical phenomena including diffusion, polymer statistics, protein folding, macromolecular crowding, cell motion, and tissue development using computational tools and methods. Intensive tutorials are provided for MATLAB including basic syntax, arrays, for-loops, conditional statements, functions, plotting, and importing and exporting data.

PHYS 524a, Introduction to Nuclear Physics Reina Maruyama

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 David Poland

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 548a / APHY 548a / ENAS 850a, Solid State Physics I Yu He

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 Sohrab Ismail-Beigi

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

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: (i) gene expression, including the kinetics of RNA and protein synthesis and degradation; (ii) activators and repressors; (iii) the lysogeny/lysis switch of lambda phage; (iv) network motifs and how they shape response dynamics; (v) cell signaling, MAP kinase networks and cell fate decisions; and (vi) 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 Joe Howard

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 570b / ASTR 570b, High-Energy Astrophysics Paolo Coppi

A survey of current topics in high-energy astrophysics, including accreting black hole and neutron star systems in our galaxy, pulsars, active galactic nuclei and relativistic

jets, gamma-ray bursts, and ultra-high-energy cosmic rays. The basic physical processes underlying the observed high-energy phenomena are also covered.

PHYS 600a / ASTR 600a, Cosmology Nikhil Padmanabhan

A comprehensive introduction to cosmology at the graduate level. The standard paradigm for the formation, growth, and evolution of structure in the universe is covered in detail. Topics include the inflationary origin of density fluctuations; the thermodynamics of the early universe; assembly of structure at late times and current status of observations. The basics of general relativity required to understand essential topics in cosmology are covered. Advanced undergraduates may register for the course with permission of the instructor.

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 Moulton

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 628a / APHY 628a, Statistical Physics II Meng Cheng

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 Moulton

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 633b / APHY 633b, Introduction to Superconductivity Yu He

The fundamentals of superconductivity, including both theoretical understandings of basic mechanism and description of major applications. Topics include historical overview, Ginzburg-Landau (mean field) theory, critical currents and fields of type II superconductors, BCS theory, Josephson junctions and microelectronic and quantum-bit devices, and high-Tc oxide superconductors.

PHYS 634a / APHY 634a, Mesoscopic Physics I Michel Devoret

Introduction to the physics of nanoscale solid state systems, which are large and disordered enough to be described in terms of simple macroscopic parameters like resistance, capacitance, and inductance, but small and cold enough that effects usually associated with microscopic particles, like quantum-mechanical coherence and/or charge quantization, dominate. Emphasis is placed on transport and noise phenomena in the normal and superconducting regimes.

PHYS 635a, Quantum Entanglement in HEP Keith Baker

Basic principles and applications of quantum entanglement and quantum information science at GeV to TeV energies in particle and nuclear physics are covered. Topics include: quantum superposition, quantum entanglement, entanglement entropy, quantum computing, quantum algorithms, Bell's inequality tests, and quantum sensors.

PHYS 650a / APHY 650a, Theory of Solids I Leonid Glazman**PHYS 670a, Special Topics in Biophysics** Benjamin Machta

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 676a / APHY 676a, Introduction to Light-Matter Interactions Peter Rakich

Optical properties of materials and a variety of coherent light-matter interactions are explored through the classical and quantum treatments. The role of electronic, phononic, and plasmonic interactions in shaping the optical properties of materials is examined using generalized quantum and classical coupled-mode theories. The dynamic response of media to strain, magnetic, and electric fields is also treated. Modern topics are explored, including optical forces, photonic crystals, and metamaterials; multi-photon absorption; and parametric processes resulting from electronic, optomechanical, and Raman interactions.

PHYS 678b, Computing for Scientific Research Larry Gladney

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 679a, Nonlinear Optics and Lasers Logan Wright

Fundamental principles of nonlinear optics and lasers. Nonlinear optical susceptibilities; wave propagation and coupling in nonlinear media; harmonic, sum, and difference frequency generation; parametric amplification and oscillation; phase conjugation via four-wave mixing; self-phase modulation and solitons. Stimulated and spontaneous emission, interaction of two-level atoms with light, optical amplification. Optical resonators and threshold conditions for laser oscillation. Semiclassical laser theory, nonlinear and multi-mode lasing. Noise and quantum effects in lasers (time permitting).

PHYS 691a / APHY 691a, Quantum Optics Shruti Puri

Quantization of the electromagnetic field, coherence properties and representation of the electromagnetic field, quantum phenomena in simple nonlinear optics, atom-field interaction, stochastic methods, master equation, Fokker-Planck equation, Heisenberg-Langevin equation, input-output formulation, cavity quantum electrodynamics, quantum theory of laser, trapped ions, light forces, quantum optomechanics, Bose-Einstein condensation, quantum measurement and control.

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 Corey O'Hern

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

Alexandre Debs

Professors Bruce Ackerman, Akhil Amar (*Law*), Bryan Garsten, Alan Gerber, Jacob Hacker, Gregory Huber, Hélène Landemore, Isabela Mares, Adam Meirowitz, Gerard Padró i Miquel, John Roemer, 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, Sarah Bush, Ana De La O Torres, Alexandre Debs, Kelly Rader

Assistant Professors Alexander Coppock, Allison Harris, John Henderson, Joshua Kalla, Sarah Khan, Christina Kinane, Shiro Kuriwaki, Egor Lazarev, Daniel Mattingly, Salma Mousa, Giulia Oskian, Tyler Pratt, Didac Queralt, Lucia Rubinelli, Fredrik Sävje, 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

Overall program requirements 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 (1) 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. (3) 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.

Course work 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/phd-program/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 P Aronow

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 503b, Theory and Practice of Quantitative Methods P Aronow

This course provides an intensive introduction to the methods used in political science for quantitative empirical inquiry. Topics include: missing data, causal inference, selection on observables, instrumental variables, regression discontinuity designs, and panel (TSCS/longitudinal) data. Prerequisites: PLSC 500, with mathematical training at the level of the math camp, and PLSC 529.

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 508a, Causal Inference and Research Design P Aronow

This seminar exposes students to cutting-edge empirical and statistical research across the social and health sciences, with a focus on topics relevant to causal questions in the domain of political science. Readings and discussions focus on selected methodological topics, such as experimental design, partial identification, design-based inference, network analysis, semiparametric efficiency theory, and qualitative/mixed-methods research. Topics vary from year to year. Statistical training at the level of PLSC 504 is expected, though training in probability theory at the level of S&DS 541 or ECON 550 is suggested.

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 well-posed 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 520b, Advanced Models of Political Economy Ian Turner

This is a second course in Ph.D.-level game theory. The course builds on skills developed in PLSC 518 and focuses on the transition from consumers to producers of theoretical models. Possible topics to be covered include comparative statics, dynamic games, mechanism design, global games, and models of information transmission and persuasion. The course consists of learning new technical skills as well as in-depth study of substantive applications in political economy. Prerequisite: PLSC 518.

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 527a, From Concept to Measure: Empirical Inquiry in Social Science Sarah Khan

This course focuses on a specific aspect of the research design process: the operationalization of abstract into concrete measures that can be used for analysis and inference. The task of operationalization is common to qualitative, quantitative, and mixed-method research, and this course draws on lessons from varied approaches. Readings are divided equally between (1) foundational theoretical texts dealing with broad concepts of interest to social scientists with an interest in politics (including but not limited to identity, norms, preferences, responsiveness, and accountability) and (2) recent approaches to measuring these concepts in the fields of political science, psychology, sociology, and economics. Key assignments include a paper critiquing the measurement strategy and developing an alternative measure in response to an existing study, and an original research proposal. There is flexibility to devote time

to concepts and measurement strategies that are of particular relevance to enrolled students' dissertations/thesis projects, if not already included on the syllabus.

PLSC 530a / S&DS 530a, Data Exploration and Analysis Ethan Meyers

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 536a, Applied Quantitative Research Design Shiro Kuriwaki

Research designs are strategies to obtain empirical answers to theoretical questions. Research designs using quantitative data for social science questions are more important than ever. This class, intended for advanced students interested in social science research, trains students with best practices for implementing rigorous quantitative research. We cover techniques in causal inference, prediction, and missing data, such as fixed effects, time series, instrumental variables, survey weighting, and shrinkage. This is a hands-on, application-oriented class. Exercises involve programming and statistics used in exemplary articles in quantitative social science. The final project advances a research question chosen in consultation with the instructor. Prerequisite: Any statistics or data science course that teaches ordinary least squares regression and p-values, such as DS&S 230. Some past or concurrent experience with a programming language such as R is also presumed. Ph.D. students in political science can join without prerequisite.

PLSC 540a and PLSC 541b, Research and Writing Ana De La O and Christina Kinane

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 Julia Istomina

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 571a, Designing and Reforming Democracy Ian Shapiro and David Froomkin

What is the best electoral system? Should countries try to limit the number of political parties? Should chief executives be independently elected? Should legislatures have powerful upper chambers? Should courts have the power to strike down democratically enacted laws? These and related questions are taken up in this course. Throughout the term, we engage in an ongoing dialogue with the *Federalist Papers*, contrasting the Madisonian constitutional vision with subsequent insights from democratic theory and empirical political science across the democratic world. Where existing practices deviate from what would be best, we also attend to the costs of these sub-optimal systems and types of reforms that would improve them.

PLSC 578a, What is the University? Mordechai Levy-Eichel

The University is one of the most influential – and underexamined – kinds of corporations in the modern world. It is responsible both for mass higher education and for elite training. It aims to produce and disseminate knowledge, and to prepare graduates for work in all different kinds of fields. It functions both as a symbol and repository of learning, if not ideally wisdom, and functions as one of the most important sites of networking, patronage, and socialization today. It is, in short, one of the most alluring and abused institutions in our culture today, often idolized as a savior or a scapegoat. And while the first universities were not founded in the service of research, today's most prestigious schools claim to be centrally dedicated to it. But what is research? Where does our notion of research and the supposed ability to routinely produce it come from? This seminar is a high-level historical and structural examination of the rise of the research university. We cover both the origins and the modern practices of the university, from the late medieval world to the modern day, with an eye toward critically examining the development of the customs, practices, culture, and work around us, and with a strong comparative perspective. Topics include: tenure, endowments, the committee system, the growth of degrees, the aims of research, peer-review, the nature of disciplinary divisions, as well as a host of other issues.

PLSC 579a, Rousseau's Emile Bryan Garsten

A close reading of Jean-Jacques Rousseau's masterpiece, *Emile*. Though the book poses as a guide to education, it has much grander aspirations; it offers a whole vision of the human condition. Rousseau called it his "best and worthiest work" and said he believed it would spark a revolution in the way that human beings understand themselves. Many historians of thought believe that the book has done just that, and that we live in the world it helped to create – a claim we consider and evaluate. Presented as a private tutor's account of how he would arrange the education of a boy named Emile from infancy through young adulthood, the book raises fundamental questions about human nature and malleability; how we learn to be free; whether we can view ourselves scientifically and still maintain a belief in free will; whether we are in need of some sort of religious faith to act morally; how adults and children, and men and women, ought to relate to one another; how the demands of social life and citizenship affect our happiness – and more. Ultimately the question at issue is whether human beings can find a way to live happily and flourish in modern societies.

PLSC 601a / CPLT 610a / GMAN 701a / SOCY 701a, Theories of Freedom: Schelling and Hegel Paul North

In 1764 Immanuel Kant noted in the margin of one of his published books that evil was "the subjection of one being under the will of another," a sign that good was coming to mean freedom. But what is freedom? Starting with early reference to Kant, we study two major texts on freedom in post-Kantian German Idealism, Schelling's 1809 *Philosophical Investigations into the Essence of Human Freedom and Related Objects* and Hegel's 1820 *Elements of the Philosophy of Right*.

PLSC 611b / PHIL 657b, Recent Work on Justice Thomas Pogge

In-depth study of one contemporary book, author, or debate in political philosophy, political theory, or normative economics. Depending on student interest, this might be a ground-breaking new book, the life's work of a prominent author, or an important theme in contemporary political thought.

PLSC 638b, Political Philosophy in a Time of Crisis: Strauss, Berlin, Oakeshott, and Aron Steven Smith

This course examines four giants of twentieth-century political philosophy—Leo Strauss, Isaiah Berlin, Michael Oakeshott, and Raymond Aron—who all wrote under the shadow of totalitarianism. The themes of the course include (but are not limited to) the sources of contemporary anti-liberalism, the revival of political philosophy in an age of positivism, the case for value pluralism, and the role of liberal education in a free society.

PLSC 695b, International Security Staff

This course covers the main theories and problems in international security, including the causes of war; the security dilemma; military effectiveness; coercion and crisis bargaining; nuclear proliferation. Students acquire broad familiarity with the canonical literature in international security and learn how to identify opportunities for new research. The course is designed for master's students in Global Affairs and Ph.D. students in Political Science.

PLSC 698b, International Political Economy Didac Queralt

This course examines how domestic and international politics influence the economic relations between states. It addresses the major theoretical debates in the field and introduces the chief methodological approaches used in contemporary analyses. We focus attention on four types of cross-border flows and the policies and international institutions that regulate them: the flow of goods (trade policy), the flow of capital (financial and exchange rate policy), the flow and location of production (foreign investment policy), and the flow of people (immigration policy).

PLSC 714b, Corruption, Accountable Government, and Democracy Susan Rose-Ackerman

A seminar on the link between corruption, government accountability, and democratic institutions. The seminar draws on research from law, economics, and political science with a comparative focus. Term paper or self-scheduled, take-home examination. Prerequisite: Students interested in the seminar should submit a paragraph to the instructor summarizing their background and expressing interest.

PLSC 721b / ECON 548b, Political Economy of Development Rohini Pande and Gerard Padro

This course analyzes empirically and theoretically the political, institutional, and social underpinnings of economic development. We cover an array of topics ranging from power structures to corruption, state capacity, social capital, conflict, democratization, and democratic backsliding. We focus on recent advances to identify open areas for further research.

PLSC 734a / SOCY 560a, Comparative Research Workshop Philip Gorski

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 746b, The Economics and Politics of Migration Emily Sellars

This course provides an introduction to contemporary social science research on immigration and emigration. Key questions we examine include: (1) Why do people

migrate (or not)? Who migrates and why? Where do people migrate? (2) What are the consequences of migration for migrants and for the broader economy/society? for politics? (3) What is the relationship between migration and conflict? (4) How do different types of migration (for example, female vs. male migration, high-skill vs. low-skill migration, refugee flows vs. “economic” migrants, internal vs. international migrants, etc.) differ and how do those differences matter for public policy? (5) What are some of the methodological challenges associated with measuring and studying migration? (6) What are some of the political challenges associated with creating migration policies? Throughout, we review important methods and theories for the social-scientific study of migration. We also read new work on the research frontier of this topic, drawing on examples from both developed and developing countries across the world. Students have the opportunity to develop their own research projects on the politics and economics of migration.

PLSC 761b, Democracy, Dictatorship, and Regime Change Milan Svolik
Examines key topics, major contributions, and recent advances in the study of democratization, authoritarian politics, and regime change.

PLSC 777a, 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 778b, 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 Wyrzten and Marcela Echeverri Munoz

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 780a, Law and Society in Comparative Perspective Egor Lazarev
This advanced seminar is about the functions of law across historical, political, and cultural contexts. We discuss what is law, why people obey the law, and how societies govern themselves in the absence of strong state legal institutions. The class explores the relationship between law and colonialism as well as the functioning of law under authoritarianism and democracy, and in conflict-ridden societies.

PLSC 783a, Democratic Backsliding Milan Svolik

This class examines the process of democratic backsliding, including its causes and consequences. Our analysis builds on prominent contemporary and historical cases of democratic backsliding, especially Hungary, India, Poland, Russia, and Venezuela. Implications for democratic stability in the United States are considered.

PLSC 798a / AFST 567a, Bureaucracy in Africa: Revolution, Genocide, and Apartheid

Jonny Steinberg

A study of three major episodes in modern African history characterized by ambitious projects of bureaucratically driven change—apartheid and its aftermath, Rwanda's genocide and post-genocide reconstruction, and Ethiopia's revolution and its long aftermath. Examination of Weber's theory bureaucracy, Scott's thesis on high modernism, Bierschenk's attempts to place African states in global bureaucratic history. Overarching theme is the place of bureaucratic ambitions and capacities in shaping African trajectories.

PLSC 800a, Introduction to American Politics Gregory Huber

An introduction to the analysis of U.S. politics. Approaches given consideration include institutional design and innovation, social capital and civil society, the state, attitudes, ideology, econometrics of elections, rational actors, formal theories of institutions, and transatlantic comparisons. Assigned authors include R. Putnam, T. Skocpol, J. Gerrig, J. Zaller, D.R. Kiewiet, L. Bartels, D. Mayhew, K. Poole & H. Rosenthal, G. Cox & M. McCubbins, K. Krehbiel, E. Schickler, and A. Alesina. 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 803b, American Politics III: Institutions Staff

A graduate-level course, open to undergraduates, designed to introduce students to research on American political institutions. We examine different explanations for and models of the sources of institutions, discuss their internal organization and governance, and consider the effects of institutions on outcomes of interest. Topics include alternatives to institutions, agenda-setting models, influences on bureaucratic decisions, the size of government and state building, congressional organization, the presidency, policy feedback and path dependence, and interest groups. Course work includes reading and writing assignments.

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 820b, Rise of Presidentialism in the United States Stephen Skowronek

This course is about the rise and makeshift character of "presidentialism" in the United States. It examines different sources of power that have, singly and in combination, put the presidency at the center of government and politics. These include: (1) popular power: in elections, public opinion, parties, and social movements; and (2) institutional power: in control of the executive branch, military command, and war making. Readings delve into cases in which each of these sources of power figured prominently.

In every particular, the seminar considers the strains that this power has put on the constitutional frame.

PLSC 837b, Gender Politics Andrea Aldrich

Exploration of theoretical and empirical work in political science to study the relationship between gender and politics in the United States and around the world. Topics include women's representation in legislative and executive branch politics in democratic regimes; the impact of gender stereotypes on elections and public opinion; conditions that impact the supply and demand of candidates across genders; and the underrepresentation of women in political institutions.

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 841b / EP&E 336b / PLSC 258b, 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 842a, The Constitution: History, Philosophy, and Law Bruce Ackerman

What are the roots of America's current constitutional crisis? If our system of checks and balances manages to survive, is there a need for fundamental reform? Or will only modest adjustments suffice? In either case, which reforms deserve the highest priority? In this course we consider prospects for future reform in the light of the efforts made by previous generations of Americans—from the Founding through the Reagan Revolution—to confront the constitutional crises of their own times, and how their successes and failures shaped today's predicaments. Some students may, after consulting with the instructor, wish to write a paper that will serve as the basis of further work during the fall term that will merit publication. I am happy to serve as a supervisor for further work during the fall term to encourage students to write an essay worthy of publication and thereby contribute to the ongoing debate over the direction of the reform effort. Self-scheduled examination or paper option.

PLSC 868b / AMST 724b / WGSS 724b, Gender and Sexuality in American Politics and Policy Dara Strolovitch

This seminar familiarizes students with foundational work on and approaches to the study of gender and sexuality in American politics and public policy. It explores empirical work that addresses these topics, a range of theoretical and epistemological approaches to them, and the social scientific methods that have been used to examine them. It explores the history, findings, and controversies in research about gender and sexuality in American politics and political science, examining work within several subfields of American politics (e.g., political development; public law; political behavior; legislative studies; public policy; interest groups and social movements), important work from other disciplines, and research that does not fit neatly into traditional disciplinary categories, paying particular attention to the implications of this "messiness" for the study of gender, sexuality, and politics. We are attentive to the complicated histories of science and social science when it comes to the study of

gender and sexuality and to the ways in which gender and sexuality intersect with other politically relevant categories, identities, and forms of marginalization, such as race, ethnicity, class, and ideological and partisan identification.

PLSC 930a and PLSC 931b, American Politics Workshop Staff

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 Katharine Baldwin, Egor Lazarev, and Jennifer Gandhi

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 Adam Meirowitz

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 Alex Debs and Didac Queralt

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 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

Melissa Ferguson

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 501b, Foundations of Psychology II: Social, Developmental, and Clinical Psychology

Melissa Ferguson

An introduction to graduate-level social, developmental, affective, and clinical psychology for first-year graduate students in psychology. Topics include theories of cognitive development, development of social cognition, and development of concepts and categories. Topics also include attitudes and persuasion, intergroup relations, stereotypes and prejudice, and cultural variation. Topics also include emotions, emotion regulation, models of psychopathology, and psychology and the law. This course serves as the foundation for further study in more advanced graduate courses on specific topics. This course is required for all Psychology Ph.D. students.

PSYC 554a / MGMT 754a, Behavioral Decision-Making II: Judgment

Nathan Novemsky and Ravi Dhar

This seminar examines research on the psychology of judgment. We focus on identifying factors that influence various judgments and compare them to which factors individuals want and expect to drive their judgments. Topics of discussion

include judgment heuristics and biases, confidence and calibration, issues of well-being including predictions and experiences, regret and counterfactuals. The goal is threefold: to foster a critical appreciation of existing research on individual judgment, to develop the students' skills in identifying and testing interesting research ideas, and to explore research opportunities for adding to existing knowledge. Students generally enroll from a variety of disciplines, including cognitive and social psychology, behavioral economics, finance, marketing, political science, medicine, and public health.

PSYC 561a, Algorithms of the Mind Ilker Yildirim

This course introduces computational theories of psychological processes with a pedagogical focus on perception and high-level cognition. Each week students learn about new computational methods grounded in neurocognitive phenomena. Lectures introduce these topics conceptually; lab sections provide hands-on instruction with programming assignments and review of mathematical concepts. Lectures cover a range of computational methods sampling across the fields of computational statistics, artificial intelligence, and machine learning, including probabilistic programming, neural networks, and differentiable programming. Prerequisites: Students must have a programming background, ideally in a high-level programming language such as Python, Julia, or Matlab. Students must also have college-level calculus. The course substantially uses Julia and Python. o Course cr

PSYC 576a, 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 626a, Topics in Law and Psychology Arielle Baskin-Sommers

This class is an introduction to topics in law and psychology. Topics include eyewitness identification; confessions; interrogation; jury decision-making; racism/sexism; media violence; and issues of culpability and mental illness. Enrollment limited to twenty. Self-scheduled examination or paper option. *Note: This course follows the Law School calendar.*

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 684a, Introduction to Psychotherapy: Technique Mary O'Brien

The focus of the seminar is on formulating and conceptualizing psychological problems from a cognitive-behavioral perspective. Special consideration is paid to individual and cultural diversity in conceptualizing cases and planning treatment. Also discussed are

ways in which cognitive-behavioral perspectives can be integrated with other theoretical orientations (e.g., interpersonal theory, experiential therapy).

PSYC 685b, Introduction to Psychotherapy Mary O'Brien

Open only to doctoral students in clinical psychology. This course is designed to prepare students to conduct therapy as clinical scientists. The class blends theoretical and empirical readings with practical training in applying interventions. Evidence-based therapy processes as well as the development of nonspecific therapeutic techniques (such as communicating empathy and structuring therapy sessions) are emphasized so that these skills can be applied across a wide range of client populations and problem presentations. In this second term of the yearlong course we discuss and practice skills related to dialectical behavior therapy (DBT, psycho-educational family therapy with serious mental illness, and three evidence-based approaches to couple therapy: a cognitive behavioral approach taken by John and Julie Gottman, an acceptance-enhanced CBT approach taken by Christensen and Jacobson, and Emotionally Focused couple work by Sue Johnson. The course includes discussion of multicultural and diversity issues as they apply to these therapeutic approaches.

PSYC 689a, Psychopathology and Diagnostic Assessment Mary O'Brien

Didactic practicum for first-year clinical students. Main emphasis is initial assessment. Treatment planning and evaluation of progress also covered. Students first observe and then perform initial interviews. Applicable ethics and local laws reviewed.

PSYC 690b, Ethics, Diversity, Supervision, Consultation, and Professional Practice

Mary O'Brien

Introduction to ethical and legal guidelines for clinical practice. In addition, supervision on diagnostic interview using the Structured Clinical Interview for DSM-IV is provided.

PSYC 695a or b, History of Psychology: Racism and Colonial Power Tariq Khan

This course examines the history of psychology with a focus on racism and colonial power embedded in psychology and the psychological sciences more broadly. Students will grapple with primary and secondary sources which prompt them to think critically about the past and present of psychology and the ways in which systems of race, gender, and class inequality interact with major institutions, systems, and their own research practices. Students will study the historical relationship between the “mind sciences” and the intertwined systems/institutions of white supremacy/racial hierarchy, cisheteropatriarchy, capitalism, empire, and colonialism from the 17th century to the present. Students will also examine the role some psychologists and related scientists and scholars have played in challenging and resisting those same intertwined systems and institutions. This course is interdisciplinary in that, in addition to studying works by psychologists, students will study, analyze, and critique works in other fields – such as history, anthropology, ethnic studies, and postcolonial studies – which are relevant to understanding the historical development of the psychological sciences.

PSYC 702a or b, 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 or b, Current Work in Behavior, Genetics, and Neuroscience Gregory McCarthy

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 or b, Current Work in Developmental Psychology Julian Jara-Ettinger

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 or b, 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 719b, History and Systems in Psychology Arielle Baskin-Sommers

Basic and applied current research on the history and systems in psychology is presented by faculty, visiting scientists, and graduate students and examined in terms of theory, methodology, and ethical and professional implications. Students cannot simultaneously enroll in PSYC 720. Open to clinical psychology graduate students only.

PSYC 720a or b, Current Work in Clinical Psychology Mary O'Brien

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 or b, 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 725a or b, Research Topics in Human Neuroscience Gregory McCarthy

Discussion of current and advanced topics in the analysis and interpretation of human neuroimaging and neurophysiology.

PSYC 727a or b, 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 Goff

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 733a or b, 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 or b, 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 or b, 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 or b, 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 or b, 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 or b, Research Topics in Computation and Cognition Julian Jara-Ettinger

Seminar-style discussion of recently published and unpublished research in cognitive development and computational models of cognition.

PSYC 744a or b, Research Topics in Philosophical Psychology Joshua Knobe

The lab group focuses on topics in the philosophical aspects of psychology.

PSYC 745a or b, 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 or b, 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 or b, 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 or b, 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 or b, Research Topics in Intergroup Relations Jennifer Richeson

Students in this laboratory course are introduced to and participate in social-psychological 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 group 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 or b, 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 or b, 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 or b, Research Topics in Cognitive and Neural Computation Ilker

Yildirim

Lab meetings of the Cognitive & Neural Computation Laboratory at Yale.

PSYC 761a or b, 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 or b, Research Topics in Skill Learning Samuel McDougale

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 or b, 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 or b, 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 or b, 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 or b, 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 or b, 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 or b, 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 778a or b, Research Topics in Clinical and Affective Neuropsychology Hedy Kober

Lab meeting is held once a week throughout the year and is attended by undergraduate and graduate students, research staff, postdoctoral fellows, and other researchers interested in the weekly topics. In a rotating fashion, both internal and external speakers present data and ideas from various research projects, and/or research and methods papers in related areas, including the use of functional magnetic resonance imaging to answer questions in clinical and affective psychology.

PSYC 801a or b, Clinical Internship (Child) Mary O'Brien

Advanced training in clinical psychology with children. Adapted to meet individual needs with location at a suitable APA-approved internship setting.

PSYC 802a or b, Clinical Internship (Adult) Mary O'Brien

Advanced training in clinical psychology with adults. Adapted to meet individual needs with location at a suitable APA-approved internship setting.

PSYC 805a or b, Affective and Developmental Bases of Behavior Mary O'Brien

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 or b, 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 or b, 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 920b, First-Year Research Staff

By arrangement with faculty.

PSYC 923a or b, Individual Study: Theme Essay Staff

By arrangement with faculty.

PSYC 930a or b, Predissertation Research Staff

By arrangement with faculty.

Public Health

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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*), Robert Dubrow, James Dziura (*Emergency Medicine*), Denise Esserman, David Fiellin (*Internal Medicine*), Lynn Fiellin (*General 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, Robert Makuch, I. George Miller (*Pediatrics*), Ruth Montgomery (*Rheumatology*), Linda Niccolai, Marcella Nunez-Smith (*Internal Medicine*), John Pachankis, Elijah Paintsil (*Pediatrics*), A. David Paltiel, Catherine Panter-Brick (*Anthropology*), Rafael Pérez-Escamilla, Melinda Pettigrew, 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*), Jody Sindelar, Andre Sofair (*Internal Medicine*), Donna Spiegelman, Jacob Tebes (*Psychiatry*), Jeanette Tetrault (*General Medicine*), Jeffrey Townsend, Christian Tschudi, Prathibha Varkey (*General Medicine*), Vasilis Vasilou, 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*), Deepa Camenga (*Emergency Medicine*), Xi Chen, Zack Cooper, Forrest Crawford, J. Lucian Davis, Andrew Dewan, Michaela Dinan, Nicole Deziel, Jennifer Edelman (*General Medicine*), Abigail Friedman, Gregg Gonsalves, Nathan Grubaugh, Nicola Hawley, Josephine Hoh, Caroline Johnson, Manisha Juthanki-Mehta (*Infectious Diseases*), Danya Keene, Kaveh Khoshnood, Sarah Lowe, Edward Melnick (*Emergency Medicine*), Jamie Meyer (*Infectious Diseases*), Joan Monin, Chima Ndumele, Ijeoma Opara, Sunil Parikh, 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, Shiyi Wang, Zuoheng (Anita) Wang, Joshua Warren, Melissa Weimer (*General Medicine*), Daniel Weinberger, Inci Yildirim (*Infectious Diseases*), Yize Zhao, Yong Zhu

Assistant Professors Amy Bei, Drew Cameron, Daniel Carrión, Chelsey Carter, Kai Chen, Jen-hwa Chu (*Internal Medicine*), Rachel Dreyer (*Emergency Medicine*), Leah Ferrucci, Laura Forastiere, 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, Michael Kane, Tassos Kyriakides, Michael Leapman (*Urology*), Morgan Levine (*Pathology*), Fan (Frank) Li, Zeyan Liew, Terika McCall, Robert McDougal, Ryan McNeil (*General Medicine*), Carol Oladele (*Internal Medicine*), Carlos Oliveira (*Pediatrics*), Victoria Perez, Kendra Plourde, Tormod Rogne, Brita Roy (*General Medicine*), Yasmmy Salinas, Wade Schultz (*Laboratory Medicine*), Sheela Shenoi (*Internal Medicine*), Jamie Tam, Jacob Wallace, 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 course work 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 course work 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 Course Work

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 (or their equivalents) 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	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 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
HPM 611	¹	1
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
SBS 676	Questionnaire Development	1
S&DS 541	Probability Theory ¹	1
S&DS 565	Introductory Machine Learning	1
or S&DS 665	Intermediate Machine Learning	
S&DS 600	Advanced Probability	1

¹ These courses are strongly recommended.

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 617	Developing a Research Proposal ¹	1
or EMD 625	How to Develop, Write, and Evaluate an NIH Proposal	
CDE 619	Advanced Epidemiologic Research Methods (or alternative course approved by student's adviser)	1
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.

In consultation with their dissertation adviser, students choose three 600-level course units in biostatistics (or equivalent substitutions approved by the student's adviser); CDE 634, Advanced Applied Analytic Methods in Epidemiology and Public Health, and S&DS 563, Multivariate Statistical Methods for the Social Sciences, may serve as an option for 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 507	Environmental Epidemiology	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 619	Research Rotation	1
EHS 620	Research Rotation	1
EPH 505	Biostatistics in Public Health	1
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

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.

Suggested electives (minimum of four 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 Diseases	1
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 545	Molecular Epidemiology	1

EHS 547	Climate Change and Public Health	1
EHS 560	Methods in Climate Epidemiology	1
EHS/CDE 563	Biomarkers of Exposure, Effect, and Susceptibility in the Epidemiology of Noncommunicable Disease	1
EHS/CDE 566	Causal Inference Methods in Public Health Research	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.

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.

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 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
MGT 611	Policy Modeling ¹	4
S&DS 530	Data Exploration and Analysis	1
S&DS 538	Probability and Statistics	1

¹ This course is offered in the School of Management.

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

¹ Two additional courses will be added. Students matriculating in 2023–2024 will take these in their second year.

² Students entering the program with an M.P.H. degree may be exempt.

³ These courses do not count toward the standard number of sixteen courses.

Methods and Statistics: Suggested courses (minimum of four)

BIS 623	Advanced Regression Models	1
BIS 628	Longitudinal and Multilevel Data Analysis	1
ECON 556	Topics in Empirical Economics and Public Policy	1
ECON 558	Econometrics	1
HPM 583	Methods in Health Services Research	1
MGMT 737	Applied Empirical Methods	1
PLSC 500	Foundations of Statistical Inference	1
PLSC 503	Theory and Practice of Quantitative Methods	1
SBS 580	Qualitative Research Methods in Public Health	1
SOCY 580	Introduction to Methods in Quantitative Sociology	1
SOCY 581	Intermediate Methods in Quantitative Sociology	1
SOCY 582	Statistics III: Advanced Quantitative Analysis for Social Scientists	1
S&DS 563	Multivariate Statistical Methods for the Social Sciences	1
S&DS 565	Introductory Machine Learning	1

Health Policy and Management: Suggested courses (minimum of two, all with Ph.D. readings)

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, are required in the student's area of specialization.

Economics: Required courses

ECON 545	Microeconomics	1
ECON 558	Econometrics ¹	1

¹ ECON 558 may count as a methods/statistics course or as a specialization course, but not both.

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

MGMT 758	Foundations of Behavioral Economics	1
PSYC 553	Behavioral Decision-Making I: Choice	1

Industrial Organization

ECON 600	Industrial Organization I	1
ECON 601	Industrial Organization II	1

Labor Economics

ECON 630	Labor Economics	1
ECON 631	Labor Economics	1

Public Finance

ECON 556	Topics in Empirical Economics and Public Policy	1
ECON 680	Public Finance I	1
ECON 681	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 required, selected in consultation with the student's adviser)

PLSC 800	Introduction to American Politics	1
PLSC 801	Political Preferences and American Political Behavior	1
PLSC 803	American Politics III: Institutions	1

Students will also choose one additional elective that will best prepare them for their dissertation research.

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.

Core requirements (All Students)

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

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.

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; CDE 516, Principles of Epidemiology II; CDE 634, Advanced Applied Analytic Methods in Epidemiology and Public Health, and SBS 676, Questionnaire Development, 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 (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	
CDE 634	Advanced Applied Analytic Methods in Epidemiology and Public Health	1
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 Course Work

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 course work 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

A minimum of two of the following biostatistics electives:

BIS 534	Stochastic Models and Inference for the Biomedical and Social Sciences (A minimum of two of the following biostatistics electives:)	1
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 Machine Learning 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 ¹	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 must be approved by the Standard Pathway faculty liaison		

¹ Cannot fulfill elective credit 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
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 510	Data Analysis and Causal Inference ¹	2
MGT 556	Big Data & Customer Analytics ¹	2
MGT 803	Decision Making with Data ¹	2
S&DS 517	Applied Machine Learning and Causal Inference	1
S&DS 530	Data Exploration and Analysis	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 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 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 must 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 Science	1
BIS 679	Advanced Statistical Programming in SAS and R	1
BIS 681	Statistical Practice II ¹	1
EMD 533	Implementation Science	1

¹ A master's thesis is strongly recommended in place of BIS 681 and one elective. 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:

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
HPM 611	¹	1
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
S&DS 565	Introductory Machine Learning	1

Alternative electives must 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

Two of the following biostatistics, computer science, or statistical methods courses

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
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 640	Topics in Numerical Computation	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	1
S&DS 541	Probability Theory ³	1
S&DS 551	Stochastic Processes ⁴	1
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 must 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 Machine Learning 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 567	Topics in Deep Learning: Methods and Biomedical Applications	1
CB&B 663	Deep Learning Theory and Applications	1
CB&B 745	Advanced Topics in Machine Learning and Data Mining	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 538	Probability and Statistics	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 must 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	Introduction to Database Systems	1
MGT 660	Advanced Management of Software Development ²	4

Additional electives must 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.

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 organized by the Biostatistics department.

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 course work 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 628	Longitudinal and Multilevel Data Analysis	1
BIS 630	Applied Survival Analysis	1
CDE 634	Advanced Applied Analytic Methods in Epidemiology and Public Health	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	
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 (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).

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 second-year 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 Machine Learning in Healthcare	1

BIS 620	Data Science Software Systems	1
BIS 621	Regression Models for Public Health	1
BIS 628	Longitudinal and Multilevel Data Analysis	1
BIS 630	Applied Survival Analysis	1
BIS 662	Computational Statistics	1
BIS 691	Theory of Generalized Linear Models	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
CB&B 745	Advanced Topics in Machine Learning and Data Mining	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 582	Current Topics in Applied Machine Learning	1
CPSC 670	Topics in Natural Language Processing	1
EMD 533	Implementation Science	1
EMD 553	Transmission Dynamic Models for Understanding Infectious Diseases	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
MGT 525	Competitive Strategy ¹	4
MGT 534	Personal Leadership ¹	4
MGT 656	Management of Software Development ¹	4
SBS 512	Social Entrepreneurship Lab	1
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 584	Applied Graphical Models	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
S&DS 670	Theory of Deep Learning	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

Frank Griffel

Director of Graduate Studies

Linn Tonstad (*Divinity*)

Professors Joel Baden (*Divinity*), Stephen Davis, Carlos Eire, Steven Fraade, Paul Franks (*Philosophy*), Bruce Gordon (*Divinity*), Frank Griffel, John Hare (*Divinity*), Jennifer Herdt (*Divinity*), Noel Lenski (*Classics*), 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*), Shawkat Toorawa (*Near Eastern Languages and Civilizations*), Miroslav Volf (*Divinity*), Tisa Wenger (*Divinity*), Travis Zadeh

Associate Professors Maria Doerfler, Eric Greene, Zareena Grewal (*American Studies*), Willie Jennings (*Divinity*), Noreen Khawaja, Hwansoo Kim, Todne Thomas

Assistant Professors Supriya Gandhi, Sonam Kachru

Lecturers Jimmy Daccache, Felicity Harley-McGowan (*Divinity*)

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 510b, Method and Theory Noreen Khawaja

Required seminar for doctoral students in Religious Studies. Others admitted with instructor's permission.

RLST 550a / EALL 707a, Translation and Commentary in Early Chinese Buddhism
Eric Greene

This seminar introduces the literary sources relevant for the earliest era of Chinese Buddhism, during the (Eastern) Han and Three Kingdoms period, which primarily consist of early translations of Indian Buddhist literature and a few pioneering Chinese commentaries to them. Largely unstudied by modern scholars owing to their archaic language and vocabulary, these sources document the first recorded intellectual encounters between the Indian and East Asian worlds. Together with a careful reading of a selection of the relevant primary sources, we also take up secondary readings on the history of early Chinese Buddhism and broader works on the problematics of translation and commentary, in the context of China and elsewhere.

RLST 584a / JDST 709, Jewish and Christian Bodies: Ritual, Law, Theory Shraga Bick

This course employs a variety of methodological tools to explore the place and meaning of the body in Judaism and Christianity by examining several central issues related to the body, such as observing the commandment, Martyrdom, illness and death, sexuality and gender, and the performance of rituals.

RLST 598a / EAST 511a, Modern Korean Buddhism from Sri Lanka to Japan

Hwansoo Kim

This course situates modern Korean Buddhism in the global context of the late nineteenth century to the present. Through critical examination of the dynamic relationship between Korean Buddhism and the Buddhisms of key East Asian cities – Shanghai, Tokyo, Taipei, and Lhasa – the course seeks to understand modern East Asian Buddhism in a transnational light. Discussion includes analyzing the impact of Christian missionaries, pan-Asian and global ideologies, colonialism, Communism, capitalism, war, science, hypermodernity, and atheism.

RLST 616b / HIST 603b / JDST 806b / MDVL 603b, How the West Became**Antisemitic: Jews and the Formation of Europe, 800–1500** Ivan Marcus

This seminar explores how medieval Jews and Christians interacted as religious societies between 800 and 1500.

RLST 625a, The Quran Travis Zadeh

Introduction to the study of the Quran. Topics include: the literary, historical, and theological reception of the Quran; its collection and redaction; the scriptural milieu of late antiquity; education and religious authority; ritual performance and calligraphic expression; the diversity of Muslim exegesis.

RLST 630b / AMST 696b / ENGL 906b / ER&M 696b / HSHM 782b / WGSS 696b,**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 twenty-first 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 646b / SAST 670b, Indian Philosophy in Sanskrit Literature Aleksandar Uskokov

In this course we focus on issues of philosophical significance in Sanskrit literature of “nonstandard” philosophical genres, i.e., other than the treatise and the commentary. Specifically we read from canonical Hindu texts such as the Upaniṣads, Mahābhārata, Rāmāyaṇa, Bhāgavata Purāṇa, Bhagavad-gītā, and Yogavāsiṣṭha; the classical genres of drama and praise poetry; and hagiographical literature, all in English translation. Attention is paid not only to substance but also to form. The selection of philosophical problems includes philosophy of mind and personal identity; allegory; the ethics of nonviolence; philosophy, politics, and religious pluralism; the highest good; theodicy; and philosophical debate.

RLST 654a, Biblical Interpretation in Early Christianity Maria Doerfler

Scripture was both the primary focus of early Christians’ literary attentions and the most significant resource for resolving questions of theological, ethical, or practical concern in their communities. Yet Scripture frequently did not speak with sufficient clarity and univocality; it required mediation—in homily, hymn, commentary, and treatise—and, in the process, interpretation and exposition. This course introduces students to a survey of ancient Christian writers’ exegetical efforts from the very beginnings of Christian interpretive activity through the flowering of exegesis across the Roman and Sassanid Empires in the fourth through sixth century.

RLST 675b, Antioch and Dura-Europos Laura Nasrallah

Antioch, a city located in ancient Syria (modern Turkey), and Dura-Europos, a city in Syria (close to the modern Iraqi border) were characterized by religious diversity. From them comes a wealth of stunning mosaics, frescoes, and other archaeological evidence. These, and a rich literary tradition, help us to understand life in the cities. In this seminar we join with students at Princeton University who are taking the same course, to learn about these ancient cities and their social and religious history. Cultural heritage is also addressed. Yale students travel once to Princeton, and Princeton students travel once to New Haven, to learn about the collections that each of our universities has due to early twentieth-century participation in excavations. There, and in our respective universities, we engage in new research into historical reconstructions of Antioch and Dura, focusing on the topic of religion and power, and using literary and material evidence.

RLST 680a / NELC 680a, Post-Classical Islamic Thought Frank Griffel

Whereas the classical period of Islamic theology and philosophy, with prominent movements such as Muʿtazilism, Ashʿarism, *falsafa*, etc., has attracted the bulk of the attention of intellectual historians who work on Islam, research on the period after that has recently caught up and has become one of the most fertile subfields in Islamic studies. This graduate seminar aims to introduce students into the most recent developments in the study of Islam’s post-classical period, which begins in the twelfth century in response to the conflict between Avicenna (d. 1037) and al-Ghazali (d. 1111). In this seminar we read Arabic texts by philosophical, theological, and scientific authors who were active after 1120, among them Abu l-Barakat al-Baghdadi (d. c. 1165), al-Suhrawardi (d. c. 1192), Fakhr al-Din al-Razi (d. 1210), Athir al-Din al-Abhari (d. 1265), Qutb al-Din al-Shirazi (d. 1311), or Shams al-Din al-Samarqandi (d. 1322). The reading of primary literature happens hand in hand with the discussion of secondary works on those texts. Class sessions are usually divided into a discussion of secondary

literature and a reading of Arabic sources. Prerequisites: reading knowledge of classical Arabic and permission by the instructor.

RLST 685a, Islam Today: Modern Islamic Thought Frank Griffel

Introduction to Islamic thought after 1800, including some historical background. The development of Islamic modernism in the nineteenth century and of Islamic fundamentalism in the twentieth. Islam as a reactive force to Western colonialism; the ideals of Shari'a, Islam as a political ideology, and the emergence of Jihad movements. Different kinds of Salafism, Islamic liberalism, and feminism as well as the revival of Islam's intellectual heritage.

RLST 748a, Secularism Kathryn Lofton

An assessment of secularism studies with a focus on the history of its relationship to the history of religions.

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 777b / HIST 590b / JDST 764b / MDVL 590b, Jews in Muslim Lands from the Seventh through the Sixteenth Century Ivan Marcus

Introduction to Jewish culture and society in Muslim lands from the Prophet Muhammad to Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire.

RLST 797b / HIST 597b / JDST 861b, Twentieth-Century Jewish Politics David Sorkin

This seminar explores major aspects of twentieth-century Jewish politics with an emphasis on new forms of political practice.

RLST 819a / AMST 630a / HSAR 529a, 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? Permission of the instructor required; qualified undergraduates are welcome.

RLST 837a / SMTc 547a, Northwest Semitic Inscriptions: Official Aramaic Jimmy Daccache

Official Aramaic is the *lingua franca* of the Persian Empire during the sixth and fourth centuries BCE. This course is designed to familiarize students with texts from Achaemenid Egypt (the abundant papyri of Elephantine and Hermopolis), Bactria, Anatolia, and Mesopotamia. The Aramaic grammar is illustrated through the texts. Prerequisite: RLST 835, or some knowledge of Aramaic or a related Semitic language.

RLST 843b / NELC 582, Intermediate Ugaritic: Mythological Texts Staff

This course completes the introduction to Ugaritic language. Students have the opportunity to improve their knowledge of Ugaritic literature by reading and analyzing texts in the major genres, with special emphasis on mythological texts.

RLST 848a / SMTC 523a, Intermediate Syriac I Jimmy Daccache

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 Jimmy Daccache

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 890a or b, Religion and Modernity Staff

Seminar for doctoral students working at the intersection of religion, philosophy, and politics in modernity. Readings and topics vary from year to year.

RLST 905a, Theology Doctoral Seminar Willie Jennings

Combining seminar and workshop formats, this course explores the themes from Christian theology and especially doctrines of creation in relation to race, decoloniality, and critical geography. Our goal through this exploration is to facilitate an ongoing communal practice of collegial and constructive reading and conversation. Sat/Unsat or Audit only. This is the required seminar for the doctoral program in theology, but doctoral students and faculty in other areas of the religious studies department or in the wider university community may also request permission to attend.

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, Katerina Clark, John MacKay

Associate Professor Marijeta Bozovic, Molly Brunson

Assistant Professors Jinyi Chu, Claire Roosien, Nariman Shelekpayev

Senior Lectors II Irina Dolgova, Constantine Muravnik, Julia Titus

Senior Lectors I Krystyna Illakowicz, Anastasia Selemeneva

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, and the digital humanities.

The Department's primary doctoral track is the Ph.D. in Russian literature and culture, with a strong emphasis on transnational and transmedial approaches. The Department also offers a combined degree in Slavic Languages and Literatures 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 951, 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 literature or culture before the eighteenth century
- Minimum of one course on eighteenth-century Slavic literature or culture
- Minimum of two courses on nineteenth-century Slavic literature or culture
- Minimum of two courses on twentieth-century Slavic literature or culture

- Minimum of one course on twenty-first-century Slavic 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 1st 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 a twelve-hour take-home exam. 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 prospectus to all students and faculty in the department. The prospectus presentation 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 Languages and Literatures 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 Russian literature

and language, 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>.

COURSES

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 609a / CPLT 549a, Memory and Memoir in Russian Culture Jinyi Chu

How do we remember and forget? How does memory transform into narrative? Why do we read and write memoirs and autobiography? What can they tell us about the past? How do we analyze the roles of the narrator, the author, and the protagonist? How should we understand the ideological tensions between official historiography and personal reminiscences, especially in twentieth-century Russia? This course aims to answer these questions through close readings of a few cultural celebrities' memoirs and autobiographical writings that are also widely acknowledged as the best representatives of twentieth-century Russian prose. Along the way, we read literary texts in dialogue with theories of memory, historiography, and narratology. Students acquire the theoretical apparatus that will enable them to analyze the complex ideas, e.g., cultural memory and trauma, historicity and narrativity, and fiction and nonfiction. Students acquire an in-depth knowledge of the major themes of twentieth-century Russian history — e.g., empire, revolution, war, Stalinism, and exilic experience — as well as increased skills in the analysis of literary texts. Students with knowledge of Russian are encouraged to read in the original. All readings are available in English.

RUSS 610a, Academic Russian: Stylistics and Practice Constantine Muravnik

This course is for graduate students and qualified undergraduates who have reached the “advanced mid” level of oral, written, and reading proficiency in Russian and who need to improve their linguistic skills for effective use in research and professional communications, including job interviews. We read sophisticated academic prose in Russian and Eurasian studies, and we discuss it in the target language. Students work with a selection of academic texts by celebrated past and contemporary scholars in the field. Special attention is paid to the formal aspects of academic writing and speaking, as well as to the terminological and linguistic apparatus. Students learn to present on topics of their interest, provide structured responses, construct hypotheses, support

their opinions, and argue their point of view. The course includes an introduction to Russian paleography and prosody that further develops students' oral and aural skills.

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

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 648b, The Russian Nineteenth Century, Remediated and Reimagined Edyta Bojanowska

This is a course about nineteenth-century Russian classics and their enduring potential to provoke and inspire. We study adaptations and transpositions as modes of critical insight into the original works they stage, interpret, and rewrite. How do texts by Pushkin, Gogol, Lermontov, Turgenev, Ostrovsky, Goncharov, Tolstoy, and Leskov, among others, speak to contemporary artists, audiences, and humanists? Focused close readings of the original works are coupled with the new transnational art they generated beyond their time and place in a variety of media (rewritings, transmedial transpositions, television and cinema, performance). Nearly all readings and films are available in the English translation; students with proficiency in Russian are encouraged to read Russian texts in the original.

RUSS 649a, Advanced Research Methods in Nineteenth-Century Russian Culture Molly Brunson

This workshop is intended to serve advanced graduate students in their fourth, fifth, sixth, or seventh year of the Ph.D. program, who are working on topics related to nineteenth-century Russian culture. Students discuss scholarly methods, research practices, and matters of professionalization (including the job market) in small groups or one-on-one with the instructor. Prior permission of the instructor is required.

RUSS 670a / E&RS 618a, Empire in Russian Culture Edyta Bojanowska

Interdisciplinary exploration of Russia's modern imperial culture, especially of the nineteenth century. How did this culture reflect, shape, and challenge imperial reality? How did the multiethnic and multiconfessional empire figure in negotiations of Russian national identity? Other topics include versions of Russian and Soviet Orientalism and colonialism, representations of peripheral regions, relations between ethnic groups, and the role of gender and race in Russia's imperial imagination. Materials combine fiction, poetry, travel writing, painting, and film, with readings in postcolonial studies, history, political science, and anthropology. Most readings are

assigned in translation, although students with a knowledge of Russian are encouraged to read the primary texts in the original; the language of seminar discussions will be English. Students with an interest in comparative studies of empire are welcome.

RUSS 851b, Proseminar in Slavic Literature Molly Brunson

Introduction to the graduate study of Russian literature. Topics include literary theory, methodology, introduction to the profession.

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

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 900a or b, 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

Philip Gorski

Director of Graduate Studies

Jonathan Wrytzen

Professors Julia Adams, Rene Almeling, Jeffrey Alexander, Elijah Anderson, Scott Boorman, Nicholas Christakis, Philip Gorski, Grace Kao, Philip Smith

Associate Professors Emily Erikson, Rourke O'Brien, Jonathan Wrytzen

Assistant Professors Angel Escamilla Garcia, 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 506a / MGMT 734a, Designing Social Research Staff

This is a course in the design of social research. The goal of research design is “to ensure that the evidence obtained enables us to answer the initial [research] question as unambiguously as possible” (de Vaus 2001: 9). A good research design presupposes a well-specified (and hopefully interesting) research question. This question can be stimulated by a theoretical puzzle, an empirical mystery, or a policy problem. With the research question in hand, the next step is to develop a strategy for gathering the empirical evidence that will allow you to answer the question “as unambiguously as possible.”

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 519b, The Sociology of Pierre Bourdieu Philip Gorski

Pierre Bourdieu (1930–2002) was arguably the greatest sociologist since the classical generation of Max Weber and Emile Durkheim. This seminar provides an intensive and critical introduction to Bourdieu's work and to Bourdieusian research. Through an intensive and extensive reading of Bourdieu's own works, empirical applications of his approach by other scholars, and critical consideration of the approach from other viewpoints, students learn what distinguishes Bourdieu's approach from other classical and contemporary versions of sociology and social science; develop a firm and nuanced grasp of his trademark concepts (“habitus,” “capital,” and “field”); and observe how Bourdieu and others have applied them to the analysis of various social fields (class, gender, the state, politics, art and culture), and how his approach might be deepened.

SOCY 534a, Cultural Sociology Yagmur Karakaya

Cultural sociology studies “irrational” meanings in supposedly rational, modern societies. Social meanings are symbolic, but also sensual, emotional, and moral. They can deeply divide nations but also powerfully unite them. They affect every dimension of social life, from politics and markets to race and gender relations, class, conflict, and war. We look at how this cultural approach developed, from counterintuitive writings of Durkheim and Weber a century ago, to the breakthroughs of semiotics and anthropology in midcentury, the creation of modern cultural sociology in the 1980s, and new thinking about social performance and material icons today. As we trace this historical arc, we examine ancient and modern religion, contemporary capitalism, the coronation of Elizabeth II, professional wrestling, Americans not eating horses, the Iraq War, the impeachment of Bill Clinton, Barack Obama’s first presidential campaign, and the new cult of vinyl records.

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 545a, Race, Medicine, and Technology Alka Menon

Medicine and technology are important sources of authority and institutionalization in modern societies. Drawing insights from across sociological subfields and adjacent disciplines, the course offers an in-depth investigation of race, medicine, and technology in the twentieth and twenty-first centuries. This course examines the role of medicine and related technologies in defining race and perpetuating racism. We trace how race became an important component of biomedical research in the United States. We also follow particular medical technologies across borders of time and space, using them to understand race and nationhood in transnational perspective. Taking a broad view of technology, we analyze cutting-edge, state-of-the-art technologies alongside older, more mundane technologies and infrastructures. Ultimately, we consider how medical technologies are not just treatments for individual patients but also windows into broader social and cultural structures and processes.

SOCY 560a / PLSC 734a, Comparative Research Workshop Philip Gorski

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 578a, Logic of Empirical Social Research Rourke O’Brien

The seminar is an intensive introduction into the methodology of the social sciences. It covers such topics as concepts and indicators, propositions and theory, explanation and understanding, observation and measurement, methods of data collection, types of data, units of analysis and levels of variables, research design inference, description and causal modeling, verification and falsification. The course involves both the study of selected texts and the analysis and evaluation of recent research papers.

SOCY 580a, Introduction to Methods in Quantitative Sociology Daniel Karell

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 Daniel Karell

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 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 high-quality 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 Wyrzten and Marcela Echeverri Munoz

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 618a, Managing Blackness in a “White Space” Elijah Anderson

“White space” is a perceptual category that assumes a particular space to be predominantly white, one where black people are typically unexpected, marginalized when present, and made to feel unwelcome—a space that blacks perceive to be informally “off-limits” to people like them and where on occasion they encounter racialized disrespect and other forms of resistance. This course explores the challenge black people face when managing their lives in this white space.

SOCY 620a, Material Culture and the Iconic Consciousness Jeffrey Alexander

How and why do contemporary societies continue to symbolize sacred and profane meanings, investing these meanings with materiality and shaping them aesthetically? Initially exploring such “iconic consciousness” in theoretical terms (philosophy,

sociology, semiotics), the course then takes up a series of compelling empirical studies about food and bodies, nature, fashion, celebrities, popular culture, art, architecture, branding, and politics.

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 Jeffrey Alexander

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 Staff

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 701a / CPLT 610a / GMAN 701a / PLSC 601a, Theories of Freedom: Schelling and Hegel Paul North

In 1764 Immanuel Kant noted in the margin of one of his published books that evil was “the subjection of one being under the will of another,” a sign that good was coming to mean freedom. But what is freedom? Starting with early reference to Kant, we study two major texts on freedom in post-Kantian German Idealism, Schelling's 1809 *Philosophical Investigations into the Essence of Human Freedom and Related Objects* and Hegel's 1820 *Elements of the Philosophy of Right*.

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 (F)

Director of Graduate Studies

Aníbal González-Pérez

Professors Santiago Acosta, Aníbal González-Pérez, K. David Jackson, Nicholas R. Jones, Noël Valis, Jesús Velasco, 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 course work, a grade of Honors in at least two of these courses each year, and a minimum grade average of High Pass. Course work 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 960a, World Cities and Narratives Kenneth David Jackson

Study of world cities and narratives that describe, belong to, or represent them. Topics range from the rise of the urban novel in European capitals to the postcolonial fictional worlds of major Portuguese, Brazilian, and Spanish American cities. Conducted in English.

PORT 967a, Machado de Assis: Major Novels Kenneth David Jackson

A study of the last five novels of Machado de Assis, featuring the author's world and stage of Rio de Janeiro, along with his irony and skepticism, satire, wit, narrative concision, social critiques, and encyclopedic assimilation of world literature.

SPAN 740a / EMST 740a, Ritual and Performance in Colonial Latin America Lisa Voigt

This course investigates how public rituals, ceremonies, and festivals enabled European conquest and evangelization in the Americas, as well as how Indigenous and Afro-descendent groups used ritual and performance to continue their own cultural traditions and to challenge or negotiate with colonial power. We study a range of primary sources—narrative, poetic, theatrical, and pictorial—and consider a variety of cultural practices, including performance, visual art and architecture, dress, music, and dance, in order to address issues of colonality and transculturation in Latin America from 1492 to the eighteenth century.

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 845a / CPLT 606a / FREN 945a, Introduction to Digital Humanities I: Architectures of Knowledge Alexander Gil Fuentes

The cultural record of humanity is undergoing a massive and epochal transformation into shared analog and digital realities. While we are vaguely familiar with the history and realities of the analog record – libraries, archives, historical artifacts – the digital cultural record remains largely unexamined and relatively mysterious to humanities scholars. In this course students are introduced to the broad field of digital humanities, theory and practice, through a stepwise exploration of the new architectures and genres of scholarly and humanistic production and reproduction in the twenty-first century. The course combines a seminar, preceded by a brief lecture, and a digital studio. Every week we move through our discussions in tandem with hands-on exercises that serve to illuminate our readings and help students gain a measure of computational proficiency useful in humanities scholarship. Students learn about the basics of plain text, file and operating systems, data structures and internet infrastructure. Students also learn to understand, produce, and evaluate a few popular genres of digital humanities, including, digital editions of literary or historical texts, collections and exhibits of primary sources and interactive maps. Finally, and perhaps the most important lesson of the term, students learn to collaborate with each other on a common research project. No prior experience is required.

SPAN 867a / AFAM 867a / CPLT 958a / EMST 667a / ER&M 677a, Black Iberia: Then and Now Nicholas Jones

This graduate seminar examines the variety of artistic, cultural, historical, and literary representations of black Africans and their descendants – both enslaved and free – across the vast stretches of the Luso-Hispanic world and the United States. Taking a chronological frame, the course begins its study of Blackness in medieval and early modern Iberia and its colonial kingdoms. From there, we examine the status of Blackness conceptually and ideologically in Asia, the Caribbean, Mexico, and South America. Toward the end of the semester, we concentrate on black Africans by focusing on Equatorial Guinea, sub-Saharan African immigration in present-day Portugal and Spain, and the politics of Afro-Latinx culture and its identity politics in the United States. Throughout the term, we interrogate the following topics in order to guide our class discussions and readings: bondage and enslavement, fugitivity and maroonage, animal imageries and human-animal studies, geography and maps, Black Feminism and Black Queer Studies, material and visual cultures (e.g., beauty ads, clothing, cosmetics, food, Blackface performance, royal portraiture, reality TV, and music videos), the Inquisition and African diasporic religions, and dispossession and immigration. Our challenging task remains the following: to see how Blackness conceptually and experientially is subversively fluid and performative, yet deceptive and paradoxical. This course will be taught in English, with all materials available in the original (English, Portuguese, Spanish) and in English translation.

SPAN 901a / CPLT 904a / FILM 617a / FREN 875a / GMAN 617a, Psychoanalysis:**Key Conceptual Differences between Freud and Lacan I** Moira Fradinger

This is the first section of a year-long seminar (second section: CPLT 914) designed to introduce the discipline of psychoanalysis through primary sources, mainly from the Freudian and Lacanian corpuses but including late twentieth-century commentators and contemporary interdisciplinary conversations. We rigorously examine key psychoanalytic concepts that students have heard about but never had the chance to study. Students gain proficiency in what has been called “the language of psychoanalysis,” as well as tools for critical practice in disciplines such as literary criticism, political theory, film studies, gender studies, theory of ideology, psychology, medical humanities, etc. We study concepts such as the unconscious, identification, the drive, repetition, the imaginary, fantasy, the symbolic, the real, and *jouissance*. A central goal of the seminar is to disambiguate Freud's corpus from Lacan's reinvention of it. We do not come to the “rescue” of Freud. We revisit essays that are relevant for contemporary conversations within the international psychoanalytic community. We include only a handful of materials from the Anglophone schools of psychoanalysis developed in England and the US. This section pays special attention to Freud's “three” (the ego, superego, and id) in comparison to Lacan's “three” (the imaginary, the symbolic, and the real). CPLT 914 devotes, depending on the interests expressed by the group, the last six weeks to special psychoanalytic topics such as sexuation, perversion, psychosis, anti-asylum movements, conversations between psychoanalysis and neurosciences and artificial intelligence, the current pharmacological model of mental health, and/or to specific uses of psychoanalysis in disciplines such as film theory, political philosophy, and the critique of ideology. Apart from Freud and Lacan, we will read work by Georges Canguilhem, Roman Jakobson, Victor Tausk, Émile Benveniste, Valentin Volosinov, Guy Le Gaufey, Jean Laplanche, Étienne Balibar, Roberto Esposito, Wilfred Bion, Félix Guattari, Markos Zafiroopoulos, Franco Bifo Berardi, Barbara Cassin, Renata Salecl, Maurice Godelier, Alenka Zupančič, Juliet Mitchell, Jacqueline Rose, Norbert Wiener, Alan Turing, Eric Kandel, and Lera Boroditsky among others. No previous knowledge of psychoanalysis is needed. Starting out from basic questions, we study how psychoanalysis, arguably, changed the way we think of human subjectivity. Graduate students from all departments and schools on campus are welcome. The final assignment is due by the end of the spring term and need not necessarily take the form of a twenty-page paper. Taught in English. Materials can be provided to cover the linguistic range of the group.

SPAN 936a, Millennials: Twenty-First-Century Latin American Narrative Anibal González-Pérez

This course deals with a new group of Spanish American writers whose breakout works were published early in the twenty-first century. Topics include postnationalism, the Crack and McOndo groups, autofiction, and genre fiction (noir novels, science fiction, horror). Readings of novels and short stories by Mario Bellatín, Roberto Bolaño, Yuri Herrera, Ena Lucía Portela, Guadalupe Nettel, Pedro Mairal, Luis Negrón, Francisco Font Acevedo, Alejandro Zambra, Santiago Gamboa, Fernanda Melchor, and Mariana Enríquez. In Spanish.

SPAN 980a, The Doctoral and Professional Workshop Anibal González-Pérez

A yearlong workshop designed for professional development. The subject matter varies from term to term, and from year to year. Students must attend at least three

complete Modules throughout the year. Graded Satisfactory/Unsatisfactory only; open to all students. Details and schedule are available at <https://span-port.yale.edu/dpw-schedule>.

SPAN 984a, Digital Humanities Practical Workshop Series Alexander Gil Fuentes
Every term, the Department of Spanish and Portuguese and the Humanities Program offers practical workshops in the digital humanities designed for graduate students. Workshops can vary between two-hour individual offerings, to series of two or four workshops on a theme or scholarly toolset. Workshops topics may include text analysis, web scraping and data mining, digital editions and exhibits, dissertation, general academic tech, advanced scholarly (re)search techniques, interactive maps and visualizations for humanistic data, data and project management, privacy and security for scholars, copyright law for digital scholarship, cultural analytics, and more. Workshops and workshop series are also available on demand at the request of four or more graduate students. Yale College students do not earn credit for this course.

SPAN 988a, Iberian Nights Workshop Jesus Velasco
This series is inspired by the spirit of Sheherazade, Dhuoda, Christine de Pizan, Teresa de Cartagena, the *pequeñas mujeres rojas*, and so many others for whom the practice of literature – in many of its facets – was the matter of survival. They existed in circumstances of physical and sexual violence, of civil war, of racial discrimination, of isolation; they also lived in circumstances that cannot be properly expressed outside their own experiments with literature. Our guests write from many directions, for many audiences, for many souls: novels, reviews, the lives of afrodescendent people, dance, race, sexual violences, asylum briefs, and so many other forms of polyhedric writing that explore the limits of literature – and those of survival. They are in conversation about their work, about their thought, and, certainly, about the joys and frustrations of the literary worlds they inhabit. The thirteen nights in the series will be held from September through November. The full schedule of Iberian Nights will be posted on Canvas. Students who would like to receive credit for attending all thirteen sessions of the Iberian Nights series should enroll in this workshop. Graded SAT/UNSAT.

SPAN 990a, Independent Group Study in Digital Humanities Alexander Gil Fuentes
Project-based learning and teams are at the heart of Digital Humanities (DH) pedagogy. Most projects in DH are produced by teams of scholars with complimentary skills and domain expertise, and we learn best how to produce digital scholarship while we are working on tangible outcomes. This independent course of study is designed to allow students to form a team with other graduate students to pursue a research question or sets of questions in the humanities and an appropriate research output for their scholarly project. During the course of their research and digital production, student teams are guided and mentored by an instructor and other relevant professionals at the University. Besides the option for pursuing their own original scholarly project, students may also participate in projects designed by the instructor or other faculty in the Humanities.

SPAN 991a, Tutorial Staff

By arrangement with faculty.

Statistics and Data Science

203.432.0666

<http://statistics.yale.edu>

M.A., M.S., Ph.D.

Chair

Joseph Chang

Directors of Graduate Studies

Andrew Barron (24 Hlh, andrew.barron@yale.edu)

John Emerson (24 Hlh, john.emerson@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/Operations Research*), 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 (*Political Science*), Forrest Crawford (*Biostatistics*), Amin Karbasi (*Electrical Engineering*), Vahideh Manshadi (*School of Management/Operations*), Ethan Meyers (*Visiting*), Sekhar Tatikonda

Assistant Professors Elisa Celis, Zhou Fan, Joshua Kalla (*Political Science*), Roy Lederman, Lu Lu, Fredrik Saye (*Political Science*), Dustin Scheinost (*Radiology and Biomedical Imaging*), 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 strongly recommends that students take S&DS 551 (Stochastic Processes), S&DS 600 (Advanced Probability), S&DS 610 (Statistical Inference), S&DS 612 (Linear Models), S&DS 625 (Statistical Case Studies), S&DS 631 (Optimization and Computation), S&DS 632 (Advanced Optimization Techniques), and S&DS 661 (Data Analysis), and requires that students

take S&DS 626 (Practical Work). 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

M.A. in Statistics

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. Most of the courses for the M.A. in Statistics should be in addition to the requirements of the primary Ph.D. program. 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 501a / E&EB 510a, Introduction to Statistics: Life Sciences Jonathan Reuning-Scherer

Statistical and probabilistic analysis of biological problems, presented with a unified foundation in basic statistical theory. Problems are drawn from genetics, ecology, epidemiology, and bioinformatics.

S&DS 502a, Introduction to Statistics: Political Science Jonathan Reuning-Scherer
Statistical analysis of politics, elections, and political psychology. Problems presented with reference to a wide array of examples: public opinion, campaign finance, racially motivated crime, and public policy. *Note:* S&DS 501–506 offer a basic introduction to statistics, including numerical and graphical summaries of data, probability, hypothesis testing, confidence intervals, and regression. Each course focuses on applications to a particular field of study and is taught jointly by two instructors, one specializing in statistics and the other in the relevant area of application. The first seven weeks are attended by all students in S&DS 501–506 together as general concepts and methods of statistics are developed. The course separates for the last six and a half weeks, which develop the concepts with examples and applications. Computers are used for data analysis. These courses are alternatives; they do not form a sequence, and only one may be taken for credit.

S&DS 503a, Introduction to Statistics: Social Sciences Jonathan Reuning-Scherer
Descriptive and inferential statistics applied to analysis of data from the social sciences. Introduction of concepts and skills for understanding and conducting quantitative research. *Note:* S&DS 501–506 offer a basic introduction to statistics, including numerical and graphical summaries of data, probability, hypothesis testing, confidence intervals, and regression. Each course focuses on applications to a particular field of study and is taught jointly by two instructors, one specializing in statistics and the other

in the relevant area of application. The first seven weeks are attended by all students in S&DS 501–506 together as general concepts and methods of statistics are developed. The course separates for the last six and a half weeks, which develop the concepts with examples and applications. Computers are used for data analysis. These courses are alternatives; they do not form a sequence, and only one may be taken for credit.

S&DS 505a, Introduction to Statistics: Medicine Jay Emerson and Jonathan Reuning-Scherer

Statistical methods relied upon in medicine and medical research. Practice in reading medical literature competently and critically, as well as practical experience performing statistical analysis of medical data. *Note:* S&DS 501–506 offer a basic introduction to statistics, including numerical and graphical summaries of data, probability, hypothesis testing, confidence intervals, and regression. Each course focuses on applications to a particular field of study and is taught jointly by two instructors, one specializing in statistics and the other in the relevant area of application. The first seven weeks are attended by all students in S&DS 501–506 together as general concepts and methods of statistics are developed. The course separates for the last six and a half weeks, which develop the concepts with examples and applications. Computers are used for data analysis. These courses are alternatives; they do not form a sequence, and only one may be taken for credit.

S&DS 506a, Introduction to Statistics: Data Analysis Robert Wooster and Jonathan Reuning-Scherer

An introduction to probability and statistics with emphasis on data analysis. *Note:* S&DS 501–506 offer a basic introduction to statistics, including numerical and graphical summaries of data, probability, hypothesis testing, confidence intervals, and regression. Each course focuses on applications to a particular field of study and is taught jointly by two instructors, one specializing in statistics and the other in the relevant area of application. The first seven weeks are attended by all students in S&DS 501–506 together as general concepts and methods of statistics are developed. The course separates for the last six and a half weeks, which develop the concepts with examples and applications. Computers are used for data analysis. These courses are alternatives; they do not form a sequence, and only one may be taken for credit.

S&DS 530a / PLSC 530a, Data Exploration and Analysis Ethan Meyers

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 540a, An Introduction to Probability Theory Robert Wooster

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 Yihong Wu

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, Theory of Statistics Andrew Barron

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 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 580a, Neural Data Analysis Ethan Meyers

We discuss data analysis methods that are used in the neuroscience community. Methods include classical descriptive and inferential statistics, point process models, mutual information measures, machine learning (neural decoding) analyses, dimensionality reduction methods, and representational similarity analyses. Each week we read a research paper that uses one of these methods, and we replicate these analyses using the R or Python programming language. Emphasis is on analyzing neural spiking data, although we also discuss other imaging modalities such as magneto/electro-encephalography (EEG/MEG), two-photon imaging, and possibility functional magnetic resonance imaging data (fMRI). Data we analyze includes smaller datasets, such as single neuron recordings from songbird vocal motor system, as well as larger

data sets, such as the Allen Brain observatory's simultaneous recordings from the mouse visual system.

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 610a, Statistical Inference Harrison Zhou

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, Statistical Case Studies Brian Macdonald

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 627a, 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

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 645b / CB&B 645b, Statistical Methods in Computational Biology Hongyu Zhao

Introduction to problems, algorithms, and data analysis approaches in computational biology and bioinformatics. We discuss statistical issues arising in analyzing population genetics data, gene expression microarray data, next-generation sequencing data,

microbiome data, and network data. Statistical methods include maximum likelihood, EM, Bayesian inference, Markov chain Monte Carlo, and methods of classification and clustering; models include hidden Markov models, Bayesian networks, and graphical models. Offered every other year. Prerequisite: S&DS 538, S&DS 542, or S&DS 661. Prior knowledge of biology is not required, but some interest in the subject and a willingness to carry out calculations using R is assumed.

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 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-to-statistical 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 690a, Independent Study Jay Emerson

By arrangement with faculty. Approval of DGS required.

S&DS 700a, Departmental Seminar Staff

Presentations of recent breakthroughs in statistics and data science. o Course cr

Translational Biomedicine

Boyer Center for Molecular Medicine 254D, 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*), Kristen Brennard (*Psychiatry*), Angelique Bordey (*Neurosurgery*), Lloyd Cantley (*Internal Medicine/Nephrology; Physiology*), Keith Choate (*Dermatology*), Marie Egan (*Pediatrics; Cellular and Molecular Physiology*), Fred Gorelick (*Internal Medicine/Digestive Diseases; Cell Biology*), Jaime Grutzendler (*Neurology*), David Hafler (*Immunology; Neurology*), Erica Herzog (*Pathology; Pulmonary, Critical Care, and Sleep Medicine*), Mustafa Khokha (*Genetics; Pediatrics*), Diane Krause (*Cell Biology; Laboratory Medicine; Pathology*), Mark Lemmon (*Pharmacology*), Ruth Montgomery (*Epidemiology; Pathology*), David Zenisek (*Cellular and Molecular Physiology; Ophthalmology*)

Associate Professors Emanuela Bruscia (*Pediatric Pulmonology, Allergy, Immunology and Sleep Medicine*), Christopher Bunick (*Dermatology*), Monique Hinchcliff (*Rheumatology*), Richard Kibbey (*Cellular and Molecular Physiology; Internal Medicine/Endocrinology*), Megan King (*Cell Biology; Molecular, Cellular, and Developmental Biology; Therapeutic Radiology*), Don Nguyen (*Pathology*), Renato Polimanti (*Psychiatry*), Katerina Politi (*Pathology*), Aaron Ring (*Immunobiology*), Faye Rogers (*Therapeutic Radiology*), Kurt Schalper (*Medical Oncology; Pathology*)

Assistant Professors Vikas Gupta (*Internal Medicine/Endocrinology; Digestive Diseases*), Brian Hafler (*Ophthalmology; Pathology*), Liza Konnikova (*Neonatal-Perinatal Medicine*), Emily Olsson (*Child Study Center*), Jason Sheltzer (*Surgery Oncology; Genetics*)

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 4 modules (1 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 covers the molecular mechanisms of therapeutics, which are presented in a conceptual framework to increase understanding but decrease memorization. Topics include (but are not limited to) receptor affinity, efficacy, multiple equilibria, pharmacokinetics, and toxicity; enzyme kinetics and inhibition, drug discovery and design; molecular basis of antimicrobial therapy, cardiology drugs, anticancer and antiviral therapies; and therapeutics for inflammatory disorders, asthma, and allergy.

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 604b / CBIO 604b, Physiologic Function and Cellular Structure of Organ Systems Agnes Vignery

Introduction to the organization and function of cells within complex multicellular systems as encountered in the human body. Covers major tissues and organs as well as the cardiovascular, immune, and nervous systems, with special emphasis on the molecular and cellular bases of developmental processes and human diseases. Lectures supplemented by electronic-based tutorials on the histology of tissues and organs.

PTB 605b, Grantsmanship and Preparing Training Award Applications Megan King

This course is designed to further refine an existing draft of a research and training proposal in the structure of an NIH F31 application in preparation for submission. In addition to providing peer and mentored feedback on the scientific proposal, this course focuses on the preparations of other materials required for the F31 application, including development of a statement of training goals. While students ineligible (or not intending) to apply for an F31 are welcome to participate (and indeed transferable skills in scientific writing and goal setting will benefit all PhD students), the course is structured to prepare an F31 application for the April F31 deadline. Required for Ph.D. Students in the Program in Translational Biomedicine.

PTB 610a / C&MP 610a and C&MP 611b, Medical Research Scholars Program: Mentored Clinical Experience George Lister, Richard Pierce, and Yelizaveta Konnikova

The goals of the course are to introduce MRSP students to aspects of clinically important human diseases. Students explore each disease over three one-and-one-half-hour sessions led by a clinician-scientist who is an expert in the relevant organ system. Students explore two disease processes per term. The first of the three sessions is devoted to a discussion of the clinical presentation, natural history, pathology, epidemiology, treatment, and prognosis of the disease process. During this session students have the opportunity to view gross or microscopic specimens of diseased tissue in association with members of the Pathology faculty. Students are assigned readings in pathology, pathophysiology, and clinical texts to prepare for the first class session.

The second session focuses on translational aspects of the disease process. Students read and present papers relevant to the molecular basis of the disease and cutting-edge approaches to its therapy. In the third session students meet with patients who have experienced the disease and/or visit and explore facilities associated with diagnosis and treatment of the disease process. Prior to the third session students receive guidance as to what they will observe and how to approach the experience; and at the end of the session, the group discusses its thoughts and impressions. Students are expected to prepare for sessions, to participate actively, and to be scrupulously respectful of patients and patient facilities.

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

Susumu Tomita, Titus Boggon, Don Nguyen, and Christopher Bunick

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.

Acting Chair

Regina Kunzel

Director of Graduate Studies

Dara Strolovitch

Professors Fatima El-Tayeb, Roderick Ferguson, Scott Herring, Margaret Homans, Regina Kunzel, Gail Lewis (*Visiting*), Dara Strolovitch, Kalinda Vora, Laura Wexler

Associate Professors Joseph Fischel, Deb Vargas

Assistant Professors Eda Pepi, Evren Savci

Senior Lecturer Maria Trumpler

Lecturers Craig Canfield, Igor De Souza, Graeme Reid, Talya Zemach-Bersin

Affiliated faculty Julia Adams (*Sociology*), Rene Almeling (*Sociology*), Carol Armstrong (*History of Art*), Daniel Botsman (*History*), Claire Bowerman (*Linguistics*), Marijeta Bozovic (*Slavic Languages and Literatures*), Daphne Brooks (*African American Studies; American Studies; Theater and Performance Studies*), Jill Campbell (*English*), Becky Conekin (*History*), Rohit De (*History*), Carolyn Dean (*History; French*), Robin Dembroff (*Philosophy*), Crystal Feimster (*African American Studies; American Studies*), Marta Figlerowicz (*English; Comparative Literature*), Moira Fradinger (*Comparative Literature*), Jacqueline Goldsby (*English; African American Studies; American Studies*), Gregg Gonsalves (*School of Medicine; Law School*), Zareena Grewal (*American Studies*), Sarah Khan (*Political Science*), Jennifer Klein (*History*), Greta LaFleur (*American Studies*), Kathryn Lofton (*American Studies; Religious Studies*), Lisa Lowe (*American Studies; Ethnicity, Race, and Migration*), Mary Lui (*American Studies; History*), Alka Menon (*Sociology*), Joanne Meyerowitz (*American Studies; History*), Alice Miller (*Law School; Public Health*), Laura Nasrallah (*Religious Studies*), Tavia Nyong'o (*African American Studies; American Studies; Theater and Performance Studies*), Sally Promey (*American Studies; Religious Studies*), Ayesha Ramachandran (*Comparative Literature*), Ana Ramos-Zayas (*Ethnicity, Race, and Migration; American Studies*), Judith Resnik (*Law School*), Juno Richards (*English*), Naomi Rogers (*History of Science and Medicine*), Alicia Schmidt Camacho (*Ethnicity, Race, and Migration; American Studies*), George Syrimis (*Hellenic Studies*), Linn Tonstad (*Divinity School*), Michael Warner (*English*), Elisabeth Wood (*Political Science*)

FIELDS OF STUDY

The Program in Women's, Gender, and Sexuality Studies (WGSS) offers a combined Ph.D. in conjunction with five departments and programs: African American Studies, American Studies, Anthropology, English, and Sociology. Students pursuing the combined Ph.D. in WGSS will determine their research and doctoral foci in

coordination with the directors of graduate studies in WGSS and the partnering department or program.

Women's, Gender, and Sexuality Studies 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, nationality, religion, ability, and other zones of human and nonhuman experience.

There are no specified areas of study within the combined Ph.D. program, but students whose research interests overlap with WGSS faculty's are encouraged to apply. 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 may only apply for the Ph.D. in WGSS in conjunction with their application to one of the five partnering departments or programs (African American Studies, American Studies, Anthropology, English, and Sociology). The doctoral program in WGSS will begin reviewing external applications in fall 2021 for matriculation in fall 2022.

REQUIREMENTS FOR TRANSFER INTO THE COMBINED PH.D. PROGRAM

Students already pursuing a Ph.D. in one of the five partnering departments and programs listed above may apply for transfer into the combined Ph.D. in WGSS, starting in fall 2021.

Students must have already taken WGSS 600 and WGSS 900 or be enrolled in them during the term of application and submit a statement of interest describing why they wish to pursue the combined Ph.D. The statement of interest should outline a plan of completion for outstanding WGSS course requirements.

Only students in the first or second year of their degree study are eligible to apply, and preference will be given to second-year students. Students must submit their statement of interest by January 4. The WGSS graduate admissions committee will inform applicants of its decision by March 5.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The WGSS combined Ph.D. student's course of study and research will be coordinated with the student's adviser, the director of graduate studies (DGS) of WGSS, and the DGS of the partnering department or program. Ideally, students should complete course work for WGSS and the partnering department or program by the end of their second year. Students are required to complete the following core 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); and one WGSS-numbered elective.

Students are strongly encouraged to take WGSS 800, *Methods in Gender and Sexuality Studies*.

In their third year, students will enroll in a term-long dissertation proposal workshop.

WGSS combined Ph.D. students will teach or serve as a teaching fellow in their third and fourth years in the program, unless their dissertation research plans require other arrangements. The courses will typically have undergraduate WGSS numbers.

Students will be admitted to candidacy when they have fulfilled all requirements of the relevant participating department or program and WGSS. The scheduling and structure of qualifying examinations will follow the protocols of the partnering department.

At least one member of the WGSS faculty or affiliated faculty will be a member of the dissertation proposal review committee; at least one faculty member of the student's dissertation committee will hold a primary, tenure, or tenure-track appointment in WGSS.

Students pursuing the combined Ph.D. with African American Studies In addition to fulfilling the course work—twelve courses over two years, including core WGSS and AFAM courses—and the teaching requirements for each program, students must also: (1) demonstrate proficiency in a language other than English by conducting substantial research in the chosen language as part of a course requirement; passing a translation test, offered each term by various language departments; or 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; and (2) pass an oral examination at the end of their third year, jointly administered by four faculty selected by the student (with at least one faculty member in African American Studies and another in WGSS). The oral exam will test on four content areas selected by the student in the student's second year of study.

Students pursuing the combined Ph.D. with Anthropology In the beginning of their second year, students should consult with directors of graduate studies in WGSS and Anthropology to coordinate the written and oral components of the qualifying exams.

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 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 high-quality 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 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 anti-blackness) 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 666b / AMST 778b / ANTH 666b / ER&M 762b, The Study of Privilege in the Americas Ana Ramos-Zayas

Examination of inequality, not only through experiences of the poor and marginal, but also through institutions, beliefs, social norms, and everyday practices of the privileged. Topics include critical examination of key concepts like "studying up," "elite," and "privilege," as well as variations in forms of capital; institutional sites of privilege (elite prep schools, Wall Street); living spaces and social networks (gated communities, private clubs); privilege in intersectional contexts (privilege and race, class, and gender); and everyday practices of intimacy and affect that characterize, solidify, and promote privilege.

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

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 twenty-first 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 Evren Savci

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 704b / AMST 704b / ENGL 886b, War and Everyday Life Sunny Xiang

This course thinks together two spatiotemporal phenomena that appear opposed: war and everyday life. Why is war generally thought of as an exceptional phenomenon, a climactic event that disrupts the quotidian rhythms of the everyday? And why does everyday life so often appear parceled off from war, a placid domestic realm that soldiers depart from and return to? The study of war is often a masculine, muscular endeavor. This course's turn to the methodologies that are guided by feminist, anti-imperialist, and anti-racist critique allows us to better contemplate how militaristic logics shape everyday life and how anti-militarism might be lived at the level of daily practices. This notion of everyday militarisms is both the impetus and the frame for our engagement of the special collections at Yale Library. As an impetus, lived experience of militarism requires us to account for our specific institutional location. What has Yale's role been in war-making and empire-building? How might we analyze our own experiences at Yale and in the historical present with these flashpoints in mind? An attunement to the more quotidian aspects of militarisms also provides an alternate frame for rethinking wartime events that may at the outset seem extraordinary or exceptional. What might it mean to understand nuclear bombs, forced migrations, and environmental disasters as ordinary crises? What do people's day-to-day experience of such crises look like? To approach such questions from different angles and at different scales, we need to consult primary source materials in tandem with an array of interdisciplinary scholarship. Considered together, these course materials help us contemplate why everyday wars tend to go undetected—whether because of new kinds of weapons, war crimes that pass as governance, the time lag of slow violence, or the representational norms of popular culture. Of course, the militarization of daily life looks different depending on one's geographical, historical, social, and disciplinary orientation. So, even though the course tries to assemble a range of materials and examples, it reflects the instructor's orientation as an Americanist scholar of twentieth-century transpacific culture and politics. But the assessment of everydayness is a matter of perception and perspective in a more general sense as well. How does militarism hide in plain sight, and for whom is it hidden? Throughout the term, the power relations embedded in discerning and analyzing everyday militarisms require us to bring an added layer of critical self-reflection to all our research endeavors.

WGSS 724b / AMST 724b / PLSC 868b, Gender and Sexuality in American Politics and Policy Dara Strolovitch

This seminar familiarizes students with foundational work on and approaches to the study of gender and sexuality in American politics and public policy. It explores empirical work that addresses these topics, a range of theoretical and epistemological approaches to them, and the social scientific methods that have been used to examine them. It explores the history, findings, and controversies in research about gender and sexuality in American politics and political science, examining work within several subfields of American politics (e.g., political development; public law; political behavior; legislative studies; public policy; interest groups and social movements), important work from other disciplines, and research that does not fit neatly into traditional disciplinary categories, paying particular attention to the implications of this “messiness” for the study of gender, sexuality, and politics. We are attentive to

the complicated histories of science and social science when it comes to the study of gender and sexuality and to the ways in which gender and sexuality intersect with other politically relevant categories, identities, and forms of marginalization, such as race, ethnicity, class, and ideological and partisan identification.

WGSS 730b / HIST 943b / HSHM 736b, Health Politics, Body Politics Naomi Rogers

A reading seminar on struggles to control, pathologize, and normalize human bodies, with a particular focus on science, medicine, and the state, both in North America and in a broader global health context. Topics include disease, race, and politics; repression and regulation of birth control; the politics of adoption; domestic and global population control; feminist health movements; and the pathologizing and identity politics of disabled people.

WGSS 734b / AMST 780b / HIST 734b, Class and Capitalism in the Twentieth-Century United States Jennifer Klein

Reading course on class formation, labor, and political economy in the twentieth-century United States; how regionalism, race, and class power shaped development of American capitalism. The course reconsiders the relationships between economic structure and American politics and political ideologies, and between global and domestic political economy. Readings include primary texts and secondary literature (social, intellectual, and political history; geography).

WGSS 783a / FREN 958a, Social Mobility and Migration Morgane Cadieu

The seminar examines the representation of upward mobility, social demotion, and interclass encounters in contemporary French literature and cinema, with an emphasis on the interaction between social class and literary style. Topics include emancipation and determinism; inequality, precarity, and class struggle; social mobility and migration; the intersectionality of class, race, gender, and sexuality; labor and the workplace; homecomings; mixed couples; and adoption. Works by Nobel Prize winner Annie Ernaux and her peers (Éribon, Gay, Harchi, Linhart, Louis, NDiaye, Taïa). Films by Cantet, Chou, and Diop. Theoretical excerpts by Berlant, Bourdieu, and Rancière. Students have the option to put the French corpus in dialogue with the literature of other countries. Conducted in French.

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 Dara Strolovitch

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

WGSS 908b / ENGL 908b, Queer and Trans Archives Juno Richards

This course offers an introduction to archival theory and methods, with a particular emphasis on the archival turn in queer and trans studies now. Most broadly, we survey major currents in the theorization of the archive, moving through the material afterlives of slavery and colonialism to draw out questions of recovery, reparation, erasure, ephemerality, bureaucracy, and over-abundance. More specifically, the arc of the course branches into three major currents. The first highlights queer and trans authors whose collections are housed in the Beinecke Library, including Richard Bruce Nugent, Langston Hughes, Gertrude Stein, and James Baldwin. The second current turns to queer and trans archives that have been digitized, including a wide range of periodicals, photographs, scrapbooks, and newsletters now available online. Finally, a third current tracks fictional and cinematic works that reimagine or incorporate the archive as an object of knowledge, including Isaac Julien's *Looking for Langston* (1989) and Shola von Reinhold's *Lote* (2020).

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

Michael Hunter (*East Asian Languages and Literatures*)

Nadine Moeller (*Near Eastern Languages and Civilizations*)

Steering Committee Maria Doerfler (*Religious Studies*), Steven Fraade (*Religious Studies; Judaic Studies*), Milette Gaifman (*Classics; History of Art*), Felicity Harley-McGowan (*Divinity*), Michael Hunter (*East Asian Languages and Literatures*), Andrew Johnston (*Classics*), Edward Kamens (*East Asian Languages and Literatures*), Noel Lenski (*Classics; History*), Susan Matheson (*Yale Art Gallery*), Laura Nasrallah (*Divinity*), James Patterson (*Classics*), Kevin van Bladel (*Near Eastern Languages and Civilizations*), Jacqueline Vayntrub (*Divinity*)

GRADUATE CERTIFICATE IN THE STUDY OF ANCIENT AND PREMODERN CULTURES AND SOCIETIES

Archaia, the Yale Program for the Study of Ancient and Premodern Cultures and Societies, aims to bring together faculty and students sharing an interest in antiquity and the premodern. It supplements the curriculum with seminars, conferences, and special lectures by scholars from Yale as well as visiting scholars, and offers a graduate certificate. Students with an interest in Archaia should apply to one of the University's degree-granting 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 wide-ranging 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. The certificate in Archaia is open to Yale Ph.D. students and to students at the Divinity School.

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

1. A team-taught Core Seminar—or, in special cases, an approved alternative seminar—introducing students to issues in the study of antiquity and the premodern world, 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).
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 2023–2024 Core Seminar, “Ancient Musical Thought from Homer to Confucius,” will be taught by Pauline LeVen (*Classics*) and Mick Hunter (*East Asian Languages and Literatures*). 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 and 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 Yale Combined Program in the Biological and Biomedical Sciences (BBS) offers unprecedented access to Yale's extensive array of bioscience resources, encompassing everything the University has to offer in one comprehensive, interdisciplinary graduate program. BBS has no boundaries, either departmental or geographical. Students therefore have access to courses, seminars, and faculty labs in every department. Moreover, students can participate in research activities anywhere – on the main University campus, West Campus, or the School of Medicine.

Within BBS there are approximately 425 participating faculty, several dozen courses, and a great many seminars from which to choose. BBS is currently divided into eight interest-based “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)

Students apply to and, upon matriculation, affiliate with one of these eight tracks. It is important to note that, regardless of a student's home track, all courses, faculty, and research opportunities at the University remain available.

Year 1 Each track has a faculty director who helps first-year students select courses and find suitable lab rotations. Students typically take two to three courses per term and conduct two to four lab rotations over the course of the year.

Year 2 Prior to the start of the second year, students select a thesis adviser in whose lab they will conduct their doctoral research. They also then leave their BBS track and formally join one of twelve Ph.D.-granting programs:

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 2 complete the course requirements for the graduate program they have joined, take a qualifying exam, act as teaching assistants in lecture or lab courses, and begin thesis research.

Year 3 and beyond Students focus primarily on thesis research, publishing their results, and presenting their work at scientific meetings.

The median time to degree is 5.7 years.

For the duration of their studies all students receive a stipend, full tuition, and health coverage. Financial support comes from Yale University Fellowships, National Institutes of Health (NIH) training grants, and research grants from foundations and companies.

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 course requirements, and <https://peb.yale.edu> for more information about the benefits of this program and application instructions.

COURSES

B&BS 640a / PATH 640a, Developing and Writing a Scientific Research Proposal

Rui Chang

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 Experimental Pathology. Registration allowed by prior authorization from course directors only.

B&BS 680b / IMED 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.

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 CIRTLL 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 CIRTLL 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.

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)

Faculty associated with the program 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 Paul Sabin and Sunil Amrith

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

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 Okiihiro (*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 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 journal-length 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

John Durham Peters

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, sounds, words and data, the Film and Media Studies Program gives students the tools necessary to grapple with the decisive media of the past century and more: 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 courses from American Studies to the History of Art, from Comparative Literature to Slavic, 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 at Yale. Its aim is to provide graduate students in other programs, departments, and divisions the opportunity to develop and demonstrate a degree of competence in the history and theory of film and media.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE IN FILM AND MEDIA STUDIES

Students must enroll in (1) FILM 601 (Foundations of Film and Media), (2) FILM 605 in the Fall and FILM 606 in the Spring (The FMS Certificate Workshop), and (3) two elective courses. The Fall and Spring Workshops meet both collectively and individually and are designed to support the student individually in their specific needs and interests and in their path toward the final paper. Attendance at the events organized by the FMS Program, including Rough Cut, is strongly recommended.

Requirements will be approved by the DGS of FMS and the DGS of the student's degree department, and an FMS adviser. A plan for fulfilling the requirements will be worked out in the advance, in consultation with all three of the above. A student may apply to count a course they took during their first year.

Applications to the Certificate are due by May 15 of each year and are based on a letter of interest to be sent to the DGS of FMS and the potential Adviser.

Completion of the certificate comes with fulfilling the Certificate comes with fulfilling all requirements, including the completion of the final paper, and a summary of the student's activities, as approved by the FMS Adviser.

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.

CERTIFICATE WORKSHOP

FILM 605	Film and Media Studies Certificate Workshop
FILM 606	Film and Media Studies Certificate Workshop

Graduate School of Arts and Sciences (GSAS)

Summer Programs

<http://gsas.yale.edu>

Dean

Lynn Cooley

The Graduate School offers two courses, GSAS 901c and GSAS 902c, to support summer training through practical internships. For the summer of 2023, 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 one-page 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 Torres, Heather Gerken, Gregory Huber, Grace Kao, Jennifer Richeson, Anthony Smith, Ebonya Washington, Steven Wilkinson

The Institution for Social and Policy Studies (ISPS) facilitates interdisciplinary social science inquiry on important public policy subjects in order to advance research, shape policy, and educate the next generation of policy thinkers and leaders. To achieve these ends, ISPS sponsors high-level conferences, interdisciplinary faculty seminars, targeted research projects on key policy issues, graduate and undergraduate fellowship programs, and postdoctoral appointments.

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. Today, ISPS hosts a number of major programs, including the Center for the Study of American Politics; ISPS Health, a University-wide health policy center; and the Behavioral Research Lab, which conducts rigorous research in a controlled setting. These programs organize many of their activities through ISPS's Policy Lab, a space for policy-oriented events, research, and collaboration. ISPS also supports the Program in Ethics, Politics, and Economics; and the Yale Interdisciplinary Center for Bioethics.

Our commitment to training students for future leadership centers around our three fellowship programs: Dahl Scholars and Director's 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.

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.

International Security Studies

31 Hillhouse Avenue, 203.432.1912

<https://jackson.yale.edu/iss/>

Director

Arne Westad (*History; Global Affairs*)

International Security Studies (ISS) is a research hub of the Jackson School of Global Affairs. It is dedicated to the study of international history, grand strategy, and global security. It currently convenes scholars and practitioners around the following program areas:

- Brady-Johnson Program in Grand Strategy
- Johnson Center for the Study of American Diplomacy
- Schmidt Program on Artificial Intelligence, Emerging Technologies, and National Power
- America, China, and Eurasia Program
- Maritime and Naval Studies Program
- Africa Security Program
- Nuclear Security Program

Although ISS is not a degree-granting program, it organizes a wide array of extracurricular activities open to all members of the Yale community, including lectures, dinner debates, conferences, symposia, workshops, and discussion groups. ISS also offers fellowships to postdoctoral scholars, predoctoral students, and members of the U.S. Armed Forces, and provides competitive summer grant funding to students.

ISS faculty members, fellows, and affiliates write and teach about numerous aspects of international history and world affairs. Their interests range from geopolitics and economics to international and foreign area studies. They are driven by an interest in understanding the genealogy of modern times and developing holistic, comprehensive ways of thinking about the twenty-first century.

Inquiries should be directed to iss@yale.edu. Further information on ISS can be found at <https://jackson.yale.edu/iss>.

Jewish Studies

Humanities Quadrangle, Rm. 423, 203.432.0843

<http://judaicstudies.yale.edu>

Chair

Elli Stern

Director of Graduate Studies

Elli Stern [F]

David Sorkin [Sp]

Professors Joel Baden (*Divinity*), Steven Fraade (*Emeritus, Religious Studies*), Paul Franks (*Philosophy*), Christine Hayes (*Emeritus, Religious Studies*), Hannan Hever (*Comparative Literature*), Nancy Levene (*Religious Studies*), Ivan Marcus (*History; Religious Studies*), Samuel Moyn (*Law*), Paul North (*German*), Maurice Samuels (*French*), David Sorkin (*History*), Elli Stern (*Religious Studies; History*), Katie Trumpener (*Comparative Literature; English*), Laura Wexler (*Women's, Gender, and Sexuality Studies; American Studies*)

Associate Professors Marci Shore (*History*), Jacqueline Vayntrub (*Divinity*)

Senior Lecturer Peter Cole (*Comparative Literature*)

Senior Lecturer II Shiri Goren (*Near Eastern Languages & Civilizations*)

Senior Lecturer I Dina Roginsky (*Near Eastern Languages & Civilizations*)

Lectors Josh Price (*German*), Orit Yeret (*Near Eastern Languages and Civilizations*)

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://judaicstudies.yale.edu>.

COURSES

For course offerings in the Hebrew language and in Israeli society and culture, see Near Eastern Languages and Civilizations.

JDST 670a / NELC 805a / PERS 505a, Middle Persian Kevin van Bladel

This one-term course covers the grammar of Middle Persian, focusing on royal and private inscriptions and the Zoroastrian priestly book tradition. Permission of the instructor required.

JDST 671a / HEBR 524a, Creative Writing in Hebrew Orit Yeret

An advanced language course with focus on creative writing and self-expression. Students develop knowledge of modern Hebrew, while elevating writing skills based on special interests, and in various genres, including short prose, poetry, dramatic writing, and journalism. Students engage with diverse authentic materials, with emphasis on Israeli literature, culture, and society.

JDST 674a / HEBR 578a, Languages in Dialogue: Hebrew and Arabic Dina Roginsky

Hebrew and Arabic are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Arabic and Hebrew have been in cultural contact in various places and in different aspects. This advanced Hebrew language class explores linguistic similarities between the two languages as well as cultural comparisons of the communities, built on mutual respect. Students benefit from a section in which they gain a basic exposure to Arabic, based on its linguistic similarity to Hebrew. Conducted in Hebrew. Prerequisite: HEBR 503, or placement test, or permission of the instructor.

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 764b / HIST 590b / MDVL 590b / RLST 777b, Jews in Muslim Lands from the Seventh through the Sixteenth Century Ivan Marcus

Introduction to Jewish culture and society in Muslim lands from the Prophet Muhammad to Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire.

JDST 806b / HIST 603b / MDVL 603b / RLST 616b, How the West Became Antisemitic: Jews and the Formation of Europe, 800–1500 Ivan Marcus

This seminar explores how medieval Jews and Christians interacted as religious societies between 800 and 1500.

JDST 861b / HIST 597b / RLST 797b, Twentieth-Century Jewish Politics David Sorkin

This seminar explores major aspects of twentieth-century Jewish politics with an emphasis on new forms of political practice.

JDST 862a / CPLT 644a, The Betrayal of the Intellectuals Hannan Hever

The target of the seminar is to clarify the concept of the intellectual and its political and literary uses during the twentieth and twenty-first centuries. The point of departure

is Julien Benda's influential book, *The Betrayal of the Intellectuals* (1927). Benda defines two kinds of intellectuals: the particularists, who are specifically committed to country, party, and economic issues – later thought of as the arena of “identity politics” – and the universalists, committed to more general humanist values. What makes one an intellectual? Does becoming an intellectual depend on specific historical, social, cultural, literary, and political conditions? Is being an intellectual a matter of “talking truth to power” in accordance with universalist values? The course looks at a variety of definitions of what constitutes an intellectual, based on approaches such as Benda's notion of the betrayal of the particularist intellectual, or postcolonial intellectualism. The course then looks at the specificity of intellectualism as it appears in certain contexts through readings from Martin Luther King, Jr., Abraham Joshua Heschel, Jean-Paul Sartre, George Orwell, Naguib Mahfouz, Frantz Fanon, Eleanor Roosevelt, James Baldwin, Angela Davis, Martin Buber, Edward Said, Antonio Gramsci, Herbert Marcuse, and Toni Morrison. Open to undergraduates with permission of the instructor.

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 1–3 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 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.

Students will also be required to complete at least one of the four optional modules (Module 4: Communication; Module 5: Leadership and Teamwork; Module 6: Self-Management; Module 7: 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 seven 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:

1. 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>

Chair

Hwansoo Kim (*Religious Studies*)

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 twenty-five 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 Studies

Chair

Edyta Bojanowska (*Slavic Languages & Literatures*)

Director of Graduate Studies

Marci Shore (*History*; marci.shore@yale.edu, 203.432.6792)

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. 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 Studies by fulfilling a supplementary curriculum. The undergraduate major in Russian and East European 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 languages and literatures; economics; history; journalism; policy; political science; law; music; sociology and other social sciences.

GRADUATE CERTIFICATE OF CONCENTRATION IN EUROPEAN STUDIES

Yale graduate students may pursue the Graduate Certificate of Concentration in European 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 Studies

1. Minimum L4 language proficiency in one modern European language, in addition to English. Students wishing to focus on Russia and East Europe must demonstrate knowledge of Russian or an East European 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-related issues
 - b. For students focusing on Russia and East Europe, 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 and East Europe.
3. A qualifying thesis paper is required to demonstrate field-specific research ability focused on the area of concentration. After completing substantial course work in the area of concentration, students must seek approval from the council faculty adviser. The thesis should be interdisciplinary as well as focused on the area of concentration. The acceptability of an M.A. thesis needs to be approved by the council adviser. More guidelines are provided by the council.
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 mail 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 & 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 & 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

Others Jane Edwards (*Sr. Associate Dean, Yale College; Dean, International & Professional Experience*), María José Hierro Hernández (*Lecturer, Political Science*), Jana Krentz (*Librarian, Latin American & Iberian Collections, Latinx Studies*), Florencia Montagnini (*Sr. Research Scientist, School of the Environment*), Maria Saez Marti (*Sr. Lector, 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.

Course work 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 & Civilizations*), Stephen Davis (*Religious Studies*), Owen Fiss (*Emeritus; Law*), Steven Fraade (*Religious Studies*), Eckart Frahm (*Near Eastern Languages & Civilizations*), Frank Griffel (*Religious Studies*), Dimitri Gutas (*Emeritus; Near Eastern Languages & 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 & Civilizations*), Robert Nelson (*Emeritus; History of Art*), Catherine Panter-Brick (*Anthropology*), Kishwar Rizvi (*History of Art*), Maurice Samuels (*French*), Shawkat Toorawa (*Near Eastern Languages & Civilizations*), Kevin van Bladel (*Near Eastern Languages & Civilizations*), Harvey Weiss (*Near Eastern Languages & 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 Wyrzten (*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, & Sexuality Studies*), Claire Roosien (*Slavic Languages & Literatures*), Evren Savci (*Women's, Gender, & Sexuality Studies*)

Senior Lecturers and Lecturers Leslie Gross-Wyrzten, Tolga Köker (*Economics*), Nicholas Lotito (*Political Science*), Emma Sky (*Global Affairs*), Kathryn Slanski (*Near Eastern Languages & 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; on leave*)

Acting Chair

Rohit De (*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*), Kalyanakrishnan Sivaramakrishnan (*Anthropology*), Shyam Sunder (*School of Management*), 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 Subhashini Kaligotla (*History of Art*), Sarah Khan (*Political Science*), Priyasha Mukhopadhyay (*English*)

Senior Lecturer Carol Carpenter (*School of the Environment*)

Senior Lector Swapna Sharma (*Hindi*)

Lector Aleksandar Uskokov (*Sanskrit*)

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

SAST 670b / RLST 646b, Indian Philosophy in Sanskrit Literature Aleksandar Uskokov

In this course we focus on issues of philosophical significance in Sanskrit literature of “nonstandard” philosophical genres, i.e., other than the treatise and the commentary. Specifically we read from canonical Hindu texts such as the Upaniṣads, Mahābhārata, Rāmāyaṇa, Bhāgavata Purāṇa, Bhagavad-gītā, and Yogavāsiṣṭha; the classical genres of drama and praise poetry; and hagiographical literature, all in English translation. Attention is paid not only to substance but also to form. The selection of philosophical problems includes philosophy of mind and personal identity; allegory; the ethics of nonviolence; philosophy, politics, and religious pluralism; the highest good; theodicy; and philosophical debate.

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 520b / LING 525b, Introductory Sanskrit II Aleksandar Uskokov

Continuation of SKRT 510/LING 515. Focus on the basics of Sanskrit grammar; readings from classical Sanskrit texts written in the Indian Devanagari script. Prerequisite: SKRT 510/LING 515.

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 556a, Advanced Sanskrit: Readings in Philosophical Poems Aleksandar Uskokov

The purpose of this course is to introduce Sanskrit philosophical works, broadly construed, written in verse. The focus of the course ranges from highly aestheticized narrative literature that makes philosophical points and often includes philosophical instruction (for instance, the *Yogavāsiṣṭha*); over philosophical sections of the epics (*Mahābhārata*), *Purāṇas* (*Viṣṇu*, *Bhagavata*), and medieval literature (*Adhyātma Rāmāyaṇa*); through praise poetry with philosophical significance (*stotras*); to strictly philosophical works set in verse (such as Gauḍapāda’s *Āgama-śāstra* or Nāgārjuna’s *Mūla-madhyamaka-kārikā*). The text of focus in any term of instruction is chosen according to student interest. Therefore, like the two other Advanced Sanskrit courses, the course is repeatable for credit. Special attention is given to matters of style, as well as to advanced morphology and syntax. Additionally, the course pays attention to the scholastic techniques of: (1) word glossing, (2) sentence construction, (3) word morphology through the principle of base and suffix, and (4) compound analysis. With this, the course facilitates learning the art of reading commentaries for the sake of understanding texts. Prerequisite: two years of Sanskrit (=L4 or equivalent). In exceptional cases (depending on the specific text taught in a specific term), graduate students who do not earn L credits may join with a year of Sanskrit and should contact the instructor.

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 of Natural History. 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/grants-students>.

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 570a or b, Readings in Indonesian Staff

For students with advanced Indonesian language skills preparing for academic performance and/or research purposes. Prerequisites: advanced Indonesian and permission of the instructor.

VIET 560b, Readings in Vietnamese Quang Van

For students with advanced Vietnamese language skills who wish to engage in concentrated reading and research.

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*), Christophe Schuwey (*French*), Shawkat Toorawa (*Near Eastern Languages and Civilizations; Comparative Literature*), Erika Valdivieso (*Classics*)

Affiliated Faculty and Staff Lucy Mulroney (*Yale Special Collections*), Ayesha Ramachandran (*Comparative Literature*), 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*), John Durham Peters (*English*), Jennifer Raab (*History of Art*), Christophe Schuwey (*French*), Camille Thomas (*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 will be required to take two elective courses, which will 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 will be expected to organize their elective courses around a concentration related to their departmental coursework and doctoral research. A list of eligible Yale courses will be compiled each academic year.

Practicum In addition to the two elective courses, in order to facilitate specialization, students will be 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 practicum can take place either during the academic year (in years 2 or 3 of graduate study), or during the summer (at the end of years 2 or 3). It will be structured as a directed reading/independent study for course credit and will involve practical experience in the field. From the start of their pursuit of the certificate, students will 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 will maintain an ongoing list of possible opportunities and also help to facilitate new ones based on students' and librarians' interest. Students will then be matched with an appropriate advisor/mentor who help guide the project.

Teaching Students will 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 3–4 times a semester; (c) supporting collections-based courses on a one-off basis 4–6 times over the course of a year. In addition to providing students with pedagogical training, this requirement will expand the opportunities for undergraduates to be exposed to and engage with Yale's collections. The co-directors will 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.

CERTIFICATE WORKSHOP

MHHR 700 & 701: Theory and Praxis of Material Histories

This year-long workshop, to be offered every other year, will take the form of a half-credit course in each semester that meets six times a term to develop students' understanding of the concepts, debates, methodologies, theories, and real-world constraints of the material histories of the human record. The first semester will focus on key concepts, genealogies of the archival and library science fields, the history of the market for archives and books, and current polemics in the field including addressing legacies of racism and white privilege, the tensions between privacy and censorship, provenance issues and export laws, and post-custodial approaches. The second semester will focus on methods and skills in teaching with and doing research in the material histories of the human record.

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

Only 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.

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 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 completion of their Ph.D. in a home department, and satisfaction of the PEB curriculum, 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.

PEB CURRICULUM

The PEB curriculum consists of four core courses (see below), which all students, regardless of their undergraduate background, take together. The Integrated Workshop course (MB&B 591/ENAS 991/MCDB 591/PHYS 991) and the Methods and Logic in Interdisciplinary Research course (MB&B 517/ENAS 517/MCDB 517/PHYS 517) are typically taken in the first year. The third course, Biological Physics (ENAS 541/CB&B 523/MB&B 523/PHYS 523), and the fourth course, Modeling Biological Systems II (MCDB 562/AMTH 765/CB&B 562/ENAS 561/INP 562/MB&B 562/PHYS 562), should be completed by the end of the second year. 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: Modeling Biological Systems I (MCDB 330); Neuromuscular Biomechanics (ENAS 559); Systems Biology of Cell Signaling (ENAS 567); Biomedical Data Science: Mining and Modeling (MB&B 752/CB&B 752/CPSC 752/MCDB 752); Genomic Methods for Genetic Analysis (GENE 760).

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.

In addition to the formal courses, there are a multitude of 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*), Leah Mirakhor (*American Studies; Ethnicity, Race, and Migration*), 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 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 for students who choose the certificate program during the application process):

1. Quantum Materials Science and Engineering (will be first offered in fall 2024, co-taught by Ismail-Beigi and O'Hern)
2. Unsupervised Learning for Big Data, CPSC 553/CB&B 555/GENE 555
3. Solid State Physics I, APHY 448/PHYS 448/ENAS 850/PHYS 548
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)

Ph.D. students in the certificate program will 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 will also present their research work in a public

setting at least once a year based on the opportunities: e.g., by presenting a poster at symposia organized by departments or the certificate program, a talk as part of research progress seminars, or a chalk talk series organized by the directors.

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 task-based and communicative language teaching in the context of a multiliteracies framework; 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-language-acquisition-registration>, which allows students to submit an application directly to the CLS. The CLS will then contact the student to schedule an initial meeting and issue an e-portfolio template that will be used to keep track of the required components of the certificate.

PROGRAM REQUIREMENTS

- A minimum of two semesters of teaching at Yale University
- A minimum of five language class observations of others, with a report on your observations, which must include: two peer observations, two observations of a senior language instructor, and one observation of a language that you do not understand
- A minimum of three observations of your language class, with a report from the observer (including at least one from both a senior language instructor and a peer)

- Completion of training and professional development requirements: training and coursework in language pedagogy, methodology, and applied linguistics are essential to the professional development of language instructors. Each of the following training components is required for the SLA certificate program. Preferably, the first four components (pedagogy workshop, two fundamentals workshops, and a linguistics seminar) should be completed as a sequence, but the order may vary in consultation with the CLS.
 - CLS Pedagogy Workshop: A four-day pre-service workshop offered at the beginning of the fall term (usually the third week in August) to graduate teaching fellows who are beginning their teaching at Yale.
 - Fundamentals of Language Teaching I and II: These two five-week workshops are offered each fall and spring term, respectively, and cover the basics of language pedagogy.
 - One required graduate course in linguistics, LING 564, Principles of Language Teaching and Learning, which is offered each fall. This seminar develops a theoretical understanding of how languages are learned. It covers the basic principles of second language acquisition theory, applied linguistics, sociolinguistics, and language teaching methodology from a variety of theoretical perspectives.
 - Professional Development Activities: Participants must complete ten professional development activities and submit evidence of attendance or completion along with a brief reflective narrative. These may include CLS Brown Bags, departmental lectures, conferences, etc.
- A teaching video (optional)
- Completion of a teaching e-portfolio which contains all the required materials for the certificate
- A reflective narrative describing your experiences in the SLA Certificate Program
- An exit interview

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 Office of the University Registrar so that the SLA will appear 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 & Literatures; Film & Media Studies; Women's, Gender, & Sexuality Studies*), Paul Bracken (*Management; Political Science*), Peter Cole (*Judaic Studies; Comparative Literature*), Robyn Creswell (*Comparative Literature*), Robert Frank (*Linguistics*), Supriya Gandhi (*Religious Studies*), Alice Kaplan (*French*), Shawkat Toorawa (*Near Eastern Languages & 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 mid-project 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 Marijeta Bozovic

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

Regina Kunzel [F]

Rod Ferguson [Sp]

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

The certificate is open to all students already enrolled in a graduate program at Yale; it may be of particular interest for students who do not have the prerequisites to apply to the combined Ph.D. and/or for students whose dissertations will not substantively focus on gender or sexuality. Students are encouraged to register for the certificate by meeting with the WGSS director of graduate studies (DGS) during their first year.

Students who wish to receive the certificate must complete WGSS 600, Introduction to Women's, Gender, and Sexuality Studies; WGSS 900, Colloquium and Working Group (half credit per semester; students should enroll for two sequential semesters); and two WGSS-numbered or substantively themed electives. Certificate students should also present a paper at the Colloquium and Working Group and fulfill a teaching requirement. Students who fulfill these expectations will receive a letter from the DGS awarding them 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 proposes 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 a 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 at <http://gsas.yale.edu/admissions/departments>. 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.

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 course work, preparing for qualifying examinations, gaining teaching experience, and the researching and writing the 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 either doctoral or 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 visiting 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 associate 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 in 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. *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 associate dean before the student has advanced to candidacy.

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-MS-C) 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.

APPLICATION AND ADMISSIONS PROCESS

Prospective students apply simultaneously to UPR-MS-C and to Yale through each institution's respective online application process. The admission process for UPR-MS-C 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-MS-C or to Yale does not guarantee admission to the M.D./Ph.D. Cooperative Program.

PROGRAM DETAILS

Years one to three: UPR-MS-C

Students are required to complete the first three years of the Medicine Program at UPR-MS-C. 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. The 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,

department 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/academics/exchanges/exchange-scholar-program-ivyplus-exchange>

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/academics/exchanges/international-exchanges>

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; Graduate Institute of International and Development Studies, Geneva, Switzerland; German Academic Exchange Service (DAAD), Germany; Hebrew University, Jerusalem, Israel; Royal Holloway College, University of London, England; Shanghai Jiao Tong University, China; University College London, England

History

Institut d'Études Politiques de Paris ["Sciences Po"], France

Italian Studies

Scuola Normale Superiore (SNS), Pisa, Italy

Political Science

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

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 graduate students may wish to take advantage of these programs while in New Haven. For further details on summer offerings at Yale, please consult the Yale Summer Session website at <http://summer.yale.edu> and the appropriate dean in the Graduate School.

Degree Requirements

The requirements set forth in the pages that follow are the minimum Graduate School degree requirements and apply to all degree candidates. Students should consult the listings of individual departments and programs for additional specific departmental requirements.

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 make it possible for 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, 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 associate 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. Specific language requirements 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 one full-year, two-credit graduate course or 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 HP-average 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. Such examinations are described in the individual department 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, 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 will normally be withdrawn from their program.

Prospectus

The dissertation topic, in the form of a prospectus, must be approved by the department. 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 department 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.

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 department 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 @ 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 their associate dean. A student must be registered at least half-time in the Graduate School to be appointed as a teaching fellow (TF) or as a part-time acting instructor (PTAI). TFs assist faculty in teaching relatively large undergraduate courses. PTAs are responsible for small undergraduate courses, subject to guidance and advice by department faculty. For a more detailed description of these types of appointments, see Teaching Fellow Levels in the Financial Aid section under Financing Graduate School.

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. While on rare occasions 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 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.

Advancing or Deferring the Teaching Years

In the humanities and social sciences, students in a teaching year, normally years three and four, may defer a teaching year or term into the fifth or sixth year. Students in the humanities and social sciences may teach earlier if there are appropriate teaching opportunities available. Such requests are subject to approval by their director of graduate studies.

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. At the time of the submission of their prospectus, students must petition for permission to submit all or a portion of their dissertations in a foreign language. 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 associate dean. Petitions for writing and submitting a dissertation in a foreign language will not be accepted after students have advanced to candidacy. 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 willingness 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 a letter 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 as failing, departmental practice determines the number of reevaluations normally permitted.

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 department.

REQUIREMENTS FOR THE DEGREE OF MASTER OF PHILOSOPHY

The Master of Philosophy is awarded en route to the Ph.D. in many departments. 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 departments offer the M.Phil. degree. Information regarding special departmental requirements for the degree, if any, are stated in the individual department 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 departments 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 courses leading to the Ph.D. or the equivalent of such courses, with grades that satisfy the 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 special departmental requirements additional to the general requirements stated above, see the department listings.

Students enrolled in a Ph.D. program may receive a master's degree from another department provided that it is in a related field of study and deemed necessary for the completion of the proposed dissertation research. The student's proposed program of study must receive formal approval in writing from the directors of graduate studies in both departments and the appropriate associate dean prior to enrollment in courses that will fulfill master's degree requirements in another department. Courses taken toward a master's degree in another department must be part of the student's course requirement for the Ph.D., as approved by the directors of graduate studies in both departments. However, such course work cannot also be counted toward a master's degree in the department 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 Bioinformatics, 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 which departments offer one-year programs and which offer two-year programs, see the department listings. Students who extend their program to retake a class 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 department and the appropriate associate 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 departments establish the specific course and language requirements for these degrees. Although departments 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 per-course 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, International and Development Economics, and Nursing. 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.

PROFESSIONAL ETHICS AND RESPONSIBLE CONDUCT IN RESEARCH

Professional Ethics and Responsible Conduct in Research (RCR) 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 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 RCR 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 RCR 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 RCR course offered by CITI. This requirement must be fulfilled within one month of receiving a Yale NetID and even if RCR training was completed at another university.

Additional requirements: (1) All DSR students registered in the fall term must complete an approved online training module in professional ethics 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 RCR 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

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 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 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.

Part-time study Students in Ph.D. programs are expected to register for full-time study. In extraordinary circumstances a student may petition the Graduate School for permission to register as a half-time student for a limited period. Students may not register for half-time study for more than three of the first four academic years they are enrolled. Thereafter they must register full-time until the four-year tuition obligation has been satisfied. Any Ph.D. student who registers half-time at any point in the graduate program must fulfill the four-year tuition obligation to receive the Ph.D. (See below.) Ph.D. students may not register less than half-time.

Students who wish to study part-time should consult with their director of graduate studies and the appropriate associate dean to develop a proposed plan of study, so that both the student and the Graduate School have a common understanding about the time by which the requirements leading to admission to candidacy must be completed. Such a plan of study may be modified with the consent of the director of graduate studies and the associate dean.

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 graduate-level 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:

H	Honors
HP	High Pass
P	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 associate 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 associate dean will inform the student and instructor. If the grade is submitted to the registrar by the new deadline approved by the associate 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.

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, full-time 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 four-year 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 and beyond 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 full time 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.
- Doctoral students participating in a summer internship normally forgo their summer stipendiary funding from Yale. 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 Yale. 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 must normally apply for a leave of absence.
- Students on internships who remain registered full-time will continue to receive a Health Award 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. 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 tenth 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 any time after matriculation. The final decision concerning a request 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 associate dean for academic support in consultation with the student's DGS, 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 is started, if they apply for this 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 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.

Students granted a parental leave may continue to reside in University housing for the remainder of the academic term for which the leave was first granted, but no longer.

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 full-time, 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 associate 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 associate 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 of 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. 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 their associate dean.

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.
6. 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.
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 from one course for a grade or credit in another, without first obtaining express written permission from both course instructors.

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 associate 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 themselves 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 24 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://student-dhr.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.

FINANCING GRADUATE SCHOOL

Tuition and Fees

TUITION, 2023–2024^{*}

Full-time study, per term: \$24,150

Full-time study in IDE, per term: \$24,150

Half-time study, per term: \$12,075

Master's programs, less than half-time per term

One-quarter time study, per term: \$6,037.50

Division of Special Registration (DSR, nondegree study)

Course work, per course, per term (including audited courses): \$6,037.50

Visiting Students, per term: \$24,150

Visiting Assistants in Research, per month: \$425

FEES, 2023–2024[†]

Continuous Registration Fee (CRF), per term[‡]: \$790

Yale Health Hospitalization/Specialty Coverage, twelve months[§]: \$2,894

^{*} 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>.

STUDENT ACCOUNT

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 fulfill requests for transcripts or 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://student-accounts.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/sites/default/files/files/Yale%20International%20Payments%20-%20YalePay.pdf>.

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/yppl>.

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 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.

Transcripts

Transcripts may be ordered online through the Registrar's Office; see <https://registrar.yale.edu/students/transcript-requests>.

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 degree-granting programs.

Eligible Ph.D. students also receive a Health Award, which covers the full cost of the single-student and the Student + Child(ren) Yale Health Hospitalization/Specialty Coverage (including coverage for prescriptions), half the cost of the Student + Spouse coverage, and the Student + Child(ren) portion of the Student 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. For Ph.D. students who elect the Family Plan at Yale Health, the Family Support subsidy is first applied automatically to pay the cost of the spousal portion of Family Plan coverage; the remainder of the subsidy is then disbursed to the student. 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 for five years upon 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 Fellowships may not be deferred beyond the sixth year of registration.

Students awarded a University 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 teaching 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 \$4,000 for a TF10 assignment and \$8,000 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. These awards, sponsored by both public and private agencies, confer distinction on a student who wins an award in a national competition. They are often more generous than the fellowships the University is able to provide.

Students receiving external awards have two options. They may either (1) hold the outside awards in conjunction with University stipends (including research and teaching fellowships) up to the total of the standard department/program stipend plus \$4,000 (pro-rated for external awards of less than one year) or (2) defer financial support awarded in their admission offer for up to one year but not beyond year six. Students must report to the Office of Financial Aid any scholarship or fellowship received from an outside agency or organization. The office and the associate dean will then assist students in considering the benefits of each option.

OPTION 1: SUPPLEMENTATION OF AN EXTERNAL FELLOWSHIP

During the twelve-month academic year (September 1–August 31), the Graduate School's stipend award, made at the time of admission, may be used to supplement the sum of all external stipend awards to a maximum stipend equal to the total of the standard department/program stipend plus \$4,000 (pro-rated for external awards of less than one year). If the sum of the Graduate School's initial stipend award and all outside awards exceeds this limit, the Graduate School's stipend award will be reduced accordingly. In instances where an external award does not cover the full twelve-month academic year, the combined award will be determined by prorating the combined award over the period when the internal and external awards overlap.

Students who receive external fellowships providing yearly stipends that are more than the total of the standard department/program stipend plus \$4,000 will retain the full external fellowship funding and will receive no university supplement.

In many cases, the Graduate School's stipend award includes a Teaching Fellowship. Recipients of external awards may waive one term of teaching per year if the annual combined value of the external award and the pay rate for the expected teaching (\$4,000 for a TF10; \$8,000 for a TF20) exceeds the value of the combined award

(standard department stipend plus \$4,000). Teaching that is part of an academic requirement may not be waived.

OPTION 2: DEFERRAL OF GRADUATE SCHOOL FUNDING

Students receiving external awards in years one through five of study may defer up to one year of the Graduate School's stipend award made at the time of admission. Stipend awards may not be deferred beyond the sixth year of study.

Eligibility for Fellowships

Students who hold Yale-administered fellowships are required to be engaged in full-time 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 they remain eligible for private (nongovernmental) 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.

Students who hold student loans must report all part-time employment earnings to the Office of Financial Aid. Failure to do so may result in cancellation of the loan(s).

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 may be eligible to borrow through federally subsidized loan programs. Eligibility is based on federal regulations and University policies. Information is available from the Office of Financial Aid (gradfinaid@yale.edu).

Eligible students in the Graduate School may be able to borrow from the Federal Direct Loan Program.

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

Living Accommodations

GRADUATE HOUSING —ON CAMPUS

<https://housing.yale.edu>

The Yale Housing Office has dormitory and apartment units available for graduate and professional students. Dormitories are single-occupancy and two-bedroom units of varying sizes and prices. They are located across the campus, from Edward S. Harkness Memorial Hall, serving the medical campus, to Helen Hadley Hall and the newly built 272 Elm Street, serving the central/science campus. Unfurnished apartments consisting of efficiencies and one-, two-, and three-bedroom apartments for singles and families are also available. Family housing is available in Whitehall and Esplanade Apartments. The Housing website is the venue for graduate housing information and includes dates, procedures, facility descriptions, floor plans, and rates. Applications for the new academic year are available beginning April 20 and can be submitted directly from the website with a Yale NetID.

The Yale Housing Office is located in Helen Hadley Hall (HHH) at 420 Temple Street and is open from 9 a.m. to 4 p.m., Monday through Friday; 203.432.2167.

OFF-CAMPUS LISTING SERVICE

<http://offcampusliving.yale.edu>

The Yale Housing Office also manages the Off Campus Living listing service (203.436.9756), which is the exclusive Yale service for providing off-campus rental and sales listings from New Haven landlords. This secure system allows members of the Yale community to search rental listings, review landlord/property ratings, and search for a roommate in the New Haven area. On-campus housing is limited, and members of the community should consider off-campus options. Yale University discourages the use of Craigslist and other third-party nonsecure websites for off-campus housing searches.

UNIVERSITY PROPERTIES —ELM CAMPUS APARTMENTS

www.elmcampus.com

University Properties manages Yale University's commercial properties, including retail stores, office spaces, and residential units, in New Haven. The office is committed to enhancing the quality of life in New Haven through the development of high-quality retail and office environments and the revitalization of surrounding neighborhoods.

Through Elm Campus, a private management company, University Properties offers a variety of market-rate housing options to the Yale community, including studio apartments, one- to four-bedroom apartments, townhouses, and single-family homes. All units border the Yale campus and are served by the Yale Shuttle. A select group are

dedicated as housing for graduate students only, and many of these units are recently renovated.

DINING AT YALE

<https://hospitality.yale.edu/graduate-meal-plan-options>

Yale Hospitality has tailored its services to meet the particular needs of graduate and professional school students by offering meal plan options that allow flexibility and value. For up-to-date information on all options, costs, and residential and retail dining locations, visit <https://hospitality.yale.edu>. Inquiries concerning food services should be addressed to Yale Hospitality, 246 Church Street, PO Box 208261, New Haven CT 06520-8261; email, yale.dining@yale.edu; tel., 203.432.0420.

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 seventeen-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, and a travel clinic and more are available with added 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 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/coverage/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/resources/forms>) 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/resources/forms>) 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/resources/forms>). 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/resources/forms>). 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/resources/forms>). 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 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, 2022. Please access the Incoming Student Vaccination Record form for graduate and professional students at <https://yalehealth.yale.edu/new-graduate-and-professional-student-forms>. 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 <http://yale.medicatconnect.com>. 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 (28) 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, 2023.

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, Harkness Dormitory, and Helen Hadley 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, 2023. 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 private, and faculty/staff are notified of approved accommodations on a need-to-know basis only, except when required by law. 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/get-started/documentation-guidelines>.

Office of International Students and Scholars

The Office of International Students and Scholars (OISS) coordinates services and support for Yale's nearly 6,000 international students, faculty, staff, and their dependents. 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 (<https://oiss.yale.edu>) 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, across the street from Helen Hadley Hall. 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 and Harassment, Including 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 committed by faculty or staff members. 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 and drop-in hours: 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 formal or informal 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. You may also drop in on weekdays during regular business hours. 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. Counselors can talk with you over the telephone or meet you in person at Acute Care in the Yale Health Center or at the Yale New Haven Emergency Room. If it is not an acute situation, you can also contact the SHARE staff via email at sharecenter@yale.edu.

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 Officer Gabrielle Cotto, the sensitive crimes & support coordinator, she can be reached at 203.432.9547 during business hours or via email at gabrielle.cotto@yale.edu. Informational sessions are available with the sensitive crimes & 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 post-professional 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.

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YALE UNIVERSITY CAMPUS SOUTH & YALE MEDICAL CENTER



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-policy-against-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>.

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