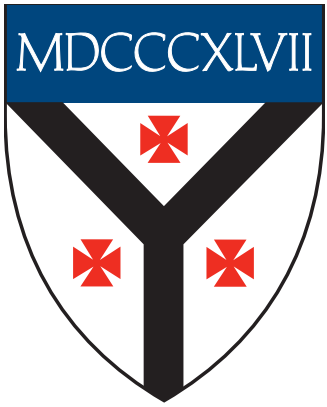
Graduate School of Arts and Sciences

Programs and Policies

2021–2022



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Series 117 Number 5 July 15, 2021

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THE PRESIDENT AND FELLOWS OF YALE UNIVERSITY

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

Fellows
His Excellency the Governor of Connecticut, *ex officio*
Her Honor the Lieutenant Governor of Connecticut, *ex officio*
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Michael James Cavanagh, B.A., J.D., Philadelphia, Pennsylvania
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David Li Ming Sze, B.A., M.B.A., Hillsborough, California
Annette Thomas, S.B., Ph.D., Cambridge, England (*June 2022*)
David Anthony Thomas, B.A., M.A., M.A., Ph.D., Atlanta, Georgia (*June 2027*)
Kathleen Elizabeth Walsh, B.A., M.P.H., Boston, Massachusetts (*June 2023*)
Michael James Warren, B.A., B.A., Washington, D.C. (*June 2024*)

THE OFFICERS OF YALE UNIVERSITY

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Vice President for Communications
Nathaniel Westgate Nickerson, B.A.

Vice President for Human Resources
John Whelan, B.A., J.D.

Effective August 1, 2021

THE ADMINISTRATION OF THE GRADUATE SCHOOL

OFFICE OF THE DEAN

Lynn Cooley, Ph.D., Dean of the Graduate School
Kathleen Galo, M.A., Senior Executive Assistant to the Dean
April Swieconek, B.A., Director of Communications

ACADEMIC AFFAIRS

Pamela Schirmeister, Ph.D., Deputy Dean and Dean for Strategic Initiatives, Graduate School; Dean of Undergraduate Education and Senior Associate Dean, Yale College
Michelle Nearon, Ph.D., Senior Associate Dean and Director, Office for Graduate Student Development and Diversity
John Alvaro, Ph.D., Associate Dean for the Biological and Biomedical Sciences
Jasmina Besirevic Regan, Ph.D., Associate Dean for Partnerships and Special Projects
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
Danica Tisdale Fisher, Ph.D., Assistant Dean of Diversity

GRADUATE STUDENT LIFE

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Jennifer Mendelsohn, M.S., Director, McDougal Graduate Student Center

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Lisa Furino, Assistant Director of Admissions

FINANCIAL AID

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Kellie Webb, A.A., Assistant Director of Financial Aid
Howard el-Yasin, M.A., M.F.A., Program Manager, Teaching Fellow Program

ADMINISTRATION

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Mary Magri, M.B.A., Senior Director of Finance and Administration
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

SCHEDULE OF ACADEMIC DATES AND DEADLINES

The following dates are subject to change as the University makes decisions regarding the 2021–2022 academic year. Changes will be posted online on the Graduate School's website.

FALL TERM 2021

Aug. 23	M	New student orientation week begins (mandatory) Oral Performance Assessment for continuing international students in Ph.D. programs
Aug. 25	W	Fall-term online course selection begins
Aug. 30	M	Teaching @ Yale Day: orientation for all new Teaching Fellows via Zoom, 10 a.m.–1 p.m. (mandatory)
Sept. 1	W	Fall-term classes begin, 8:20 a.m.
Sept. 3	F	Monday classes meet on Friday Due date to notify department of intention to submit dissertation for award of the Ph.D. in December
Sept. 6	M	Labor Day. Administrative offices are closed. Classes do not meet
Sept. 15	W	Fall-term online course selections ends 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 Final day to file petitions for M.A., M.S., and M.Phil. degrees to be awarded in December
Sept. 24	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	F	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. 19	T	October recess begins, 11 p.m.
Oct. 25	M	Classes resume, 8:20 a.m.
Oct. 29	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

Nov. 1	M	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in December
Nov. 10	W	Final day to withdraw a degree petition for degrees to be awarded in December
Nov. 12	F	Oral Proficiency Assessment for international students in all GSAS degree programs Deadline for departments to return Degree Recommendation Forms for December degrees to registrar
Nov. 19	F	November recess begins, 5:30 p.m.
Nov. 29	M	Classes resume, 8:20 a.m.
Dec. 1	W	Final day to submit petitions for extended registration and Dissertation Completion Status for the spring term
Dec. 16	TH	Classes end, 5:30 p.m. Final examinations begin, 7 p.m.
Dec. 22	W	Examinations end, 5:30 p.m. Winter recess begins
Dec. 23	TH	Date of December degree award

SPRING TERM 2022 (PROVISIONAL)

Jan. 3	M	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. 12	W	Spring-term online course selection begins
Jan. 14	F	Teaching @ Yale Day: orientation for all new Teaching Fellows
Jan. 17	M	Martin Luther King, Jr. Day. Administrative offices are closed. Classes do not meet
Jan. 18	T	Spring-term classes begin, 8:20 a.m.
Jan. 27	TH	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
Jan. 28	F	Spring-term online course selection ends. Final day for registration. A fee of $50 is assessed for course schedules accepted after this date
Feb. 11	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	T	Due date to notify department of intention to submit dissertation for award of the Ph.D. in May
Mar. 1	T	Final day to file petitions for M.A.S., M.A., M.S., and M.Phil. degrees to be awarded in May

Mar. 11	F	Midterm Spring recess begins, 5:30 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	T	Due date for dissertations to be uploaded to DPRS for consideration by the Degree Committee for award of the Ph.D. in May
Mar. 28	M	Classes resume, 8:20 a.m.
Apr. 15	F	Good Friday. Administrative offices closed. Classes meet Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in May
Apr. 18	M	Oral Proficiency Assessment for international students in all GSAS degree programs 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 5	TH	Classes end, 5:30 p.m.
May 6	F	Final examinations begin
May 11	W	Final examinations end
May 13	F	Final grades for spring-term courses are due for candidates for terminal M.A.S., M.A., and M.S. degrees to be awarded at Commencement
May 22	SU	Graduate School Convocation
May 23	M	University Commencement Date of May degree award
June 3	F	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 6	M	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 women and men 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 fourteen schools comprising Yale University and the only one that awards the degrees of Doctor of Philosophy, Master of Philosophy, Master of Arts, Master of Science, and Master of Advanced Study. The work of the Graduate School is carried on in the divisions of the Humanities, Social Sciences, and Biological and Physical Sciences. Fifty-seven departments and programs offer courses of study leading to the Ph.D. degree. Nineteen 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 2,800 graduate students and a faculty of nearly 1,000 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 650 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.

Approximately one-third 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 president 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 president 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.

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

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

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

The Dean

Lynn Cooley; grad.dean@yale.edu

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

Deputy Dean

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

Associate and Assistant Deans for Academic Affairs

Michelle Nearon, Senior Associate Dean and Director, Office for Graduate Student Development and Diversity (OGSDD); michelle.nearon@yale.edu
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Robert Harper-Mangels, Associate Dean for Admissions and Financial Support; robert.harper-mangels@yale.edu
Danica Tisdale Fisher, Assistant Dean of Diversity; danica.fisher@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 advise on and approve 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., 203.436.1301
Danica Tisdale Fisher, Assistant Dean of Diversity, 406 Dow Hall, 370 Temple St., 203.436.4171
http://gsas.yale.edu/diversity

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 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 Mr. Alfred McDougal '53, a Yale alumnus, and his wife, Ms. 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

Matthew Tanico, Assistant Dean of Graduate Student Life; Founders Hall, 135 Prospect St., upper level, Rm. 185, 203.432.2583
Jennifer Mendelsohn, Director, McDougal Center; Founders Hall, 135 Prospect St., upper level, Rm. 186, 203.432.2583, jennifer.mendelsohn@yale.edu
http://gsas.yale.edu/life-yale/graduate-student-life-office
http://yaleconnect.yale.edu

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

The assistant dean and staff coordinate general campus services for graduate students, serving as graduate student advocates and departmental liaisons for graduate housing, dining services, health services, athletics, security, chaplains, child care, and parking and transit. The assistant dean and staff are available to answer questions or help with any problems students may have, including speaking individually about issues concerning their life at Yale and other personal matters and concerns. The Graduate Student Life office also assists with departmental recruitment activities and organizes new student orientation and Graduate School Dean's social events. Graduate Student Life staff help coordinate other events for the Graduate School community, including the Graduate School's participation in the University's Commencement exercises.

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.

Business Operations

Cathy Vellucci, Senior Director of Business Operations; Warner House, 1 Hillhouse Ave., 203.436.9093, cathy.vellucci@yale.edu
Mary Magri, Senior Director of Finance and Administration; Warner House, 1 Hillhouse Ave., 203.432.6346, mary.magri@yale.edu
Jennifer Medina, Manager of Finance and Administration; Warner House, 1 Hillhouse Ave., 203.436.9376, jennifer.medina@yale.edu

The Office of Business Operations is responsible for all financial transactions in the Graduate School, overseeing both financial aid and operating activities. Working with the dean and others, the office develops and monitors all Graduate School budgets and expenditures, maintaining compliance with internal and external policies and regulations. The office provides support to the dean and Graduate School supervisory staff in hiring, training, and related human resources activities of the School. The office is a resource to Graduate School, University, and external organizations seeking interpretation of policies and regulations, providing guidance about procedures, reporting, and interactive systems.

Financial Aid

Sara Estrom, Director; 246 Church St., 203.432.7980, gradfinaid@yale.edu
Kellie Webb, Assistant Director; 246 Church St., 203.432.2899, 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

Kory Riddle, Associate University Registrar for Student Support; 246 Church St., 203.432.8649, registrar.gsas@yale.edu
Claudia Schiavone, Assistant University Registrar; 246 Church St., 203.432.2743, 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://www.yale.edu/sis.

Teaching Fellow Program

Pamela Schirmeister, Deputy Dean and Dean for Strategic Initiatives, Graduate School; Dean of Undergraduate Education and Senior Associate Dean, Yale College; pamela.schirmeister@yale.edu
Howard el-Yasin, Program Manager; 203.432.2757, howard.el-yasin@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 program manager of the Teaching Fellow Program or the deputy dean.

Affiliated Offices

OFFICE OF CAREER STRATEGY

Hyun Ja Shin, Ph.D., Director, Graduate and Postdoctoral Career Services; hyunja.shin@yale.edu
Brian Frenette, M.A., Senior Associate Director; brian.frenette@yale.edu
55 Whitney Ave., 3rd floor; McDougal Center, Founders Hall, 135 Prospect St., Rm. 187B; Humanities Quadrangle, 320 York St., Rm. C46 (concourse level)
https://ocs.yale.edu

The Office of Career Strategy (OCS) works with graduate students, alumni, and postdoctoral scholars to clarify career aspirations, identify opportunities beyond the academy, and provide support for every stage of career development. Throughout the year, OCS offers one-on-one advising appointments; résumé and cover letter review; career education and job search workshops; professional development resources; employer events; and alumni networking opportunities. In addition, students may access extensive web-based resources, including career exploration and planning tools designed just for Ph.D. students; an employer database with 10,000+ registered employers; an online jobs board; alumni networking tools; and an interactive mock interview resource. OCS and its team of graduate fellows collaborate closely with faculty, campus partners, student organizations, alumni associations, and employers to expand and enrich its programming.

All graduate students receive regular communication and program updates from OCS via a weekly e-newsletter, and a complete calendar of events is viewable on the OCS website. Students are encouraged to meet with a career adviser at any stage of their time at Yale. Appointments may be made via the Yale Career Link (https://yale-csm.symplicity.com/students).

POORVU CENTER FOR TEACHING AND LEARNING

Jennifer Frederick, Ph.D., Executive Director; jennifer.frederick@yale.edu

Sterling Memorial Library, 301 York St. entrance
https://poorvucenter.yale.edu

The Poorvu Center supports teaching and learning excellence across the campus, integrating support for faculty, graduate students and postdocs, and undergraduates. Several Poorvu Center units are focused exclusively on professional development and skill-based training for graduate and professional school students.

Graduate and Postdoctoral Teaching Development

Suzanne Young, Ph.D., Director; suzanne.young@yale.edu
Gina Hurley, Ph.D., Assistant Director; gina.hurley@yale.edu
301 York St.
https://poorvucenter.yale.edu/teaching/graduate-student-professional-student-and-postdoctoral-teaching-development

The Graduate Teaching unit of the Poorvu Center offers a full range of training, consultation, and teacher development services to teaching fellows and postdoctoral fellows at Yale. The professional staff and McDougal Graduate Teaching Fellows are available throughout the year to provide training in effective teaching methods and support for teaching challenges. For first-time teaching fellows in the GSAS, the Poorvu Center provides a required training, Teaching @ Yale Day, that equips graduate teaching fellows with knowledge of University policies and effective teaching practices. Beyond Teaching @ Yale Day, graduate students may wish to hone their teaching skills by participating in further workshops on teaching, including the Fundamentals of Teaching series, Inclusive Teaching, Teaching with Technology, Teaching First-Generation and Non-Traditional Students, Course Design, and Delivering Effective Lectures, to name just a few. The Academic Job Search series helps graduate students prepare for the academic job market with workshops on writing the teaching statement, preparing the teaching portfolio, and talking about teaching in the job interview. The center offers classroom teaching observations, as well as one-on-one consultations on any teaching topic, including reviewing job market materials or designing a new course. All Poorvu Center programs and consultations are strictly confidential.

The Graduate Teaching unit offers several special programs for graduate students who wish to deepen their teaching skills. Graduate students may earn the Certificate of College Teaching Preparation (CCTP), a certificate that signals commitment to teaching. Graduate students and postdocs may participate in the Spring Teaching Forum, a venue for members of the Yale community to discuss contemporary issues in pedagogy and higher education. Graduate students may apply to the Associates in Teaching program, which allows a graduate student to co-teach a course with a faculty mentor, or to the Teaching Innovation Project Grant program, which supports the creation of teaching resources, strategies, and tools. Finally, graduate students may wish to participate in online teaching courses and workshops available through the Center for the Integration of Research, Teaching and Learning (CIRTL). This consortium leverages the expertise of multiple research institutions to offer a diverse array of teacher-training opportunities.

On the Poorvu Center website, graduate students will find a variety of teaching resources, including descriptions of the center's programs, a teaching guide for new and

returning teachers, and modules on important teaching topics. All graduate students receive a weekly newsletter about upcoming programs and events.

Graduate Writing Laboratory

Ryan Wepler, Ph.D., Director; ryan.wepler@yale.edu
Julia Istomina, Ph.D., Associate Director; julia.istomina@yale.edu
Patricia Trainor, J.D., Writing Specialist
Sterling Memorial Library, 301 York St., mezzanine level
https://poorvucenter.yale.edu/writing/graduate

The Graduate Writing Laboratory (GWL), a unit of the Poorvu Center, offers resources to all currently enrolled graduate and professional school students who want to grow as successful academic writers. The GWL provides support through individual consultations, workshops on written and oral communication, a public speaking studio, writing groups, and online resources. Graduate students are encouraged to schedule individual writing consultations with Graduate Writing Consultants, available throughout the academic year to meet in the Poorvu Center, the Marx Science and Social Science Library, and the Cushing/Whitney Medical Library. During these consultations, students can discuss all elements of academic communication, including writing, speaking, and visuals. The GWL works with graduate students from across the disciplines on research papers, grant and fellowship applications, conference presentations, prospectuses, and dissertation chapters. In addition, the GWL offers workshops, information sessions, and discussion panels led by the professional staff, GWL Fellows, and invited speakers. These programs relate to topics of academic research, writing, communication, and publishing and take place at campus locations convenient for graduate students. The GWL has recently opened a public speaking studio where graduate students can schedule a session with PitchVantage innovative software to improve their public speaking skills, master different aspects of presentation delivery techniques, and evaluate their performance in real time. Finally, the GWL organizes regular writing groups including working groups and full-day and half-day retreats, which help students with the process of writing and provide accountability and peer support. A complete list of programs is available through the GWL website and a weekly e-newsletter circulated among graduate students.

CENTER FOR LANGUAGE STUDY

Nelleke Van Deusen-Scholl, Director; Associate Dean, Yale College; 203.432.6456, nelleke.vandeusen-scholl@yale.edu
James Tierney, Director, English Language Program; james.tierney@yale.edu
Dow Hall, 370 Temple St.
https://cls.yale.edu

The Center for Language Study (CLS) supports language teaching and learning across the University, including support for nonnative speakers of English through its English Language Program (see below). For graduate students in language and literature programs, it offers a Certificate in Second Language Acquisition (SLA) that includes pedagogy workshops, a capstone course in language teaching methodology, and a series of professional development workshops that, taken together, give graduate students grounding in the theory and practice of language education. Graduate students have found the SLA Certificate helpful in preparing for the job market, in part because

the teaching ePortfolio they prepare as they exit the program is attractive to hiring committees. Finally, the CLS offers two programs for independent language learning, Directed Independent Language Study (DILS) and Fields, both of which are available to graduate students. DILS matches students who want to study languages not taught at Yale with an educated native speaker of that language. Fields matches advanced students of any language (including those taught at Yale) with a language partner to study a language and a field together (e.g., Chinese and Economics). Although neither DILS nor Fields carries course credit, graduate students often use these programs to prepare for field study and research as well as for fellowship applications. For more information, contact Vee Cangiano (vee.cangiano@yale.edu).

English Language Program

James Tierney, Director; james.tierney@yale.edu
Dow Hall, 370 Temple St.
https://cls.yale.edu/programs/english-language-program

The English Language Program (ELP) provides language and communication support for graduate and professional students and faculty. It serves multilingual students at all stages of their academic careers, from orientation through dissertation and job search. ELP faculty help students in all areas of academic communication, especially writing, vocabulary development, presentation skills, and pronunciation. The program offers a wide range of courses, workshops, and individual instruction, as well as an intensive Summer Program for those entering doctoral programs. The ELP is also responsible for conducting assessments certifying graduate students and others teaching at Yale. In addition, the program provides consultations across Yale departments and units on issues relating to language, culture, and communication. The overall aim is to advance the capacities of students for greater success at Yale and beyond. ELP programs are open to students of all levels and to all Yale constituents, including graduate and professional school students, postdocs, and visiting faculty. For more information, contact James Tierney at james.tierney@yale.edu.

Committees

Currently five 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 and procedure and makes recommendations to the faculty of the Graduate School.

The Degree Committee The Degree Committee, composed of two senior faculty members from each division (Humanities, Sciences, and Social Sciences) and chaired by the dean, 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.

Dean's Advisory Committee on Student Grievances Composed of three graduate students, three faculty members, normally one from each division, and one administrator of the Graduate School, the committee reviews complaints brought by graduate students against a member of the faculty or administration of the Graduate School (see Grievance Procedures, under Academic Regulations, under Policies and Regulations).

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 thirteen 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. After such approval has officially been given, students in that department or program will receive written notification. 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
Jacqueline Goldsby

Director of Graduate Studies
Daphne Brooks (81 Wall St., daphne.brooks@yale.edu)

Professors Elijah Anderson, David Blight, Daphne Brooks, Hazel Carby (*Emerita*), Roderick Ferguson, Phillip Atiba Goff, Jacqueline Goldsby, Emily Greenwood, Matthew Jacobson, Gerald Jaynes, Christopher Miller (*Emeritus*), Tavia Nyong'o, Robert Stepto (*Emeritus*), Michael Veal, Shane Vogel

Associate Professors Aimee Cox, Crystal Feimster, Elizabeth Hinton, Edward Rugemer

Assistant Professors Jonathan Howard, Ernest Mitchell, Carolyn Roberts

Lecturers Aaron Carico, Nicholas Forster, Thomas Allen Harris, Elleza Kelley

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, History of Science and Medicine, 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: e.g., Caribbean or African American literature, a comparison of African American literature in a combined degree with the Department of English; an investigation of the significance of the presence of African cultures in the New World, either in the Caribbean or in Latin and/or South America in a combined degree with the Spanish and Portuguese department. An area of concentration may also follow the fields of study already established within a single discipline: e.g., race/minority/ethnic studies in a combined degree with Sociology. An area of concentration must either be a field of study offered by a 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 dissertation committee, 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 Daphne Brooks
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 518a / PSYC 536a / SOCY 539a, Is That Racist? Theory and Methods for Diagnosing and Demonstrating Racism Phillip Atiba Goff
How do we know when something is racist? And how do we prove it to those who are skeptical? This course is designed to allow students to go beyond armchair pontificating about racism by exploring a broad range of ways social theorists have defined the term and methods they have used to demonstrate it. Together, we read, critique, and synthesize scholarship from across disciplines, with the goal of refining our own definition of the term. To accomplish this, we examine the stakes of calling something racist, who benefits and who suffers from a given definition, and how racism functions across contexts (mostly) within the United States. We also learn about popular methods for demonstrating that an idea, feeling, behavior, person, or institution is racist and evaluate how evidence about racism (or lack thereof) can obscure a diagnosis of racism—or lead to an erroneous one. Throughout the course, we take opportunities to translate the theoretical and methodological lessons we learn to the world we live in today, from popular culture to dinner table conversations. This course is designed to be mostly *synchronous,* with synchronous sections accompanying lectures. Videos are made available for students who are not able to attend lectures or sections, but taking the course asynchronously is discouraged. Prerequisite: students should be comfortable reading journal articles and thinking critically about contentious social/political topics. Readings and other course materials span a wide range of

disciplines. While there are no statistical prerequisites, students are asked to think about the logic of statistical analysis and should be comfortable reasoning about numbers.

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 584b / SOCY 584b, Inequality, Race, and the City Elijah Anderson
Urban inequality in America. The racial iconography of the city is explored and represented, and the dominant cultural narrative of civic pluralism is considered. Topics of concern include urban poverty, race relations, ethnicity, class, privilege, education, social networks, social deviance, and crime.

AFAM 605a / AMST 686a / HIST 769a / PHUM 686a, Introduction to Documentary Studies Matthew Jacobson
This mixed graduate/undergraduate seminar surveys documentary work in three media —film, photography, and sound—since the 1930s, focusing on the documentary both as a cultural form with a history of its own and as a parcel of skill sets and storytelling and production practices to be studied and mastered. Readings and discussions cover important scholarly approaches to documentary as a genre, as well as close readings of documentaries themselves and practitioners' guides to various aspects of documentary work. Topics include major trends in documentary practice across the three media, documentary ethics, aesthetics and truth-claims, documentary's relationship to the scholarly disciplines and to journalism, and documentary work as political activism. Class meetings include screenings/viewings/soundings of documentary works, and practitioners' panels and workshops with Yale documentarians (including Charles Musser, Zareena Grewal, Elihu Rubin, Gretchen Berland, and Laura Wexler) and local New Haven documentarians such as Jake Halpern (Yale '97, *This American Life*). Students' final projects may take the form of a traditional scholarly paper on some aspect of documentary history or a particular documentary producer, or an actual piece of documentary work—a film treatment, a brief video, a set of photographs, a sound documentary, or script.

AFAM 626a / HIST 721a / RLST 626a, African American Religious History Nicole Turner

African American religions have been central to the African American experience since Africans arrived in North America. An amalgam of traditional African religions, Christianity, Islam, Judaism, and African American ingenuity, African American religions are dynamic and multifaceted. Although they are often depicted as sources of black resilience and emblems of black resistance, they have also been critiqued for marginalizing and racializing black people, as well as encoding archaic gender paradigms and reinforcing class divisions. This course explores the ways histories of African American religions have produced these various interpretive frames. Questions that animate the course include: What role have African American religions played in African American life? How have scholars studied the history of African American religions and ultimately shaped the discourse about African American religious life, and by extension African American history? The course engages foundational works, such as Albert Raboteau's *Slave Religion* and Evelyn Brooks Higginbotham's *Righteous Discontent,* as well as newer works like Judith Weisenfeld's *New World A-Coming* and Matthew Harper's *The End of Days*.

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 724b / AMST 732b / FILM 693b / HSAR 759b / WGSS 693b, Imaging War, Imagining Peace: Memory, Justice, and Repair Laura Wexler

This course explores the ways in which both war and peace have been imagined and represented, and how those visual practices might be unlearned and reimagined. What do images and imaginings of war and peace leave out of view, and how can we bring both underlying social vulnerability and extant networks of protest and resistance into greater visibility? How might we avoid automatized reiterations of well-worn locations and scenarios of violence, for example in constructions of "the enemy," and develop new approaches to the nationalist, racialized, and gendered stakes of conflict? What alternative acts of intervention, witnessing, and reparation might we create so as to see emergencies more freshly—at a time of conflict, as well as in anticipation and in retrospect? Can the visual archives of violence be reframed and recirculated to shape more firmly the potential of justice, cohabitation, and peace? How can visualizations of antiwar movements and peace actions be mobilized more effectively? This team-taught course is inspired by the documentary work of Susan Meiselas. Her distinctive photographic practice with communities in Nicaragua, El Salvador, Chile, Kurdistan, and elsewhere, her repeated return to sites of conflict over

time, and her collaboration with the subjects of her images, as well as her extensive and innovative archival work, serve as one model for the kinds of approaches we want to explore and foster. In addition, our work is guided by close study of authors such as Leni Riefenstahl, Virginia Woolf, Alain Resnais, Susan Sontag, Sigmund Freud, Errol Morris, Judith Butler, Ariella Azoulay, Diana Taylor, Thy Phu, David Shneer, Amitav Ghosh, Anne McClintock, Grace Paley, Maaza Mengiste, Viet Thanh Nguyen, Karla Cornejo Villavicencio, Jenny Holzer, Walid Raad, Harun Farocki, Sam Durant, Sim Chi Yin, and more.

AFAM 752a / HIST 937a / HSHM 761a, Medicine and Empire Carolyn Roberts
A reading course that explores medicine in the context of early modern empires with a focus on Africa, India, and the Americas. Topics include race, gender, and the body; medicine and the environment; itineraries of scientific knowledge; enslaved, indigenous, and creole medical and botanical knowledge and practice; colonial contests over medical authority and power; indigenous and enslaved epistemologies of the natural world; medicine and religion.

AFAM 764b / AMST 715b / HIST 715b, 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 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 775b / AMST 771b / ENGL 981b, Affect Theory Tav Nyong'o
This seminar traces the emergence of affect, sense, feeling, and mood as critical keywords in American studies. Particular attention is paid to the manner in which queer theorists such as Eve Kosofsky Sedgwick, Lauren Berlant, Ann Cvetkovich, Heather Love, Jennifer Doyle, Jonathan Flatley, and José Esteban Muñoz developed the concept in what has been called "the affective turn" in queer and feminist aesthetics. The philosophical basis of affect theory in the writings of Spinoza, Heidegger, and Deleuze forms the core of the seminar. We also look to an alternate genealogy for affect politics in the writings of Bergson and Deleuze on fabulation. We consider the psychoanalytic take on affect, in particular the object relations school of Klein and Winnicott, and we read critics who contrast affect theory with trauma theory. Marxist contributions to affect theory include readings from Virno (on humor), Hardt and Negri (on affective labor), and Rancière (on the distribution of the sensible). The writings of Jasbir Puar and Brian Massumi on the affective politics of contemporary war, empire, and societies

of control are also considered, as are writings by Fred Moten, Saidiya Hartman, and Frank Wilderson on optimism and pessimism as moods/modalities of black studies.

AFAM 797b / AMST 797b / HIST 797b, Atlantic Abolitions Marcela Echeverri Munoz
This readings course explores the historiography on the century of abolition, when the new states of the Americas abolished racial slavery. Beginning with the first abolitions in the U.S. North during the 1780s, we consider the emergence and process of abolition throughout the Atlantic world, including the Caribbean, Spanish America, and Brazil, through the 1880s.

AFAM 858b / ENGL 943b, Hurston, Hughes, and Black Modernisms Shane Vogel
This course considers some of the key concepts and tensions in the development of black modernisms through a focus on two of its major innovators: Zora Neale Hurston and Langston Hughes. We consider their work across the first half of the twentieth century and the scholarly debates and intellectual formations that developed in response to their work in the second half. We pay special attention to formal experimentation across genres and to the relationship between literature and performance. Topics include folklore and the folk; migration; memory; transnationalism; gender and sexuality; political writings; the question of archives; musicality; drama and performance; religion; the Federal Writers Project; and autobiography. While Hurston and Hughes serve as the focus of the course, the inquiry is a wide-ranging engagement with black modernisms, understood as an ongoing project.

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 880a or b, Directed Reading Staff
By arrangement with faculty.

AFAM 895a and AFAM 896b, Dissertation Prospectus Workshop Daphne Brooks
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 per term

African Studies

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

Chair
Stephanie Newell (*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*), Gerald Friedland (*Internal Medicine; Epidemiology*), Robert Harms (*History*), 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 & Evolutionary Biology*), Asghar Rastegar (*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*), Cajetan Iheka (*English*), Kaveh Khoshnood (*Epidemiology*), Louisa Lombard (*Anthropology*), Urania Magriples (*Obstetrics, Gynecology, & Reproductive Sciences*), LaRon Nelson (*Nursing*), Sunil Parikh (*Public Health; Internal Medicine*), Carla Staver (*Ecology & Evolutionary Biology*), Jonathan Wyrtzen (*Sociology*)

Assistant Professors Amy Bei (*Epidemiology*), Jill Jarvis (*French*), Benedito Machava (*History*), Hani Mowafi (*Emergency Medicine*), Christine Ngaruiya (*Emergency Medicine*), Oluwatosin Onibokun (*Obstetrics, Gynecology, & Reproductive Sciences*), Nana Osei Quarshie (*History*), Tracy Rabin (*Internal Medicine*), Jeremy Schwartz (*Internal Medicine*), Sheela Shenoi (*Internal Medicine*), Carla Staver (*Ecology & Evolutionary Biology*)

Lecturers Adalgisa Caccone (*Ecology & 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 & 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, who is chosen by the student in consultation with the DGS.

PROGRAM IN AFRICAN LANGUAGES

The language program offers instruction in five major languages from sub-Saharan Africa: Kiswahili (eastern and central Africa), 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 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 585a, Pandemics in Africa: From the Spanish Influenza to COVID-19 Jonny Steinberg

The overarching aim of the course is to understand the unfolding COVID-19 pandemic in Africa in the context of a century of pandemics, their political and administrative management, the responses of ordinary people, and the lasting changes they have wrought. The first eight meetings examine some of the best social science literature on twentieth-century African pandemics before COVID-19. From the Spanish influenza to cholera to AIDS, to the misdiagnosis of yaws as syphilis, and tuberculosis as hereditary, the social science literature can be assembled to ask a host of vital questions in political theory: on the limits of coercion; on the connection between political power and scientific expertise, between pandemic disease and political legitimacy, and, across all modern African epidemics, between infection and the politics of race. The remaining meetings look at COVID-19. We chronicle the evolving responses of policy makers, scholars, religious leaders, opposition figures, and, to the extent that we can, ordinary people. The idea is to assemble sufficient information to facilitate a real-time study of thinking and deciding in times of radical uncertainty and to examine, too, the consequences of decisions on the course of events. There are of course so many moving parts: health systems, international political economy, finance, policing, and more. We also bring guests into the classroom, among them frontline actors in the current pandemic as well as veterans of previous pandemics well placed to share provisional comparative thinking. This last dimension is especially emphasized: the current period is studied in the light of a century of epidemic disease, affording us the opportunity to see path dependencies and novelties, the old and the new.

AFST 639b / ANTH 639b, Africa, Politics, Anthropology Louisa Lombard

A historical-anthropological study of politics in Africa. How have anthropologists made sense of the workings of African politics, both those of state and nonstate actors? This course charts how African states came into being, how they operate, and how state agents and the people they govern negotiate legitimacy, authority, and belonging.

AFST 833b, 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 836a / HIST 836a, Histories of Postcolonial Africa: Themes, Genres, and the Phantoms of the Archive Benedito Machava

This course is both historiographic and methodological. It is meant as an introduction to the major themes that have dominated the study of postcolonial Africa in recent years, and the material circumstances in which they were produced. We pay close attention to the kinds of sources and archives that scholars have employed in their works, and how they addressed the challenges of writing contemporary histories in Africa. We center our weekly meetings around one key text and one or two

supplementary readings. We engage with works on politics, violence, environment and technology, women and gender, affect, fashion, leisure, and popular culture.

AFST 839a / HIST 839a, Environmental History of Africa Robert Harms
An examination of the interaction between people and their environment in Africa and the ways in which this interaction has affected or shaped the course of African history.

AFST 965b / CPLT 729b / FREN 965b, On Violence: Politics and Aesthetics across the Maghreb Jill Jarvis
A study of twentieth-century Maghrebi texts and films that document, theorize, and critique forms of political violence. How might aesthetic works—novels, plays, poems, torture and prison testimonies, political cartoons, films—run counter to state-sanctioned memory projects or compel rethinking practices of testimony and justice for a postcolonial time? Works by Kateb, Djebar, Mechakra, Djaout, Alleg, Boupacha, Meddeb, Barrada, Binebine, Laâbi, Rahmani, Mouride. Theoretical readings by Fanon, Mbembe, Khatibi, Kilito, Dorlin, Benjamin, Spivak, Derrida, Lazali. Conducted in English. Prerequisite: reading knowledge of French.

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 620b, Beginning Kiswahili II John Wa'Njogu
Continuation of SWAH 610. Texts provide an introduction to the basic structure of Kiswahili and to the culture of the speakers of the language. Prerequisite: SWAH 610.

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 640b, Intermediate Kiswahili II Veronica Waweru
Continuation of SWAH 630.

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 660b, Advanced Kiswahili II John Wa'Njogu
Continuation of SWAH 650.

SWAH 670a and SWAH 671b, 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 (*ewì*); 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 YorubaLit&Culture II Oluseye Adesola

ZULU 610a, Beginning isiZulu I Nandipa Sipengane
A beginning course in conversational isiZulu, using web-based materials filmed in South Africa. Emphasis on the sounds of the language, including clicks and tonal variation, and on the words and structures needed for initial social interaction. Brief dialogues concern everyday activities; aspects of contemporary Zulu culture are introduced through readings and documentaries in English. Credit only on completion of ZULU 620.

ZULU 620b, Beginning isiZulu II Nandipa Sipengane
Development of communication skills through dialogues and role play. Texts and songs are drawn from traditional and popular literature and songs. Students research daily life in selected areas of South Africa. Prerequisite: ZULU 610.

ZULU 630a, Intermediate isiZulu I Nandipa Sipengane
Development of basic fluency in speaking, listening, reading, and writing isiZulu, using web-based materials filmed in South Africa. Students describe and narrate spoken and written paragraphs. Review of morphology; concentration on tense and aspect. Materials are drawn from contemporary popular culture, folklore, and mass media. Prerequisite: ZULU 620.

ZULU 640b, Intermediate isiZulu II Nandipa Sipengane
Students read longer texts from popular media as well as myths and folktales. Students are prepared for initial research involving interaction with speakers of isiZulu in South Africa, and for the study of oral and literary genres. Prerequisite: ZULU 630.

ZULU 650a, Advanced isiZulu I Nandipa Sipengane
Development of fluency in using idioms, speaking about abstract concepts, and voicing preferences and opinions. Excerpts are drawn from oral genres, short stories, and dramas made for television. Introduction to other South African languages and to issues of standardization, dialect, and language attitude. Prerequisite: ZULU 640.

ZULU 660b, Advanced isiZulu II Nandipa Sipengane
Readings may include short stories, a novel, praise poetry, historical texts, or contemporary political speeches, depending on student interests. Study of issues of language policy and use in contemporary South Africa; introduction to the Soweto dialect of isiZulu. Students are prepared for extended research in South Africa involving interviews with isiZulu speakers. Prerequisite: ZULU 650.

American Studies

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

Chair
Michael Denning (HQ 302, 203.432.1186)

Director of Graduate Studies
Lisa Lowe (HQ 304, 203.432.1186)

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

Associate Professors Rene Almeling, Crystal Feimster, Zareena Grewal, Daniel HoSang, Greta LaFleur, Albert Laguna, Joanna Radin, Elihu Rubin, Tisa Wenger

Senior Lecturer James Berger

FIELDS OF STUDY

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

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

During the first two years of study students are required to take twelve term courses; at least half of these courses must be in American Studies. First-year students are also required to take AMST 600, American Scholars (graded Satisfactory/Unsatisfactory). 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. (en route to the Ph.D.) The M.A. is granted upon the 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. It can be petitioned for in the term following completion of the requirements. Candidates in combined programs will be awarded the master's degree only when the master's requirements for both programs have been met.

Terminal Master's Degree Program The basic requirements for this terminal degree are seven term courses, including a special writing project, and the successful completion of the language requirement. The project involves the submission of substantial written work either in conjunction with one course or as a tutorial that substitutes for one course. Students must earn a grade of Honors in two of their courses and an average grade of High Pass in the others.

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

COURSES

AMST 601a, Interdisciplinary Research in American Studies Lisa Lowe
This seminar introduces students to interdisciplinary research methods and paradigms in American studies. It is both a history of the field and American studies scholarship, and an exploration of new approaches and alternative frameworks that revise earlier national objects, areas, historical events, and periods. The seminar features visits from program faculty and others.

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 625b / ENGL 885b, The Transpacific Midcentury Sunny Xiang
This course situates war and empire at the cross-section of political geography, critical historiography, and cultural studies. Put another way, it uses the concept-term "Transpacific Midcentury" to undertake an extended meditation on the methodological categories that organize our intellectual work and everyday thinking: period, area, and archive. My hope is that our conversations over the term allow us to unsettle, distort, reject, and remake these seemingly stable categories. Questions that guide our thinking include: How do we periodize a mid-century cold war between superpowers that spun off into multiple colonial wars, civil wars, guerrilla wars, and cultural wars? How does the archipelagic imaginary of the transpacific complicate the continental biases of area studies and ethnic studies? How might cultural texts help us fashion informed hypotheses about a historical period saturated with new ideas about race, gender, media, travel, governance, and consumerism? In exploring these questions, we engage writers, thinkers, and artists such as Gina Apostol, Samuel Delany, Vernadette Gonzalez, Jodi Kim, Myung Mi Kim, Christina Klein, Richard Mason, Craig Santos Perez, Teresia Teaiwa, and Lisa Yoneyama.

AMST 630a / HSAR 529a / RLST 819a, Religion and Museums 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 686a / AFAM 605a / HIST 769a / PHUM 686a, Introduction to Documentary Studies Matthew Jacobson
This mixed graduate/undergraduate seminar surveys documentary work in three media —film, photography, and sound—since the 1930s, focusing on the documentary both as a cultural form with a history of its own and as a parcel of skill sets and storytelling and production practices to be studied and mastered. Readings and discussions cover important scholarly approaches to documentary as a genre, as well as close readings of documentaries themselves and practitioners' guides to various aspects of documentary work. Topics include major trends in documentary practice across the three media, documentary ethics, aesthetics and truth-claims, documentary's relationship to the scholarly disciplines and to journalism, and documentary work as political activism. Class meetings include screenings/viewings/soundings of documentary works, and practitioners' panels and workshops with Yale documentarians (including Charles Musser, Zareena Grewal, Elihu Rubin, Gretchen Berland, and Laura Wexler) and local New Haven documentarians such as Jake Halpern (Yale '97, *This American Life*). Students' final projects may take the form of a traditional scholarly paper on some aspect of documentary history or a particular documentary producer, or an actual piece of documentary work—a film treatment, a brief video, a set of photographs, a sound documentary, or script.

AMST 687b / HIST 723b / WGSS 697b, Colonial Domesticity and Reproductive Relations Lisa Lowe
In this interdisciplinary seminar, we study the central importance of kinship, family, and domestic labor to the social reproduction of racial colonial processes. Settler colonialism, colonial slavery, overseas empire, and their aftermaths depend not only on

the brute force of war, captivity, and occupation; they are also sustained and contested through culture, language, forms of family and household, and the social reproduction of race, gender, intimacy, and filiation. We trace a genealogy of "colonial domesticity" that considers histories of the sexual violation and separation of slave women from their children, compulsory boarding schools for Native Americans, racialized gendered divisions of care labor, transnational Asian adoption, and contemporary migrant detention and family separation; this genealogy also includes alternative forms of kinship, domesticity, generation, and relation. Readings include historical and anthropological studies of colonialism, feminist debates on social reproduction, and literary and visual culture materials by Maria Mies, Ann Laura Stoler, Silvia Federici, Tithi Bhattacharya, Ruha Benjamin, Kalindi Vora, Thavolia Glymph, Saidiya Hartman, Dorothy Roberts, Audra Simpson, Jodi Byrd, Amy Kaplan, Evelyn Nakano Glenn, Laura Briggs, Elizabeth Freeman, Chandan Reddy, Alys Weinbaum, Louise Erdrich, Mary Prince, Toni Morrison, Patricia Powell, Chang-rae Lee, Octavia Butler, and others. Permission of the instructor 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 715b / AFAM 764b / HIST 715b, 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 717a / ENGL 867a, Writing Reconstruction Michael Warner
This course treats the afterwork of the Civil War and the 15th Amendment, as writers in various ways imagined the meaning of the war, the possibility of multiracial democracy, and the reality of fracture. The course begins with Civil War writing in a range of genres, including poetry by Whitman and Melville as well as writings by Douglass, Alcott, Keckley, and others. It touches on readings about Reconstruction in the South by white writers such as Constance Fenimore Woolson, Albion Tourgée, Joel Chandler Harris, and Thomas Nelson Page, alongside the African American tradition from Douglass through Charles Chesnutt and Ida B. Wells. We read *The Adventures of*

Huckleberry Finn and various works by Stephen Crane, including "The Monster," and conclude with the great novel of unfinished business, *Absalom, Absalom!*

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 724a / PLSC 868a / WGSS 724a, 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 729a / FILM 810a / WGSS 746a, Visual Kinship: Families and Photographs Laura Wexler

Exploration of the history and practice of family photography from an interdisciplinary perspective. Study of family photographs from the analog to the digital era, from snapshots to portraits, and from instrumental images to art exhibitions. Particular attention to the ways in which family photographs have helped establish gendered and racial hierarchies and examination of recent ways of reconceiving these images.

AMST 730a / ANTH 727a / RLST 704a, Readings in Critical Muslim Studies Zareena Grewal

This course surveys key texts from a broad range of fields, including transnational American studies, religious studies, history, and anthropology, to explore methodological and theoretical questions that include: What is the "critical" in critical Muslim studies? What and who is "the Muslim" in these scholarly formations: a religious subject, a racial category, a location of subjection and surveillance, or all of these? What theoretical frameworks have emerged in the past twenty years to analyze the Muslim experience, and what is the impact of these intellectual projects on the academy and Muslim populations themselves? What different methodologies are used and what kinds of knowledge do they yield? How does critical Muslim studies as an emergent field complicate notions of an "American Islam" and "American Islamophobia," terms that are and have been practiced, debated, encoded, and altered both by transnational populations within the United States and by U.S. imperial policies, investments, and interests in Islam. The aim is to combine the resources and insights of various disciplines while identifying theoretical and methodological pitfalls and possibilities for future research. We focus on the relationship of our readings to other interdisciplinary formations that transcend disciplines, such as critical security studies and the anthropology of the secular, and the debates and trends therein. Permission of the instructor required.

AMST 732b / AFAM 724b / FILM 693b / HSAR 759b / WGSS 693b, Imaging War, Imagining Peace: Memory, Justice, and Repair Laura Wexler

This course explores the ways in which both war and peace have been imagined and represented, and how those visual practices might be unlearned and reimagined. What do images and imaginings of war and peace leave out of view, and how can we bring both underlying social vulnerability and extant networks of protest and resistance into greater visibility? How might we avoid automatized reiterations of well-worn locations and scenarios of violence, for example in constructions of "the enemy," and develop new approaches to the nationalist, racialized, and gendered stakes of conflict? What alternative acts of intervention, witnessing, and reparation might we create so as to see emergencies more freshly—at a time of conflict, as well as in anticipation and in retrospect? Can the visual archives of violence be reframed and recirculated to shape more firmly the potential of justice, cohabitation, and peace? How can visualizations of antiwar movements and peace actions be mobilized more

effectively? This team-taught course is inspired by the documentary work of Susan Meiselas. Her distinctive photographic practice with communities in Nicaragua, El Salvador, Chile, Kurdistan, and elsewhere, her repeated return to sites of conflict over time, and her collaboration with the subjects of her images, as well as her extensive and innovative archival work, serve as one model for the kinds of approaches we want to explore and foster. In addition, our work is guided by close study of authors such as Leni Riefenstahl, Virginia Woolf, Alain Resnais, Susan Sontag, Sigmund Freud, Errol Morris, Judith Butler, Ariella Azoulay, Diana Taylor, Thy Phu, David Shneer, Amitav Ghosh, Anne McClintock, Grace Paley, Maaza Mengiste, Viet Thanh Nguyen, Karla Cornejo Villavicencio, Jenny Holzer, Walid Raad, Harun Farocki, Sam Durant, Sim Chi Yin, and more.

AMST 734b / CPLT 645b / ENGL 971b / FREN 871b, Fictions of Canada: Colonialism, Nationalism, Postcolonialism Katie Trumpener

This seminar explores the literature(s) of Canada in its long history, its considerable linguistic and cultural range, and its complex relationship to political history. Like Canada itself, Canadian literature represents a "contact zone" between First Nations peoples, French and British settlers, and immigrants from Eastern Europe, East and South Asia, and the Caribbean. Particular focus on Canada's diverse early literatures (from Jesuit hymn to epistolary novel); on the prominent role of women writers across Canadian literature history; on the emergence of an experimental Québécois literature (utilizing Montreal patois as a new literary language) in an era also marked by secularization, modernization, and political separatism; on English Canadian attempts to rethink colonial history; and on the critiques of Canada's ongoing decolonization process by new generations of indigenous, immigrant, and ethnic writers. This course explores both literary history and literary form; and the work of internationally famous novelists and poets (Leonard Cohen, Marie-Claire Blais, Margaret Atwood, Alice Munro, Michael Ondaatje) and their innovative local counterparts. Throughout the term, moreover, our discussion of written literary texts (poems, novels, plays) is supplemented by primarily oral texts (Canadian anthems, ballads, folk, rock, and punk songs in a range of Canadian languages). We are thus listening to even as we are reading Canada.

AMST 746b / ANTH 503b, 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 771b / AFAM 775b / ENGL 981b, Affect Theory Tav Nyong'o

This seminar traces the emergence of affect, sense, feeling, and mood as critical keywords in American studies. Particular attention is paid to the manner in which queer theorists such as Eve Kosofsky Sedgwick, Lauren Berlant, Ann Cvetkovich, Heather Love, Jennifer Doyle, Jonathan Flatley, and José Esteban Muñoz developed the concept in what has been called "the affective turn" in queer and feminist aesthetics. The

philosophical basis of affect theory in the writings of Spinoza, Heidegger, and Deleuze forms the core of the seminar. We also look to an alternate genealogy for affect politics in the writings of Bergson and Deleuze on fabulation. We consider the psychoanalytic take on affect, in particular the object relations school of Klein and Winnicott, and we read critics who contrast affect theory with trauma theory. Marxist contributions to affect theory include readings from Virno (on humor), Hardt and Negri (on affective labor), and Rancière (on the distribution of the sensible). The writings of Jasbir Puar and Brian Massumi on the affective politics of contemporary war, empire, and societies of control are also considered, as are writings by Fred Moten, Saidiya Hartman, and Frank Wilderson on optimism and pessimism as moods/modalities of black studies.

AMST 775a / ANTH 612a / WGSS 613a, Latinx Ethnography Ana Ramos-Zayas
Consideration of ethnography within the genealogy and intellectual traditions of Latinx studies. Topics include questions of knowledge production and epistemological traditions in Latin America and U.S. Latino communities; conceptions of migration, transnationalism, and space; perspectives on "(il)legality" and criminalization; labor, wealth, and class identities; contextual understandings of gender and sexuality; theorizations of affect and intimate lives; and the politics of race and inequality under white liberalism and conservatism in the United States.

AMST 778b / ANTH 666b / WGSS 666b, 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 797b / AFAM 797b / HIST 797b, Atlantic Abolitions Marcela Echeverri Munoz
This readings course explores the historiography on the century of abolition, when the new states of the Americas abolished racial slavery. Beginning with the first abolitions in the U.S. North during the 1780s, we consider the emergence and process of abolition throughout the Atlantic world, including the Caribbean, Spanish America, and Brazil, through the 1880s.

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

AMST 832a / FILM 735a, 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 856a, 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 Terrell 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 903b / HIST 746b / PHUM 903b, Introduction to Public Humanities Ryan Brasseaux
What is the relationship between knowledge produced in the university and the circulation of ideas among a broader public, between academic expertise on the one hand and nonprofessionalized ways of knowing and thinking on the other? What is possible? This seminar provides an introduction to various institutional relations and to the modes of inquiry, interpretation, and presentation by which practitioners in the humanities seek to invigorate the flow of information and ideas among a public more broadly conceived than the academy, its classrooms, and its exclusive readership of specialists. Topics include public history, museum studies, oral and community history, public art, documentary film and photography, public writing and educational outreach, the socially conscious performing arts, and fundraising. In addition to core readings and discussions, the seminar includes presentations by several practitioners who are currently engaged in different aspects of the Public Humanities. With the help of Yale faculty and affiliated institutions, participants collaborate in developing and executing a Public Humanities project of their own definition and design. Possibilities might include, but are not limited to, an exhibit or installation, a documentary, a set of walking tours, a website, a documents collection for use in public schools.

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

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

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

AMST 998a or b, Directed Reading Staff

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, Eduardo Fernandez-Duque, Marcia Inhorn (*Middle East Studies*), William Kelly (*Emeritus*), Paul Kockelman, Roderick McIntosh, Catherine Panter-Brick, Douglas Rogers, Eric Sargis, Helen Siu, Kalyanakrishnan Sivaramakrishnan, Anne Underhill, Claudia Valeggia, David Watts

Associate Professors Oswaldo Chinchilla, Aimee Cox (*African American Studies*), Erik Harms, Yukiko Koga, Louisa Lombard, William Honeychurch

Assistant Professors Lisa Messeri, Jessica Thompson, Serena Tucci

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; email, anthropology@yale.edu; website, http://anthropology.yale.edu.

COURSES

ANTH 502a, Research in Sociocultural Anthropology: Design and Methods Helen Siu
The course offers critical evaluation of the nature of ethnographic research. Research design includes the rethinking of site, voice, and ethnographic authority.

ANTH 503b / AMST 746b, 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 513a, Language, Culture, and Ideology J Joseph Errington
Influential anthropological theories of culture are reviewed with critical reference to theories of language that inspired or informed them. Topics include American and European structuralism; cognitivist and interpretivist approaches to cultural description; work of Bakhtin, Bourdieu, and various "critical theorists."

ANTH 529a and ANTH 530b, Ethnography and Social Theory Staff
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 per term

ANTH 538b / GLBL 838b, Culture and Politics in the Contemporary Middle East Marcia Inhorn

This interdisciplinary seminar is designed to introduce students to some of the most pressing contemporary cultural and political issues shaping life in the Middle East and North Africa. The course aims for broad regional coverage, with particular focus on several important nation-states (e.g., Egypt, Saudi Arabia, Afghanistan, Iran, Iraq) and Western interventions in them. Students should emerge with a keener sense of Middle Eastern regional histories and contemporary social issues, as described by leading scholars in the field of Middle Eastern studies and particularly Middle Eastern anthropology. Following a historical introduction, the course is organized around three core themes—Islam, politics, modernity—with movement from the macropolitical level of Islamic discourse and state politics to the most intimate domains of gender, family life, and contemporary youth culture. Through reading, thinking, talking, and writing about a series of book-length monographs, students gain broad exposure to a number of exigent issues in the Middle Eastern region, as well as to the ethnographic methodologies and critical theories of Middle East anthropologists. Students are graded on seminar participation, leadership of seminar discussions, two review/analysis papers, and a comparative written review of three books. Required for Council on Middle East Studies (CMES) graduate certificate students. Recommended for Middle East concentrators in other disciplines.

ANTH 541a / ENV 836a / HIST 965a / PLSC 779a, Agrarian Societies: Culture, Society, History, and Development Kalyanakrishnan Sivaramakrishnan 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 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 571a, Modern Indonesia J Joseph Errington

Political and cultural dynamics in contemporary Indonesia explored from historical and anthropological perspectives. Major ethnic groups, key historical dynamics, political culture, and interaction between modernization and traditional lifeways. Issues of ethnicity, gender, religion, and economy in situations of rapid social change.

ANTH 575a / EAST 575a, 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 581a, Power, Knowledge, and the Environment: Social Science Theory and Method Michael Dove
Course on the social scientific contributions to environmental and natural resource issues, emphasizing equity, politics, and knowledge. Section I, introduction to the course. Section II, disaster and environmental perturbation: the social science of emerging diseases; and the social origins of disaster. Section III, boundaries: cost and benefit in the Green Revolution; riverine restoration; and aspirational infrastructure. Section IV, methods: working within development projects, and rapid appraisal and consultancies. Section V, local communities, resources, and (under)development: representing the poor, development discourse, and indigenous peoples and knowledge. This is a core M.E.M. specialization course in YSE and a core course in the combined YSE/Anthropology doctoral degree program. Enrollment capped.

ANTH 588b, Politics of Culture in Southeast Asia Erik Harms
The course analyzes how Southeast Asian nations promote national culture as part of political and economic agendas. It also explores Southeast Asian cultural and political diversity to rescue the possibility for cultural difference within a global world.

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 612a / AMST 775a / WGSS 613a, Latinx Ethnography Ana Ramos-Zayas
Consideration of ethnography within the genealogy and intellectual traditions of Latinx studies. Topics include questions of knowledge production and epistemological traditions in Latin America and U.S. Latino communities; conceptions of migration, transnationalism, and space; perspectives on "(il)legality" and criminalization; labor, wealth, and class identities; contextual understandings of gender and sexuality; theorizations of affect and intimate lives; and the politics of race and inequality under white liberalism and conservatism in the United States.

ANTH 619b, Urban Culture, Space, and Power Erik Harms
This course looks at urban environments as spatial landscapes infused with power relations. Readings come from urban studies, anthropology, and cognate disciplines. Anthropological perspectives are used to analyze spatial dimensions of cities and to understand how social life transforms, and is transformed by, the cities we live in.

ANTH 620a, Unfinished Projects Erik Harms
This course guides Anthropology Ph.D. students toward the completion of unfinished projects, which might include dissertations, writing or research interrupted by COVID-19, op-ed pieces, fanciful creative work, unfinished articles, grant proposals, and so on. Admission requires description of an unfinished project and a preliminary plan for completing the project by the end of the term. The rest of the term focuses on completing the project in the company of fellow students and a humble instructor, all of whom have unfinished projects of their own. All participants must be willing to share

something they have failed at completing and come with a willingness to confront the challenge of facing down the unfinished project. ½ Course cr

ANTH 638a, Culture, Power, Oil Douglas Rogers
The course analyzes the production, circulation, and consumption of petroleum in order to explore key topics in recent social and cultural theory, including globalization, empire, cultural performance, natural resource extraction, and the nature of the state. Case studies from the United States, Saudi Arabia, Nigeria, Venezuela, and the former Soviet Union, among others.

ANTH 639b / AFST 639b, Africa, Politics, Anthropology Louisa Lombard
A historical-anthropological study of politics in Africa. How have anthropologists made sense of the workings of African politics, both those of state and nonstate actors? This course charts how African states came into being, how they operate, and how state agents and the people they govern negotiate legitimacy, authority, and belonging.

ANTH 642b, Histories and Ethnographies of the Corporation Douglas Rogers
A survey of recent approaches to the study of corporations, with a focus on historical and anthropological perspectives. Topics include early modern corporations and colonialisms; states and corporations; labor; transformations of corporations in the neoliberal era; corporate "culture"; corporate philanthropy; and methodological considerations for conducting research on/in corporations. Case studies drawn from around the world and focused on the twentieth and twenty-first centuries. Prerequisites: graduate student status and permission of the instructor.

ANTH 651b / WGSS 651b, Intersectionality and Women's Health Marcia Inhorn
This interdisciplinary seminar explores how the intersections of race, class, gender, and other axes of "difference" (age, sexual orientation, disability status, nation, religion) affect women's health, primarily in the contemporary United States. Recent feminist approaches to intersectionality and multiplicity of oppressions theory are introduced. In addition, the course demonstrates how anthropologists studying women's health issues have contributed to social and feminist theory at the intersections of race, class, and gender.

ANTH 666b / AMST 778b / WGSS 666b, 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 726b / ARCG 726b, Ancient Civilizations of the Eurasian Steppes William Honeychurch
Peoples of the steppe zone, stretching from Eastern Europe to Mongolia, have played a pivotal role in Old World prehistory, though much about their societies and lifeways is still shrouded in mystery. The archaeology of this macro-region has developed rapidly since the 1990s, and this course presents an overview of major topics and debates in the region based on what archaeologists currently know about Eurasian steppe societies of the past.

ANTH 727a / AMST 730a / RLST 704a, Readings in Critical Muslim Studies Zareena Grewal
This course surveys key texts from a broad range of fields, including transnational American studies, religious studies, history, and anthropology, to explore methodological and theoretical questions that include: What is the "critical" in critical Muslim studies? What and who is "the Muslim" in these scholarly formations: a religious subject, a racial category, a location of subjection and surveillance, or all of these? What theoretical frameworks have emerged in the past twenty years to analyze the Muslim experience, and what is the impact of these intellectual projects on the academy and Muslim populations themselves? What different methodologies are used and what kinds of knowledge do they yield? How does critical Muslim studies as an emergent field complicate notions of an "American Islam" and "American Islamophobia," terms that are and have been practiced, debated, encoded, and altered both by transnational populations within the United States and by U.S. imperial policies, investments, and interests in Islam. The aim is to combine the resources and insights of various disciplines while identifying theoretical and methodological pitfalls and possibilities for future research. We focus on the relationship of our readings to other interdisciplinary formations that transcend disciplines, such as critical security studies and the anthropology of the secular, and the debates and trends therein. Permission of the instructor required.

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 754b / ARCG 754b, Statistics for Archaeological Analysis William Honeychurch
An introduction to quantitative data collection, analysis, and argumentation for archaeologists. Lectures, readings, and exercises emphasize the exploration, visualization, and analysis of specifically archaeological data using simple statistical approaches. No prior knowledge of statistics is required.

ANTH 773a / ARCG 773a / NELC 588a, Climate Change, Societal Collapse, and Resilience Harvey Weiss
Collapse documented in the archaeological and early historical records of the Old and New Worlds, including Mesopotamia, Mesoamerica, the Andes, and Europe. Analysis of politicoeconomic vulnerabilities, resiliencies, and adaptations in the face of abrupt climate change, anthropogenic environmental degradation, resource depletion, "barbarian" incursions, or class conflict.

ANTH 782b / ARCG 782b, Advanced Archaeological Theory Roderick McIntosh
Review of the intellectual history of archaeology, with readings from the Enlightenment to the present. Emphasis on the tension between science, mysticism, and nationalism in the interpretation of prehistoric processes.

ANTH 785b / ARCG 785b, 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 787b / ARCG 787b / HSAR 804b, East Asian Objects and Museums: Collection, Curation, and Display Anne Underhill
This course explores the East Asian art and anthropological collections at Yale's museums and at other major museums in North America and East Asia. Students study collections and their histories; gain experience in museum practices; and learn from specialists through class visits to other relevant museums in the United States.

ANTH 797a / ARCG 797a, Archaeology of East Asia Anne Underhill
Introduction to the findings and practice of archaeology in China, Japan, Korea, and southeast Asia. Methods used by archaeologists to interpret social organization, economic organization, and ritual life. Attention to major transformations such as the initial peopling of an area, establishment of farming villages, the development of cities, interregional interactions, and the nature of political authority.

ANTH 803b, Reproductive Ecology of Humans and Nonhuman Primates Richard Bribiescas
Survey of the current understanding of the physiology of reproductive function within the control of evolutionary and life history theory. Emphasis on population variation in female and male reproductive endocrinology as well as the sources of that variation.

ANTH 806a, Research Methods in Biological Anthropology Eduardo Fernandez-Duque and Claudia Valeggia
The goal of the course is to encourage students to consider whether we should all "stop working and start thinking." We use the title of the book by J. Cohen and G. Medley as a premise to read and discuss issues related to research design, data analyses, and interpretation of results. We focus on foundational topics in science that we think are not getting enough attention early enough in the process of doing scientific research. Some of the specific topics addressed are: (1) articulation of clear hypotheses and predictions; (2) considerations of study feasibility, sample size, selection of proxy variables, and data organization; (3) *a priori* statistical protocols; (4) data-sharing plans; (5) interpretation of statistical vs. biological significance of results; and (6) broader impacts.

ANTH 808a, Topics in Evolutionary Morphology Eric Sargis
Readings and discussions of literature on evolutionary morphology. Particular focus on systematics and functional morphology of mammals. Research projects are conducted in the Mammalian Evolutionary Morphology Lab.

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

ANTH 864a / ARCG 864a, 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 880b, Evolutionary Biology of Infant Care Eduardo Fernandez-Duque
Few aspects of the behavior of human and nonhuman primates are so intriguing, yet so poorly understood, as the prevalence of intense alloparental care in some primate species and human societies. Early hominoids probably evolved a social organization that, among other things, changed from involving loose male-female relationships to close dyadic partnerships requiring provisioning of offspring by other individuals besides the mother. Therefore, the development of extensive alloparental care and provisioning is considered a fundamental adaptation in the evolution of human life history patterns and in the differentiation of humans from other primates.

ANTH 902b, Environmental Anthropology Research Lab Michael Dove
A biweekly seminar for Dove doctoral advisees and students in the combined YSE/Anthropology doctoral program. Presentation and discussion of grant proposals, dissertation prospectuses, and dissertation chapters; trial runs of conference presentations and job talks; discussion of comprehensive exams, grantsmanship,

fieldwork, data analysis, writing and publishing, and the job search; and collaborative writing and publishing projects.

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

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

ANTH 952a or b, Directed Research in Linguistics Staff
By arrangement with faculty.

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

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

ANTH 955a or b, Directed Research in Evolutionary Biology Staff
By arrangement with faculty.

ANTH 963a and ANTH 964b / HIST 963a and HIST 964b / HSAR 841a and HSAR 842b / HSHM 691a and HSHM 692b, Topics in the Environmental Humanities Kalyanakrishnan Sivaramakrishnan and Paul Sabin
This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. Open only to students pursuing the Graduate Certificate in Environmental Humanities.
½ Course cr per term

ANTH 965a or b, Directed Research in Physical Anthropolgy Staff
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 & Data Science*), Joseph Chang (*Statistics & Data Science*), Ronald Coifman (*Mathematics; Computer Science*), John Emerson (*Adjunct; Statistics & Data Science*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology; Physics*), Michael Fischer (*Computer Science*), Anna Gilbert (*Mathematics; Statistics & Data Science*), Jonathon Howard (*Molecular Biophysics & Biochemistry*), Peter Jones (*Mathematics*), Yuval Kluger (*Pathology*), Nicholas Read (*Physics; Applied Physics; Mathematics*), Vladimir Rokhlin (*Computer Science; Mathematics*), Wilhelm Schlag (*Mathematics*), John Schotland (*Mathematics*), Mitchell Smooke (*Mechanical Engineering & Materials Science; Applied Physics*), Daniel Spielman (*Computer Science; Mathematics*), Van Vu (*Mathematics*), John Wettlaufer (*Earth & Planetary Sciences; Mathematics; Physics*), Huibin Zhou (*Statistics & Data Science*), Steven Zucker (*Computer Science; Biomedical Engineering*)

Associate Professors Josephine Hoh (*Public Health*), Smita Krishnaswamy (*Genetics; Computer Science*), Sekhar Tatikonda (*Statistics & Data Science*)

Assistant Professor Roy Lederman (*Statistics & 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, and randomized algorithms. Topics covered by the program include classical and modern applied harmonic analysis, linear and nonlinear partial differential equations, 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 algebra, analysis, and probability and statistics) by the end of their second year; (3) submit a dissertation prospectus; (4) participate in the instruction of undergraduates; (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 the methods of applied analysis, numerical computation, algorithms, and probability; 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 Math 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. (en route to the Ph.D.) Applications for a terminal master's degree are not accepted. Students who withdraw from the Ph.D. program may be eligible for the M.S. degree if they have completed ten graduate-level term courses, maintained a High Pass average, and met the Graduate School's Honors requirement for the Ph.D. program. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

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

COURSES

AMTH 525a or b, Seminar in Applied Mathematics Boris Landa
This course consists of weekly seminar talks given by a wide range of speakers. Required of all first-year students.

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 Smita Krishnaswamy
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 617b / MATH 617b, Partial Differential Equations John Schotland
Classical theory of Laplace, heat and wave equations including energy methods and maximum principles; distribution theory and the Fourier transform; Sobolev spaces; elliptic boundary value problems. The latter part of the course emphasizes functional analytic techniques and estimates rather than explicit solutions.

AMTH 631a / S&DS 631a, Optimization and Computation Anna Gilbert
An introduction to optimization and computation motivated by the needs of computational statistics, data analysis, and machine learning. This course provides foundations essential for research at the intersections of these areas, including the asymptotic analysis of algorithms, an understanding of condition numbers, conditions for optimality, convex optimization, gradient descent, linear and conic programming, and NP hardness. Model problems come from numerical linear algebra and constrained least squares problems. Other useful topics include data structures used to represent

graphs and matrices, hashing, automatic differentiation, and randomized algorithms. Prerequisites: multivariate calculus, linear algebra, probability, and permission of the instructor. Enrollment is limited, with preference given to graduate students in Statistics and Data Science.

AMTH 640b / CPSC 640b, Topics in Numerical Computation Staff
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 675a / MATH 675a, Numerical Methods for Partial Differential Equations
Vladimir Rokhlin
(1) Review of the classical qualitative theory of ODEs; (2) Cauchy problem. Elementary numerical methods: Euler, Runge-Kutta, predictor-corrector. Stiff systems of ODEs: definition and associated difficulties, implicit Euler, Crank-Nicolson, barrier theorems. Richardson extrapolation and deferred corrections; (3) Boundary value problems. Elementary theory: finite differences, finite elements, abstract formulation and related spaces, integral formulations and associated numerical tools, nonlinear problems; (4) Partial differential equations (PDEs). Introduction: counterexamples, Cauchy–Kowalevski theorem, classification of second-order PDEs, separation of variables; (5) Numerical methods for elliptic PDEs. Finite differences, finite elements, Richardson and deferred corrections, Lippmann–Schwinger equation and associated numerical tools, classical potential theory, "fast" algorithms; (6) Numerical methods for parabolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, integral formulations and related numerical tools; (7) Numerical methods for hyperbolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, time-invariant problems and Fourier transform.

AMTH 701b / MATH 701b, Topics in Analysis Peter Jones
This course provides an introduction to some topics in harmonic analysis and probability. Starting with basic dyadic analysis, we use this to give a short introduction to stochastic processes. We then give an introduction to quasiconformal mappings and results concerning random Jordan curves in R2. The main theorem discussed at the end of the course is contained in K. Astala, P. Jones, A. Kupiainen, E. Saksman, "Random Conformal Weldings," *Acta Mathematica* 207 (2011): 203–254. Some of the topics to be covered are: dyadic grids, maximal functions, and domain decomposition; Haar wavelet analysis, square functions, and Lp estimates; positive measures and product formulas, dyadic earth mover distances; wavelets and applications to function spaces; probability theory in the dyadic setting and the martingale convergence theorem; random walk, Brownian motion (via Haar functions) and introduction to stochastic processes, Feynman-Kac formalism; Brownian motion and relations to L2. Other topics covered depend on students' interests and could include: the Johnson-Lindenstrauss theorem and relations to random Gaussian vectors; the Gaussian Free Field and Kahane's theorem on exponentiation of the GFF; multiscale estimates for Kahane's

theorem; degenerate QC mappings and applications related to Kahane's theorem on the GFF. A background in basic graduate-level analysis (e.g., MATH 320 and MATH 325) is assumed, though most of the material can be understood by anyone with an understanding of Lebesgue measure.

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

This class covers basic methods of classical harmonic analysis that can be carried over to graphs and data analysis. We cover the fundamentals of nonlinear Fourier analysis, including functional approximations in high dimensions. We intend to cover foundational material useful for data organization and geometries.

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

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.

AMTH 999b, Directed Reading Vladimir Rokhlin

Applied Physics

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

Chair
Charles Ahn

Director of Graduate Studies
Vidvuds Ozolins (305 BCT and ESI, West Campus, vidvuds.ozolins@yale.edu)

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

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

Assistant Professors Yu He, Owen Miller, Shruti Puri

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.

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 student plans a course of study in consultation with faculty advisers (the student's advisory committee). There are a minimum of five core courses, two electives, and two Special Investigations (APHY 990), for a total of nine graded term courses. Core courses will be chosen from four groups: two from the QM group, and one from each of the other groups. Quantum Mechanics I (PHYS 508), Quantum Mechanics II (PHYS 510), and Electromagnetic Theory I (PHYS 502) will be default courses from their groups, with place-up option to others in the QM and E&M groups based on passing the Physics department exam. There will be no placing out of the required

seven courses, except for incoming students with master's or equivalent degrees, who are allowed to place out of three core courses.

The core groups are as follows:

Group 1 (QM, two courses required): Quantum Mechanics I (PHYS 508)*; Quantum Mechanics II (PHYS 510)*; Quantum Information and Computation (APHY 601); Quantum Optics (APHY 691).

Group 2 (E&M, one course required): Electromagnetic Theory I (PHYS 502)*; Principles of Optics with Applications (APHY 675); Techniques of Microwave Measurement and RF Design (APHY 816).

Group 3 (CM Physics, one course required): Solid State Physics I (APHY 548); Solid State Physics II (APHY 549); Statistical Physics I (PHYS 512); Introduction to Light-Matter Interactions (APHY 676).

Group 4 (one course required): Mathematical Methods of Physics (PHYS 506); Solid State Physics II (APHY 549); Principles of Optics with Applications (APHY 675); Noise, Dissipation, Amplification, and Information (APHY 677).

* PHYS 508, PHYS 510, and PHYS 502 are default courses requiring place-up exam in order to choose other courses from these groups.

Any of the courses from these groups not taken to meet core requirements may be taken as electives. Students who place up from a required course and prefer not to take any of the other courses in that group to satisfy the core requirement may petition the director of graduate studies (DGS) to substitute a different elective. Electives may be widely chosen, but will typically come from the following: Mesoscopic Physics I (APHY 634); Introduction to Superconductivity (APHY 633); Quantum Many-Body Theory (APHY 610); Nonlinear Optics and Lasers (APHY 679); Biological Physics (PHYS 523). Students may also petition the DGS to substitute an elective not on the standard list. The required seven courses are just the minimum, and students are strongly encouraged to take additional courses that are centrally related to their Ph.D. research. The DGS will work with students and their advisers to ensure that students are prepared for success in their field of research.

Students must take Responsible Conduct in Research for Physical Scientists (APHY 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 APHY 590 may not be used to fulfill the nine-course requirement.

Each term, the faculty review the overall performance of the student and report their findings to the DGS, who 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. 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 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 and 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

Students must meet the Graduate School's Honors requirement in at least two term courses (excluding Special Investigations) by the end of the third term of full-time study. An extension of one term may be granted on a case-by-case basis at the discretion of the DGS, in consultation with the student's committee.

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.

Program materials are available upon request to the Director of Graduate Studies, Department of Applied Physics, Yale University, PO Box 208267, New Haven CT 06520-8267; email, applied.physics@yale.edu; website, http://appliedphysics.yale.edu.

COURSES

APHY 506a, Basic Quantum Mechanics Sohrab Ismail-Beigi
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, 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, Solid State Physics II Vidvuds Ozolins
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 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 Leonid Glazman
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-Tc 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 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 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 Vidvuds Ozolins
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 (*Anthropology*)

Professors Richard Burger (*Anthropology*), Edward Cooke, Jr. (*History of Art; American Studies*), John Darnell (*Near Eastern Languages & Civilizations*), Stephen Davis (*Religious Studies; History*), Eckart Frahm (*Near Eastern Languages & Civilizations*), Milette Gaifman (*History of Art; Classics*), J.G. Manning (*Classics; History*), Roderick McIntosh (*Anthropology*), Nadine Moeller (*Near Eastern Languages & Civilizations*), Eric Sargis (*Anthropology; Ecology & Evolutionary Biology*), Anne Underhill (*Anthropology*), David Watts (*Anthropology*), Harvey Weiss (*Near Eastern Languages & 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 & Civilizations*), Lucy Salazar (*Anthropology*), Catherine Skinner (*Earth & 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 & Planetary Sciences, History, History of Art, Near Eastern Languages & 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 & Planetary Sciences, Ecology & 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, samantha.ware@yale.edu.

COURSES

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

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

ARCG 539a / NELC 539a, Era of the Pyramids: Archaeology and Material Culture of the Old Kingdom, Egypt Gregory Marouard

This seminar examines in detail the Old Kingdom period, covering about eight hundred years of this crucial phase of the Egyptian civilization, from the late phase of the Early Dynastic state formation period (ca. 2850 BCE) to the First Intermediate period (ca. 2050 BCE), encompassing the Third to the Sixth Dynasty. The course is based on an archaeological approach and is not a language or history course. All major archaeological sites of this period are investigated through the scope of material culture, art, and architecture, using as much as possible information from recent excavations and discoveries. The approach includes the study of the large mortuary complexes, from Saqqara to Dahshur, Giza, Abu Rawash, and Abusir, as well as several settlement sites from the central state capital in the Memphite region, the lower and upper provinces to the Egyptian borders. Several aspects of the connections established by Egypt with its neighboring areas such as Nubia and the Levant and desert areas at the periphery of the Nile Valley are included to illustrate the extensive exchange network and the complex economy and administrative system established to support the major construction projects of the period. Material culture, artistic aspects, and typologies (within an overview of reliefs and statuary), craft productions, everyday life activities, and burial practices are addressed. This course constitutes the first in a series of chronological survey courses in Egyptian archaeology.

ARCG 645a / NELC 627a, Archaeology of Ancient Egypt: An Introduction Gregory Marouard

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

ARCG 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 714b, The 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. It then reviews a variety of methods that scholars may use to reconstruct ancient beliefs and rituals. It 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 716La / ANTH 716La, Introduction to Archaeological Laboratory Sciences Ellery Frahm
Introduction to techniques of archaeological laboratory analysis, with quantitative data styles and statistics appropriate to each. Topics include dating of artifacts, sourcing of ancient materials, remote sensing, and microscopic and biochemical analysis. Specific techniques covered vary from year to year.

ARCG 726b / ANTH 726b, Ancient Civilizations of the Eurasian Steppes William Honeychurch
Peoples of the steppe zone, stretching from Eastern Europe to Mongolia, have played a pivotal role in Old World prehistory, though much about their societies and lifeways is still shrouded in mystery. The archaeology of this macro-region has developed rapidly since the 1990s, and this course presents an overview of major topics and debates in the region based on what archaeologists currently know about Eurasian steppe societies of the past.

ARCG 754b / ANTH 754b, Statistics for Archaeological Analysis William Honeychurch
An introduction to quantitative data collection, analysis, and argumentation for archaeologists. Lectures, readings, and exercises emphasize the exploration, visualization, and analysis of specifically archaeological data using simple statistical approaches. No prior knowledge of statistics is required.

ARCG 758a, Chavin and the Origins of Peruvian Civilization. Richard Burger
The development of early complex society in Peru during the Early Horizon is examined along with its antecedents during the Preceramic and Initial periods. This seminar focuses on the problems of elucidating the sociopolitical organization of these societies and the factors responsible for their transformation. General theories of the origins of complex society are critically reviewed in light of the Peruvian case. Also ANTH 758.

ARCG 773a / ANTH 773a / NELC 588a, Climate Change, Societal Collapse, and Resilience Harvey Weiss
Collapse documented in the archaeological and early historical records of the Old and New Worlds, including Mesopotamia, Mesoamerica, the Andes, and Europe. Analysis of politicoeconomic vulnerabilities, resiliencies, and adaptations in the face of abrupt climate change, anthropogenic environmental degradation, resource depletion, "barbarian" incursions, or class conflict.

ARCG 782b / ANTH 782b, Advanced Archaeological Theory Roderick McIntosh
Review of the intellectual history of archaeology, with readings from the Enlightenment to the present. Emphasis on the tension between science, mysticism, and nationalism in the interpretation of prehistoric processes.

ARCG 785b / ANTH 785b, 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 787b / ANTH 787b / HSAR 804b, East Asian Objects and Museums: Collection, Curation, and Display Anne Underhill
This course explores the East Asian art and anthropological collections at Yale's museums and at other major museums in North America and East Asia. Students study collections and their histories; gain experience in museum practices; and learn from specialists through class visits to other relevant museums in the United States.

ARCG 797a / ANTH 797a, Archaeology of East Asia Anne Underhill
Introduction to the findings and practice of archaeology in China, Japan, Korea, and southeast Asia. Methods used by archaeologists to interpret social organization, economic organization, and ritual life. Attention to major transformations such as the initial peopling of an area, establishment of farming villages, the development of cities, interregional interactions, and the nature of political authority.

ARCG 864a / ANTH 864a, 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, Alexander Garvin (*Adjunct*), 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 sound 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 in the program focus their research on a diverse range of topics, often drawing on related disciplines ranging from art history and media studies to the history of science and technology and social and political theory and history. 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.

ADMISSION REQUIREMENTS

Applicants must have a master's degree or equivalent in Architecture, Engineering, Environmental Design, or, exceptionally, a related field. They should specify to which track of the program—History and Theory of Architecture, or Ecosystems in Architectural Sciences—they seek admission. 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 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 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 questions regarding admissions, please contact graduate.admissions@yale.edu.

SCHOOL OF ARCHITECTURE SUMMER PREPARATION COURSES FOR INCOMING PH.D. STUDENTS

In the week before the beginning of the School of Architecture fall term, the School of Architecture offers two preparation courses that are required of incoming Ph.D. students.

- Summer Digital Media Orientation Course. This half-day orientation covers accessing the School's servers, use of the School's equipment, and the School's digital media policies and procedures.
- Arts Library Research Methodology Course. This course covers research methodologies and tools specific to the Ph.D. curriculum.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Entering students with sound professional preparation engage in a concerted course of study that leads directly to dissertation research and a doctoral degree.

Students are required to be full-time and in residence in the New Haven area during the first three academic years. (See Degree Requirements under Policies and Regulations.) Students in both tracks of the program take twelve graduate and Ph.D. seminars for credit. In the History and Theory track, these include a Ph.D. seminar taught in each of the first four terms by a member of the School of Architecture faculty that introduces the student to various methodologies and areas of study. Some seminars encourage primary research on a specific topic. Others offer a survey of historiographic approaches or focus on the reading of a body of texts. The four required seminars (ARCH 551, ARCH 552, ARCH 553, ARCH 554) form the methodological foundation of the program. In the Ecosystems in Architectural Sciences track, the requirements in the initial two years include four Ecosystems in Architectural Sciences seminars, ARCH 558, ARCH 559, ARCH 568, and ARCH 569.

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 Italian modernism would be encouraged to take a course in Italian history or culture. Likewise, 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.

Not later than the end of their second year, students are also 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.

The student's field of interest within either the History and Theory of Architecture track or the Ecosystems in Architectural Sciences track is defined by the end of the second year, by which point all course and language requirements are normally completed. At this time the director of doctoral studies (DDS) assigns the student a thesis adviser, who may or may not be from the School of Architecture. During the fall term of the third year, students undergo three oral examinations on topics relevant to their doctoral research, in the presence of the thesis adviser. Following successful completion of the examinations, the DDS, in consultation with the student's adviser, appoints a dissertation committee for the student. The dissertation committee consists of the student's adviser plus 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.

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 predissertation requirements, including the prospectus and oral examinations. 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.

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

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. 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. 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.

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
ARCH 552	Ph.D. Seminar: History/Theory II
ARCH 553	Ph.D. Seminar: History/Theory III
ARCH 554	Ph.D. Seminar: History/Theory IV

Required Courses in the Ecosystems in Architectural Sciences Track

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

Astronomy

52 Hillhouse Avenue, 203.432.3000
http://astronomy.yale.edu
M.S., M.Phil., Ph.D.

Chair
Sarbani Basu

Director of Graduate Studies
Héctor Arce (203.432.3018, hector.arce@yale.edu) (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 oral examination, which is based on the student's chosen field of research, and the Ph.D. dissertation. A written master's thesis containing original astronomical research is also required. Students are not admitted for this degree.

M.S. (en route to the Ph.D.) Upon application, the department will recommend for the award of the M.S. degree any student who has taken at least ten courses (not including

ASTR 710 and ASTR 711), including at least one research project (ASTR 580). The student should have a grade average of High Pass in the courses and a grade of High Pass or above in the research project.

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

COURSES

ASTR 500a, The Physics of Astrophysics Sarbani Basu
Primarily for incoming students in the Ph.D. program in Astronomy. The basic physics and related mathematics needed to take the advanced graduate courses. Topics in mechanics, thermodynamics and statistical mechanics, fluid mechanics, special relativity, and electrodynamics with applications to astrophysical systems are covered. Open to undergraduates with permission of the instructor.

ASTR 501b, 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 530a, Galaxies Jeffrey Kenney
The structure and morphology of galaxies, stellar populations, interstellar media, star formation, central black holes, galaxy mergers, and galaxy properties as a function of environment.

ASTR 535b / PHYS 678b, Computing for Scientific Research David Moore
This hands-on lab course introduces students to essential computational and data analysis methods, tools, and techniques and their applications to solve problems in physics. The course introduces some of the most important and useful skills, concepts, methods, tools, and relevant knowledge to get started in scientific research broadly defined, including theoretical, computational, and experimental research. Students learn basic programming in Python, data analysis, statistical tools, modeling, simulations, machine learning, high-performance computing, and their applications to problems in physics and beyond.

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 Priyamvada Natarajan
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 575a, Exoplanets Gregory Laughlin
In recent years hundreds of exoplanets have been discovered orbiting around other stars. This course reviews the physics of planetary orbits, current exoplanet detection techniques, recent progress in characterizing exoplanet interiors and atmospheres, and the implications of these findings for our understanding of planet formation and evolution.

ASTR 580a or b, Research Staff
By arrangement with faculty.

ASTR 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 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
Jay Humphrey

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,† Jay Humphrey, Fahmeed Hyder,† Francis Lee,* Andre Levchenko, Graeme Mason,* Evan Morris,* Laura Niklason,* Xenophon Papademetris,* Douglas Rothman,† W. Mark Saltzman, Martin Schwartz,* Fred Sigworth,* Albert Sinusas,* Brian Smith,* Lawrence Staib,† Hemant Tagare,* Paul Van Tassel,* Steven Zucker†

Associate Professors Stuart Campbell, Tarek Fahmy, Rong Fan, Gigi Galiana,* Anjelica Gonzalez, Michelle Hampson,* Henry Hsia,* Farren Issacs,* Themis Kyriakides,† Chi Liu,* Kathryn Miller-Jensen, Michael Murrell, Dana Peters,* Jiangbing Zhou*

Assistant Professors Nicha Dvornek,* Ansel Hillmer,* Michael Mak, 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, Michael Caplan (*Cellular & 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, Vincent Marchesi (*Pathology*), Mark Mooseker (*Molecular, Cellular, & Developmental Biology*), Michael Nathanson (*Internal Medicine/Digestive Diseases*), Karla Neugebauer (*Molecular Biophysics & Biochemistry*), Karin Reinisch, James Rothman, Martin Schwartz (*Internal Medicine/Cardiology*), Derek Toomre, Felix Weiland (*Adjunct*), Sandra Wolin (*Emerita*)

Associate Professors Julien Berro (*Molecular Biophysics & Biochemistry*), Jonathan Bogan (*Internal Medicine/Endocrinology*), David Calderwood (*Pharmacology*), Shawn Ferguson, Shangqin Guo, Megan King, Chenxiang Lin, Jun Liu (*Microbial Pathogenesis*), Patrick Lusk, Malaiyalam Mariappan, Thomas Melia, Christian Schlieker (*Molecular Biophysics & 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 Fred Gorelick
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
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, Systems Cell Biology 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 and Julia von Blume
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 701b, Illuminating Cellular Function Derek Toomre
The focus of the course is on the technical treatment of light microscopy and its applications. The course provides biology and bioengineering students with the knowledge and skills necessary to design and undertake advanced light microscopy experiments. It covers conceptual elements of fluorescence microscopy imaging and analysis (without going too heavily into the theory and math); new advances in super-resolution modalities; biological applications; and hands-on practical work. Enrollment limited to fifteen.

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

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

CBIO 911a / GENE 911a / MCDB 911a, First Laboratory Rotation Shirin Bahmanyar
First laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

CBIO 912a / GENE 912a / MCDB 912a, Second Laboratory Rotation Shirin Bahmanyar
Second laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

CBIO 913b / GENE 913b / MCDB 913b, Third Laboratory Rotation Shirin Bahmanyar

Third laboratory rotation for Molecular Cell Biology, Genetics, and Development 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 & 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, Fred Wright (*Internal Medicine/Nephrology*), Lawrence Young (*Internal Medicine/Cardiology*), David Zenisek, Z. Jimmy Zhou (*Ophthalmology & 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, Kristopher Kahle (*Neurosurgery*), Rachel Perry, 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 Molecular Medicine, Pharmacology, and Physiology (MMPP) 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 560, and C&MP 630. 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.

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, Physiological Systems 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 711b / MB&B 711b, Practical cryo-EM Workshop Yong Xiong, Jack Zhang, Franziska Bleichert, and Sigrid Nachtergaele

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
Jaehong Kim

Director of Graduate Studies
Paul Van Tassel (paul.vantassel@yale.edu)

Professors Eric Altman, Paul Anastas,† Michelle Bell,* Ruth Blake,* Menachem Elimelech, Gary Haller (*Emeritus*), 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 Professors John Fortner, Drew Gentner

Assistant Professors Peijun Guo, Amir Haji-Akbari, Shu Hu, Mingjiang Zhong

Lecturer Katherine Schilling

* 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.

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.

Program materials are available online at https://chem.yale.edu/useful-links.

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 503a, Fundamentals of Organometallic Chemistry Nilay Hazari
A half-term survey of the main principles of organometallic chemistry that enables students to understand basic concepts in the field. It prepares students for CHEM 504, the second half of this course. Prerequisites: two terms of organic chemistry and one term of inorganic chemistry (CHEM 252) or equivalent experience. ½ Course cr

CHEM 504a, Applications of Organometallic Chemistry Nilay Hazari
A half-term survey of the applications of organometallic chemistry demonstrating the range of areas where organometallic reactions are important. It builds on the knowledge learned in CHEM 503. Prerequisite: CHEM 503 or equivalent experience. ½ Course cr

CHEM 505b, Inorganic Reaction Mechanisms James Mayer
This half-term course covers the fundamentals of kinetics and mechanisms used by coordination compounds and transition-metal catalysts, and features analysis of papers from the recent literature. Prerequisites: two terms of organic chemistry, one term of inorganic chemistry, and CHEM 502 or equivalent. ½ Course cr

CHEM 506a, Bioinorganic Spectroscopy Gary Brudvig
This course is an advanced introduction to biological inorganic chemistry with an emphasis on the methods used to characterize the active sites of metalloproteins. The major physical methods used in the determination of molecular structure, bonding, and physical properties of metal ions in proteins are introduced. Prerequisite: a general knowledge of biochemistry and familiarity with both inorganic coordination chemistry and physical chemistry. ½ Course cr

CHEM 508a, Principles of Materials Chemistry Hailiang Wang
This course is an advanced introduction to materials chemistry. It aims to serve senior undergraduates who are interested in learning and applying chemical principles for materials research and applications. Fundamental principles in solid-state chemistry, including crystal structures and chemical interactions, are taught. Ionics, metal, semiconductor, and polymer materials, including their synthesis, structures, properties, and applications, are discussed. Prerequisites: general chemistry, inorganic chemistry, and physical chemistry, or equivalent experience. ½ Course cr

CHEM 511b, Fundamentals of Diffraction for Small Molecule Crystallography Brandon Mercado
In the field of chemistry, determining the connectivity of atoms in unknown compounds is critical. Accurate and precise structure models help us understand the function of materials. Single crystal diffraction is an elegant method to determine molecular structure and its related parameters. This course introduces the fundamental concepts of diffraction with a summary of symmetry elements, space group theory, and solving "the phase problem." The course is designed to provide the foundation for students to critically evaluate not only their own structure models determined by diffraction, but also those presented in the literature and diffraction databases. Prerequisite: inorganic chemistry, CHEM 502, or permission of the instructor. ½ Course cr

CHEM 512b, The Refinement of Small Molecule Crystal Structures Brandon Mercado
In the field of chemistry, determining the connectivity of atoms in unknown compounds is critical. Accurate and precise structure models help us understand the function of materials. Single crystal diffraction is an elegant method to determine molecular structure and its related parameters. This course introduces the practical concepts of how to model a structure from diffraction data. Some of the topics covered include visualizing electron density in a crystal, molecular disorder, twinning, and publication of results. Prerequisite: CHEM 511 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 Scott Miller
The course generally follows CHEM 516. This module covers concepts in physical organic chemistry including acid-base chemistry, advanced issues in stereochemistry, kinetics, and thermodynamics, as well as experiments and techniques employed in mechanistic analysis. Issues in catalysis are addressed throughout. Prerequisites: CHEM 516, two terms of introductory organic chemistry, and two terms of physical chemistry. Permission of the instructor may be sought for potential exceptions. ½ Course cr

CHEM 519a, Foundations of Chemical Biology Stacy Malaker
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 522a, Foundations of Chemical Biology II Sarah Slavoff
A comprehensive introduction to the origins and emerging frontiers of chemical biology. Prerequisite: CHEM 519 or permission of the instructor. ½ Course cr

CHEM 524a, Applications of Chemical Biology to Therapy David Spiegel
This course explores the design and enablement of medicines derived from a convergence of concepts and techniques from chemistry and biology. Topics include small-molecule drug discovery concepts and tools, drug metabolism, protein therapeutics, hybrid chemical/biologic drugs, and bifunctional molecules. Modern approaches for target discovery and validation are also discussed. Prerequisite: CHEM 519, two terms of undergraduate organic chemistry, or permission of the instructor. A basic understanding of biochemistry and molecular biology is assumed. ½ Course cr

CHEM 525b, Spectroscopic Methods of Structure Determination Martin Saunders
The background and use of spectroscopic methods emphasizing NMR in organic chemistry. The course includes the use of programs for simulating spin-spin coupling and rapid rearrangement reactions in NMR. All methods commonly used by organic chemists for determining molecular structures of species in solution, in the gas phase, and in solids are included.

CHEM 528b, Natural Products Synthesis Timothy Newhouse
Survey of natural products syntheses, with an emphasis on those that contain unique strategies, transformations, or reagents. Key transformations are introduced in the context of various syntheses. Retrosynthetic analysis and synthetic planning are discussed. Prerequisites: undergraduate organic chemistry and one term of a graduate course in organic chemistry, 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 Jon Ellman
Compound synthesis is essential to the discovery and development of new chemical entities with a desired property, whether that be for fundamental study or for a more applied goal such as a new pharmaceutical, agrochemical, or material. In this course we emphasize key transformations and principles to provide a framework for the efficient

design and synthesis of organic compounds. This course builds on the knowledge learned in CHEM 532. Prerequisite: CHEM 532 or permission of the instructor. ½ Course cr

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

CHEM 535b, Fundamental Medicinal Chemistry William Jorgensen
The course covers basic concepts of medicinal chemistry including drug structures, properties of drugs, methods of drug discovery, protein-ligand interactions, enzyme inhibition, assays, drug targets, anti-infective agents, virtual and high-throughput screening, structures to avoid (PAINS), structure-based drug design, and metabolism. Prerequisites: undergraduate organic and physical chemistry, or permission of the instructor. ½ Course cr

CHEM 536b, Computer Simulations of Organic and Biomolecular Systems William Jorgensen
The course covers methods and applications of statistical mechanics and molecular dynamics to model fluid systems including biomolecules in aqueous solution. Topics covered include force fields, Monte Carlo and molecular dynamics theory, simulation of water and other liquids, free-energy methods and applications, QM/MM simulations, protein dynamics, and molecular recognition and design. Prerequisites: undergraduate organic and physical chemistry, or permission of the instructor. ½ Course cr

CHEM 537a, Chemistry of Isotopes Martin Saunders
Advanced applications of isotopes to chemical problems and the theory associated with them, including kinetic and equilibrium isotope effects, tracer applications, and dating.

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 568b, Advanced Quantum Mechanics Staff
Topics in quantum mechanics that are essential for understanding modern chemistry, physics, and biophysics. Topics include the interaction of radiation with matter and the use of quantized radiation fields and may include time-dependent quantum theory, scattering, semiclassical methods, angular momentum, density matrices, and electronic structure methods. Prerequisite: introductory quantum mechanics or permission of the instructor. 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 576a, Fundamentals for Physical Chemistry Mark Johnson
This course reinforces the principles of physics that are most relevant to experimental and theoretical physical chemistry. These include classical electricity and magnetism (with emphasis on the nature of light and the interaction of light with matter), optics, lasers, angular momentum, and atomic structure, including the spin-orbit interaction. The basic theme of the course is to provide students with physical intuition that can bridge the observations of everyday experience to the abstract concepts required for the correct, quantum-mechanical description of atomic-scale phenomena. Prerequisites: two terms of undergraduate physical chemistry (CHEM 328 or CHEM 332, and CHEM 333; or equivalents); and physics course work covering classical mechanics and electrostatics. ½ Course cr

CHEM 578a, Molecules and Radiation I: Matrix Methods in Quantum Mechanics Kurt Zilm
A treatment of time-independent quantum mechanics especially aimed at applications in spectroscopy focusing on the use of matrix methods. Development of basis sets, time-independent perturbation theory, matrix mechanics, angular momentum, and basic group theory. Prerequisite: previous exposure to quantum mechanics at the level of physical chemistry, or permission of the instructor. ½ Course cr

CHEM 579a, Molecules and Radiation II: Time-Dependent Quantum Mechanics and Spectroscopy Kurt Zilm
A treatment of time-dependent quantum mechanics especially aimed at applications in spectroscopy. Sudden and adiabatic processes, interaction of radiation with electric and magnetic dipoles, Fermi's golden rule, two-level systems and Rabi cycling, spontaneous

emission and relaxation kinetics, Bloch equations, line shapes and relaxation theory, illustrations chosen from optical and magnetic resonance. Prerequisite: CHEM 578 or permission of the instructor. ½ Course cr

CHEM 584b, Machine Learning and Quantum Computing in Chemistry and Materials Science Victor Batista
Machine learning and quantum computing have emerged as leading technologies of the twenty-first century and are expected to be increasingly applied to a wide variety of chemical and materials science challenges. This course introduces fundamental concepts of machine learning and quantum computing to chemists and materials science students through an overview of algorithms, computational methods, and applications. It is intended to empower students to engage with this emerging field and foster the growing field of artificial intelligence for accelerated scientific discoveries in the molecular and physical sciences. Prerequisites: introductory quantum mechanics and Python, or permission of the instructor. ½ Course cr

CHEM 585b, 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 586b, Quantitative Biochemical Imaging Caitlin Davis
Theory of optical microscopy, imaging, and image analysis with emphasis on quantitative characterization of the structure, dynamics, and chemical reactions of proteins, nucleic acids, and other biopolymers. Topics include optics of microscope and image formation, interaction of light and matter, fluorescent probes and biosensors, digital image processing, modern approaches in light microscopy (including confocal and multiphoton), and a brief introduction to electron microscopy and scanning probe techniques. Prerequisite: physical chemistry that includes quantum mechanics; calculus and linear algebra are recommended but not required. ½ Course cr

CHEM 587b, Time-Resolved Spectroscopy Ziad Ganim
Time-resolved spectroscopies allow us to probe the energy levels of molecular systems and observe processes such as relaxation, reorientation, spectral diffusion, photochemistry, and coherent energy transfer as they are occurring. This course presents a unified view of linear and nonlinear spectroscopies following the development of pulsed laser technology from pump-probe measurements to modern coherent multidimensional spectroscopies. Prerequisite: one term of quantum mechanics (wave mechanics). Preferred: familiarity with density matrices and Maxwell's equations. ½ Course cr

CHEM 588b, Optical Spectroscopy: Applications in Biophysics E. Chui-Ying Yan
The course covers basic theory of fluorescence and vibrational spectroscopies and their applications in biophysics. Emphasis is placed on quantitative interpretation of experimental data to gain structural and dynamic information to address biological questions at the molecular level. Topics include fluorescence correlation spectroscopy (FCS); Forster resonance energy transfer (FRET); fluorescence anisotropy; and Raman, infrared, and non-linear optical spectroscopies. Discussions of applications

focus on current and classic literature. This course provides foundational knowledge for advanced courses on molecular optical imaging. Prerequisite: undergraduate upper-level physical chemistry or permission of the instructor. ½ Course cr

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

CHEM 592a, Biochemical Rates and Mechanisms I J Patrick Loria
An advanced treatment of enzymology. Topics include transition state theory and derivation of steady-state and pre-steady-state rate equations. The role of entropy and enthalpy in accelerating chemical reactions is considered, along with modern methods for the study of enzyme chemistry. These topics are supplemented with in-depth analysis of the primary literature. Prerequisites: CHEM 332 or equivalent, two terms of organic chemistry, and MATH 115. ½ Course cr

CHEM 593a, Biochemical Rates and Mechanisms II J Patrick Loria
This course focuses on the role of molecular motions in enzyme function, and on biochemical and spectroscopic methods to interrogate these motions. Examples explore motions ranging from picoseconds to milliseconds and how the timescales and amplitudes of these motions impact catalysis and allostery. Prerequisite: CHEM 592 or permission of the instructor. ½ Course cr

CHEM 596b, Computational Chemistry Sharon Hammes-Schiffer
An introduction to modern computational methods employed for the study of chemistry and biochemistry, including molecular mechanics, quantum mechanics, statistical mechanics, and molecular dynamics. Special emphasis on the hands-on use of computational packages for current applications ranging from organic reactions to protein-ligand binding and dynamics. Prerequisite: physical chemistry or permission of the instructor. ½ Course cr

CHEM 600a or b, 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 700a or b, Laboratory Rotation for First-Year Biophysical and Chemical Biology Graduate Students Staff

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

CHEM 730a or b, Molecular Science Seminar Staff
A seminar series based on invited speakers in the areas of physical, inorganic, and biological chemistry.

CHEM 740a or b, Seminar in Chemical Biology Staff

CHEM 750a or b, Biophysical Chemistry Seminar Staff

CHEM 760a or b, Seminar in Inorganic Chemistry Staff

CHEM 990a or b, 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
www.yale.edu/classics
M.A., M.Phil., Ph.D.

Acting Chair
Kirk Freudenburg

Director of Graduate Studies
Egbert Bakker (dgs.classics@yale.edu)

Professors Egbert Bakker, Kirk Freudenburg, Milette Gaifman (*Classics; History of Art*), Emily Greenwood (*Classics; African American Studies*), Verity Harte (*Classics; Philosophy*), Brad Inwood (*Classics; Philosophy*), Christina Kraus, Noel Lenski (*Classics; History*), J.G. Manning (*Classics; History*)

Associate Professors Pauline LeVen, Andrew Johnston

Assistant Professor Jessica Lamont

Lecturers Timothy Robinson, Joseph Solodow

Affiliated faculty and secondary appointments Harold Attridge (*Divinity School; Emeritus*), Victor Bers (*Classics; Emeritus*), Adela Yarbro Collins (*Divinity School; Emerita*), John J. Collins (*Divinity School; Emeritus*), John Hare (*Divinity School*), Diana Kleiner (*Classics; History of Art; Emerita*), Yii-Jan Lin (*Divinity School*), Susan Matheson (*Curator of Ancient Art, Yale Art Gallery*), David Quint (*English; Comparative Literature*), Kathryn Slanski (*Humanities; Near Eastern Languages & Civilizations*), George Syrimis (*Hellenic Studies*)

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. Diagnostic sight 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, essays, and a twenty-four-hour research paper, 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 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.

Classics and Renaissance Studies

Requirements for the Ph.D. Degree in Classics and Renaissance Studies

1. Practice translation exams in Greek and Latin on texts assigned from the Classics and Renaissance Studies 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. Sixteen term courses, divided equally between Classics and Renaissance Studies: (i) eight courses in Classics; (ii) including two yearlong surveys (four courses) of Greek and Latin literature; (iii) at least three seminars; (iv) eight courses in Renaissance Studies; (v) two terms of the Renaissance Studies Core Course; (vi) six additional term courses to be taken in at least two disciplines (such as literature, history, history of art, music, religious studies, etc.); one of these courses should meet the normal Classics requirements of a course in classical art or archaeology; (vii) of these sixteen courses, fourteen 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.
4. Literary proficiency in Italian, as examined by Renaissance Studies, and in a second language, normally German or French.

5. Oral examinations in Greek and Latin literature, based on the syllabus covered by the survey courses, drawn from the Classics and Renaissance Studies 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).
6. Translation examinations in Greek and Latin, based on the Classics and Renaissance Studies Ph.D. reading lists, by the end of the fifth term in residence.
7. Oral examinations on special fields appropriate to both disciplines, by the beginning of the sixth term. Seventy-five minutes on three or four topics in classical Greek and Latin literature; and forty-five minutes (three fifteen-minute questions) on Renaissance topics to be divided between at least two disciplines, i.e., literature, history, history of art, etc., selected in consultation with the directors of graduate studies in both disciplines. One of the fields studied will be related to the student's dissertation topic. 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.
8. A dissertation prospectus, by the end of the sixth term in residence.
9. 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.

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 DEGREES

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

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 N. Raymond Clemens
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 624b / ENGL 521b / HIST 532b / MDVL 621b, Advanced Manuscript Studies N. Raymond Clemens
This course builds on the foundation provided by MDVL 620 by focusing on both regional Latin hands and the vernacular hands that grew from the Latin tradition. The backbone of the course is Middle English paleography (no prior experience needed), but the course surveys French, Italian, Hebrew, and German hands as well. Prerequisite: MDVL 620 or MDVL 571 or equivalent study of Latin paleography strongly suggested.

CLSS 808b / ARCG 500b / NELC 500b, Environmental History of West Asia, Egypt, and the Mediterranean Harvey Weiss
The new linkages of high-resolution paleoclimate and archaeological and epigraphic records revise earlier historiography for the major disjunctions, including societal genesis, collapse, habitat tracking, and technological and ideological innovations, from 4000 to 40 BCE across west Asia, Egypt, and the Aegean. The seminar synthesizes speleothem and lake, marine, and glacial core records for abrupt climate changes and coincident societal adaptations previously unexplained.

CLSS 830a, Beauty Pauline LeVen
This seminar concentrates on the ancient Greek discourse on beauty, from Homer to the period known as the Second Sophistic. Weekly discussions of ancient Greek texts (Homer, archaic lyric poetry, Plato, Xenophon, Philostratus, Dio Chrysostom, Greek novels) and critical literature on the topic focus on the following themes: beauty and the body; beauty and the senses; beauty and the good; beauty and the arts; beauty and the beasts. Prerequisite: knowledge of ancient Greek. Students with no knowledge of Greek interested in taking the course should contact the instructor.

CLSS 834a / PHIL 763a, Friendship and Egoism: *Nicomachean Ethics* 9 David Charles and Brad Inwood
The class reads, analyzes, and discusses book 9 of Aristotle's Nicomachean Ethics, dealing with the nature of the self, the place of friendship in the good life, and the balance between one's commitments to social and intellectual activities. This is a core course for the combined Ph.D. program in Classics and Philosophy. Open to all graduate students in Philosophy or Classics who have suitable preparation in Attic 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 835a / HIST 509a, Problems in Hellenistic History Joseph Manning
The course explores current problems in Hellenistic history and how the period is related to premodern global history. We read in depth from current literature on key themes.

CLSS 839b / HIST 609b, Ancient Greek Magic: Spells, Curses, Incantations Jessica Lamont
This seminar explores private ritual practices in the ancient Mediterranean often categorized as "magical," through the lens of literary, epigraphic, and material evidence for spells, curses, and incantations. The seminar begins in the world of Mesopotamia, Egypt, and Phoenicia in order to assess later Greek borrowings; the primary focus, however, is on the circum-Mediterranean basin from the archaic period through Late Antiquity. Examined rituals include conditional self-curses attached to oaths, spells, incantations, revenge curses, binding-curses (defixiones), prayers for justice, curse effigies, amulets, and erotic curses used for seduction. Attention is paid to methodological problems of categorization in the historiography of ancient "magic," in addition to debates about the place of such rituals within the broader framework of Greek and Roman religion. Knowledge of Greek and Latin recommended.

CLSS 880b / HIST 521b, 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 Milette Gaifman
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 882b, Graduate Works in Progress Colloquium Staff
Students precirculate work-in-progress material from their prospectus or dissertation and present it to the class. Open to all students in years 3 and above.

CLSS 895a / HIST 504a, Survey of Greek and Latin Historical Sources Noel Lenski
Familiarizes students with the major sources for Greek and Roman history in the original languages. Covers material to be tested on comprehensive examinations for the Ph.D. in the combined program in Classics and History.

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 899b, Graduate Latin Survey II Kirk Freudenburg
A continuation of CLSS 898.

GREK 730b, Aristophanes' *Acharnians* and *Birds* Emily Greenwood Milne
Intensive reading and study of Aristophanes' plays in their historical, social, and intellectual context.

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.

LATN 765a, Lucan Christina Kraus
Reading of selected Latin passages from Lucan's epic poem *The Civil War* (the whole poem to be read in English translation). Topics to be covered include design and style of Imperial epic; Lucan's manipulation of the epic tradition; the lure and nature of violence in civil war narrative.

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, David Quint, 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

Affiliated faculty R. Howard Bloch (*French*), Francesco Casetti (*Film & Media Studies*), Michael Denning (*American Studies*), Alice Kaplan (*French*), Tina Lu (*East Asian Languages & Literatures*), John MacKay (*Slavic Languages & 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.

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).

Ph.D. dissertation Supervised by a dissertation director (or directors)—at least one from the core or affiliate departmental faculty—and approved by a faculty committee, the dissertation completes the degree. Its initial step is a dissertation prospectus, to be submitted and approved by the dissertation director and a standing faculty committee no later than halfway through the seventh term of study. 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.

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

Course work 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 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.

Course work 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).

Comparative Literature and Renaissance Studies

Course work Students are required to complete sixteen graduate term courses, at least seven of these (including the Comparative Literature proseminar) in the Department of Comparative Literature. Students must take at least ten courses in the field of Renaissance Studies (offered in several departments), including two terms of the Renaissance Studies core seminar and three courses in two disciplines other than literature (such as history, history of art, or religious studies). 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. 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 Latin and Italian, as set by Renaissance Studies—one hour of Renaissance Latin prose; one hour of sixteenth-century Italian prose, one of modern Italian scholarship—and two additional languages, at least one of them European.

Orals The joint oral examination will consist of seven twenty-minute questions (two topics in Renaissance literature from a comparative perspective; three on non-Renaissance literature, including at least one theoretical or critical question; and two questions on Renaissance topics in nonliterary disciplines). Orals should be completed no later than the end of the sixth term.

Prospectus and dissertation The prospectus should be completed in September of the fourth year. Procedures regarding the dissertation will follow departmental practice, although the final readers will normally include at least one member of the Renaissance Studies Executive Committee.

MASTER'S DEGREES

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

M.A. (en route to the Ph.D.) Students enrolled in the Ph.D. program may receive the M.A. upon completion of 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. No student is admitted to a terminal M.A.

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 or b, 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 509a, Advanced Literary Translation Robyn Creswell
Students apply to this workshop with a project in mind that they have been developing, either on their own or for a senior thesis, and they present this work during the class on a regular basis. Practical translation is supplemented by readings in the history of translation practice and theory, and by the reflections of practitioners on their art. These readings are selected jointly by the instructor and members of the class. Topics include the history of literary translation—Western and Eastern; comparative approaches to translating a single work; the political dimension of translation; and translation in the context of religion and theology. Class time is divided into student presentations of short passages of their own work, including related key readings; background readings in the history of the field; and close examination of relevant translations by accomplished translators. Students receive intensive scrutiny by the group and instructor. Permission of the instructor required.

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 Ethic*s. 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 522b / GMAN 687b, Heimito von Doderer's *The Strudlhof Steps* Kirk Wetters
Spanning the fin-de-siècle to the postwar, high modernism and popular fiction, Heimito von Doderer's classic 1951 novel of the city of Vienna was published in English only recently, in 2021. Unclassifiable in its combination of romanticism, realism, and modernism, *The Strudlhof Steps* has won over many generations of readers, critics, scholars, and other novelists (including recently Daniel Kehlmann, for whom Doderer's novel is "the best German language novel of the 20th century"). This course undertakes a slow reading of Doderer's 900-page bestseller, with attention to many relevant contexts, including: the theory and history of the novel, modernism in art and architecture, the complex genesis of *The Strudlhof Steps,* selections of Doderer's other

writings, the historical context (especially the interwar period, the rise of fascism, and the question of Habsburg nostalgia). Strongly recommended to avid readers of fiction. Knowledge of German is helpful.

CPLT 524a / GMAN 650a, Critique and Crisis Kirk Wetters
In our time, when everyone is suspected of being hypercritical, it is not surprising that the limits of critique, its function, and institutional location are called to question. The idea of "post-critique" has been much discussed in recent years. This course develops critical models, primarily from the German tradition, in order to show the great variety of options available beyond the "hermeneutics of suspicion." Topics include post-critique, the history of critique/criticism, the Romantic concept of critique, traditional vs. critical theory, historicism, philology vs. hermeneutics, science (Wissenschaft) vs. the critique of positivism. Main protagonists include Kant, Schiller, Schlegel, Nietzsche, Dilthey, Max Weber, Lukács, Husserl, Benjamin, Adorno, Koselleck, Szondi, Gadamer, Gumbrecht, Latour, Felski.

CPLT 582a / ENGL 545a / FREN 802a / MDVL 502a, Chaucer and Translation Ardis Butterfield
An exploration of the works of Geoffrey Chaucer (ca. 1340–1400), brilliant writer and translator. Using modern postcolonial as well as medieval theories of translation, memory, and bilingualism, we investigate how texts in French, Latin, and Italian are transformed, cited, and reinvented in his writings. Some key questions include: What happens to language under the pressure of crosslingual reading practices? What happens to the notion of translation in a multilingual culture? How are ideas of literary history affected by understanding Chaucer's English in relation to the other more prestigious language worlds in which his poetry was enmeshed? Texts include material in French, Middle English, Latin, and Italian. Proficiency in any one or more of these languages is welcome, but every effort is made to use texts available in modern English translation, so as to include as wide a participation as possible in the course.

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

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 624b / GMAN 689b, Alienation, Reconciliation: From Hegel to the Ecological Rift Rudiger Campe

Alienation has been explored in social, economic, or environmental respects, and thinkers differ widely according to how, where, and when to identify the other of alienation, a non-alienated way of life or reconciliation. This course discusses alienation and reconciliation along these lines in Rousseau, Hegel, Marx; Simmel, Lukács, Sartre; Lefebvre, J.B. Foster, J.W. Moore; and others.

CPLT 638b / ENGL 605b, Shakespeare's *Tempest,* Cultural Translation, and the Genealogies of Race Lawrence Manley and Ayesha Ramachandran

This course explores current debates over questions of premodern race, racialization, and race-thinking through the lens of *The Tempest* and its literary and critical afterlives. Almost since its first performance, Shakespeare's play has served as an index of England's (and Europe's) engagement with its "others": it is (arguably) a play both about and against empire, a meditation on indigenous and settler relations, a study in language and social stratification, a wry dramatization of gender dynamics, and an exemplary case in the making and deconstruction of race. Its classical and contemporary early modern sources are already concerned with these problems, which are in turn reimagined by Shakespeare for his time and then repurposed by the diverse range of writers who adapt from his work. The process of adapting *The Tempest* to different media and cultural situations over the past century (and more) has further elaborated these complex intersections: from Browning and Renan to Auden, from Césaire and Lamming to Virahsawmy, from Darío and Rodó to Fanon and Retamar, from Brathwaite to Cliff and Wynter, Shakespeare's play is an occasion for exploring processes of cultural translation and the critical problems of race, gender, and (post)colonialism. While examining the transhistorical travels of *The Tempest,* this seminar introduces and examines the current state of criticism and theory with regard to adaptation, race, and empire.

CPLT 645b / AMST 734b / ENGL 971b / FREN 871b, Fictions of Canada: Colonialism, Nationalism, Postcolonialism Katie Trumpener

This seminar explores the literature(s) of Canada in its long history, its considerable linguistic and cultural range, and its complex relationship to political history. Like Canada itself, Canadian literature represents a "contact zone" between First Nations peoples, French and British settlers, and immigrants from Eastern Europe, East and South Asia, and the Caribbean. Particular focus on Canada's diverse early literatures (from Jesuit hymn to epistolary novel); on the prominent role of women writers across Canadian literature history; on the emergence of an experimental Québécois literature (utilizing Montreal patois as a new literary language) in an era also marked by secularization, modernization, and political separatism; on English Canadian attempts to rethink colonial history; and on the critiques of Canada's ongoing decolonization process by new generations of indigenous, immigrant, and ethnic writers. This course explores both literary history and literary form; and the work of internationally famous novelists and poets (Leonard Cohen, Marie-Claire Blais, Margaret Atwood, Alice Munro, Michael Ondaatje) and their innovative local counterparts. Throughout the term, moreover, our discussion of written literary texts (poems, novels, plays) is

supplemented by primarily oral texts (Canadian anthems, ballads, folk, rock, and punk songs in a range of Canadian languages). We are thus listening to even as we are reading Canada.

CPLT 656a / GMAN 643a, Georg Büchner's Revolutions Rudiger Campe
Georg Büchner's (1813–1837) work is a work across times and places. In *Danton's Death* he reenacts the French Revolution, in the pamphlet *Hessian Messenger* he calls for revolution in German lands. Büchner's other, simultaneous, revolution is one of language and literature. In the narrative *Lenz* and the theater play *Woyzeck,* Büchner turns the Romanticism of his own time upside down, and the two works resurface only ca. 1900 as trailblazers of social naturalism and modernist (postdramatic) theater. Celan, in *The Meridian,* gives an idiosyncratic account of Büchner's travel across times and places. This course contextualizes the close reading of Büchner's work with materials from the French Revolution, early socialists, and Marx; French, German, and British Romanticism; prose and theater ca. 1900 when Büchner is rediscovered; and Celan.

CPLT 684a / ENGL 574a / ITAL 720a / RNST 684a, Renaissance Epic David Quint
This course looks at Renaissance epic poetry in relationship to classical models and as a continuing generic tradition. It examines epic type scenes, formal strategies, and poetic architecture. It looks at themes of exile and imperial foundations, aristocratic ideology, and the role of gender. The main readings are drawn from Vergil's *Aeneid,* Lucan's *Bellum civile,* Tasso's *Gerusalemme liberata,* Camões's *Os Lusíadas,* and Spenser's *Faerie Queene*.

CPLT 705b / ITAL 781b, *The Decameron* Millicent Marcus
An in-depth study of Boccaccio's text as a journey in genre in which the writer surveys all the storytelling possibilities available to him in the current repertory of short narrative fiction—ranging from ennobling example to flamboyant *fabliaux,* including hagiography, aphorisms, romances, anecdotes, tragedies, and practical jokes—and self-consciously manipulates those forms to create a new literary space of astonishing variety, vitality, and subversive power. In the relationship between the elaborate frame-story and the embedded tales, theoretical issues of considerable contemporary interest emerge—questions of gendered discourse, narratology, structural pastiche, and reader response among them. *The Decameron* is read in Italian or in English. Close attention is paid to linguistic usage and rhetorical techniques in this foundational text of the vernacular prose tradition.

CPLT 716a / FILM 729a / GMAN 730a, German New Waves in Cold War Europe Katie Trumpener
Before 1961, Berlin was the best place in Europe to follow both Eastern and Western Europe's emerging cinematic New Waves. And first in East, then in West Germany, young filmmakers developed distinctive approaches to political and documentary filmmaking, to the Nazi past and the Cold War, to class, gender, and social transformation. This course juxtaposes the two German New Waves, focusing on aesthetic ferment, institutional barriers, and transformation. Features, documentaries, and experimental films by Gerhard Klein, Konrad Wolf, Alexander Kluge, Herbert Vesely, Edgar Reitz, Jean-Marie Straub and Danièle Huillet, Jürgen Böttcher, Heiner Carow, Frank Beyer, Wim Wenders, Rainer Werner Fassbinder, Helke Sander, Helke Misselwitz, read against other Eastern and Western New Wave films (i.e., by Lindsay

Anderson, Karel Reisz, Andrzej Munk, Alain Resnais, Mikhail Kalatozov, Milos Forman).

CPLT 724b / ENGL 729b, Literature and Philosophy from Locke to Kant Jonathan Kramnick

This is a class on epistemology, aesthetics, and literary form. We read major works in empiricism and moral philosophy alongside poetry and fiction in several genres. We ask, for example, how do poetry, fiction, and the visual arts recruit and account for perceptual experience or consider material and natural objects? What happens when the empirical psychology of consciousness or the categories of the sublime, beautiful, and picturesque take narrative or poetic form? What sort of ethical models follow from formal or generic decisions? We focus throughout on how these topics have been discussed across the history of literary studies, and we pay close attention to current debates in the field, including those prompted by new formalisms and materialisms, critical race studies, cognitive literary studies, and the digital humanities. Authors include Locke, Behn, Defoe, Pope, Addison, Hume, Burke, Sterne, Smith, Kant, and Wordsworth.

CPLT 729b / AFST 965b / FREN 965b, On Violence: Politics and Aesthetics across the Maghreb Jill Jarvis

A study of twentieth-century Maghrebi texts and films that document, theorize, and critique forms of political violence. How might aesthetic works—novels, plays, poems, torture and prison testimonies, political cartoons, films—run counter to state-sanctioned memory projects or compel rethinking practices of testimony and justice for a postcolonial time? Works by Kateb, Djebar, Mechakra, Djaout, Alleg, Boupacha, Meddeb, Barrada, Binebine, Laâbi, Rahmani, Mouride. Theoretical readings by Fanon, Mbembe, Khatibi, Kilito, Dorlin, Benjamin, Spivak, Derrida, Lazali. Conducted in English. Prerequisite: reading knowledge of French.

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

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

CPLT 777b / ENGL 777b / GMAN 777b, Poems and Their Theories Paul North

A task lies before us: to go back and understand the importance that critical theory, in its inception and throughout its life, gave to poems. Poems and theories shared ideals from the turn of the nineteenth century to at least the end of the twentieth, at a minimum in German, French, and English. They dreamed of taking a vacation

from language, of returning to the sensible, of imagining communities, of revising the model of *Bildung* and culture, of rethinking history, of critiquing the nation-state and capitalism, among other dreams. Why this shared project between poetry and theory? What did theory find in the resources of literature, the genius idea, the past, and other foreignnesses that seemed so vital to critiquing the perceived present? Readings include Hölderlin, Schlegel, Novalis, Wordsworth, Shelley, Baudelaire, Celan, Benjamin, Heidegger, Arendt, de Man, Lacoue-Labarthe, Sedgwick, Kristeva, Jacobs.

CPLT 790b / GMAN 657b, Writing Scenes: Toward a Theory of the Literary Act Rudiger Campe

For a long time, thinking about producing literature has been dominated by the legalism of authorship. The notion of the "writing scene" allows us to rethink the production of literature in broader ways: technologies of writing, the writing body, systems of writing, etc. This course looks at investigations into the act of writing by Benjamin, Blanchot, Foucault, Barthes, Flusser, Latour; theories of cultural production by Cassirer, Jameson, Goody, Kittler, Bolter, Rheinberger; and vignettes of writing scenes in Quintilian, Christine de Pisan, Dante, Descartes, Goethe, Blake, Hegel, Flaubert, F. Douglass, V. Woolf, Kafka, Proust, Cixous.

CPLT 809a / ENGL 668a / ITAL 668a / RNST 668a, Translating the Renaissance Jane Tylus

Would there have been a Renaissance without translation? We approach this question by beginning with the first modern treatise on translation, by the Florentine chancellor Leonardo Bruni, and moving on to consider the role of translation in Florence's and Tuscany's growing cultural and political mastery over the peninsula—and in Italy's cultural domination of Europe. We go on to explore the translation of "medieval" into "early modern" Europe, the translation of visual into verbal material, and the role of gender in the practice of translation. Students engage in their own translation projects as we dedicate the last part of the seminar to the diffusion of the Petrarchan sonnet tradition in early modern Europe.

CPLT 816a / FREN 874a, Marketing and Literature Christophe Schuwey

Books are not only the medium of great literary works. They are also competing commercial products that, in order to be bought and/or read, must attract and retain attention, spark interest, and excite or meet a specific need. This course examines how markets, production techniques, habits, fashions, or advertising practices shape literary production. Drawing from the Beinecke collections, we study a wide range of diverse early modern French books to rethink the way we approach literature in general, from titles to typography, from structure to the very content of a work.

CPLT 820a, Comparative Theory Dissertation Workshop Marta Figlerowicz

This workshop gathers biweekly, throughout the academic year, to workshop chapters, articles, and prospectuses around the general topic of comparative literary and critical theory. It is intended to foster conversations among advanced graduate students working within this broad methodological framework across diverse historical and geographic fields. Permission of the instructor is required.

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 873a / SPAN 873a, New Latin American Cinemas: 1950–1990 Moira Fradinger
This seminar is a study of cinema produced in Latin America between 1950 and 1990, when filmmakers throughout the region articulated anew the relationship between cinema and politics. In Latin America, scholars identify the films of this era as "New Latin American Cinema," on account of their rejection of the national cinema traditions of the thirties and forties, which were dependent on the control of studios and Hollywood conventions. We study a vast array of films from the period that are usually hard to access, but deserving of scholarly attention. We watch, for example, many "firsts": the first Honduran film (1962), the first Haitian feature-length film (1975), the first film by a woman in Peru (Nora de Izcue), the first film in Quechua (1961), the first fully Paraguayan film (1978). Our corpus includes films from Peru, Argentina, Chile, Brazil, Colombia, Venezuela, Cuba, Mexico, Honduras, Paraguay, Bolivia, Ecuador, and Haiti. We read film manifestos that launched concepts such as "cine imperfecto," "cine urgente," "cinema novo," "estética da fome," and so forth. Readings are in Spanish and Portuguese. The seminar requires approximately four hours of film viewing *per* week. Prerequisite: a high level of proficiency in Spanish. Many films have no subtitles in English, and the seminar is conducted in Spanish.

CPLT 897b / FREN 899b, Modernity Maurice Samuels
The seminar studies literature and art from nineteenth-century France alongside theoretical and historical reflections to explore the significance of modernity. How did historical forces shape cultural trends? How did literature and art define what it means to be modern? Writers to be studied include Balzac, Baudelaire, Flaubert, Maupassant, and Zola. Theorists include Benjamin, Durkheim, Foucault, Marx, Simmel, and Weber. We also examine the painting of Manet and his followers. Reading knowledge of French required.

CPLT 900a, 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.

CPLT 913a / FILM 690a, Radical Cinemas of Latin America Moira Fradinger
An introductory overview of Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national

cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required.

CPLT 917b / ENGL 920b / FILM 601b, Foundations of Film and Media Dudley Andrew and John Peters
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 924a / JDST 857a, Modernism and Avant-Garde in Hebrew Poetry: Poetics and Theory Hannan Hever
Modernism in Hebrew poetry: close readings of the poetry of Nathan Alterman, Lea Goldberg, Nathan Zach, Yona Volakh, Avot Yeshurun. Prerequisites: a high level of reading Hebrew texts in poetry and criticism, and permission of the instructor.

CPLT 960b / SPAN 914b, Microliteratures: The Margins of the Law Jesus Velasco
Examining marginal writing in manuscripts and printed books from the Middle Ages and the early modern period, we interrogate the productive relations between law and culture. We focus on a wide array of sources from the Iberian Peninsula and the Mediterranean. Likewise, we consider different legal systems.

CPLT 973a / RNST 870a / SPAN 870a, Imagining the New World Lisa Voigt
This course focuses on the use of images of and in the "New World" during the first century of European exploration, conquest, and colonization in the Americas. We explore printed illustrations that shaped European perceptions of New World "exoticism" and "barbarism," as well as indigenous pictorial manuscripts that continued and adapted native visual practices and offered alternative views of the conquest. Besides reading texts by European and indigenous authors in which images played an important role (Columbus, Las Casas, Oviedo, Staden, Léry, Raleigh, Sahagún, Guaman Poma), we study nonalphabetic visual sources such as Nahua codices and maps, and portraits and festive performances of Afro-descendants. We also examine how images of the Americas were disseminated in Europe through copied illustrations, generating clichés and stereotypes—terms originally associated with printing techniques—that contributed to the racism and colonialism that have shaped the modern world. We conclude with a discussion of examples of contemporary films that reimagine the colonial Americas.

CPLT 974b / PORT 905b, The Short Story: Major Authors Kenneth David Jackson
Close reading of modern short stories by major authors writing in Portuguese, with an emphasis on Brazilian literature. Dominant critical and thematic currents; analysis of social forces. In Portuguese.

CPLT 976b / SPAN 866b, Roberto Bolaño in the Twenty-First Century Anibal González-Pérez
Readings of the poetry, short stories, novellas, novels, and essays of the Chilean-Mexican author Roberto Bolaño (1953–2003), regarded as a founding figure of early twenty-first-century Spanish American narrative. Topics explored include issues of truth and reality; ethics; materiality; self-fictionalization; post-nationalism; gender; Bolaño's politics; humor; fractals; and narrative.

Computational Biology and Bioinformatics

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Associate Professors Julien Berro (*Molecular Biophysics & Biochemistry*), Chris Cotsapas (*Neurology*), Forrest Crawford (*Public Health*), Smita Krishnaswamy (*Genetics*), Jun Lu (*Genetics*), Kathryn Miller-Jensen (*Engineering & Applied Science*), James Noonan (*Genetics*), Zuoheng (Anita) Wang (*Public Health*)

Assistant Professors Leying Guan (*Biostatistics*), Samah Jarad (*Emergency Medicine*), Monkol Lek (*Genetics*), Bluma Lesch (*Genetics*), Morgan Levine (*Pathology*), Zachary Levine (*Pathology*), Benjamin Machta (*Physics*), Robert McDougal (*Biostatistics*), John Murray (*Psychiatry; Neuroscience; Physics*), Andrew Taylor (*Emergency Medicine*), Serena Tucci (*Anthropology*), David vanDijk (*Cardiology*), Jack Zhang (*Molecular Biophysics & 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 bioinformatics, (2) biological sciences, and (3) informatics (including computer science, statistics, and applied mathematics). 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 562 or CB&B 750, CB&B 740, and CB&B 752. A typical program will include 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 at the end of the second year or the beginning of the third year. There is no 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, with ten

required course credits taken at Yale, (2) complete the required course work for the Ph.D. program with an average grade of High Pass or higher, (3) successfully complete three research rotations, and (4) meet the Graduate School's Honors requirement.

Terminal Master's Degree Program The CB&B terminal master's program has limited availability and is intended primarily for postdoctoral fellows supported by training grants and for students with sponsored funding, e.g., from industry. The curriculum requirements are the same as in the CB&B Ph.D. program with the following exceptions: there are no requirements for fulfilling laboratory research rotations or completing a Ph.D. dissertation, and only one term as a teaching assistant is required. Terminal M.S. students will be expected to complete an M.S. project, including a project report. Completion of the terminal M.S. degree will typically take four terms of full-time study. Applicants should contact the CB&B registrar before submitting an M.S. application.

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 523b / ENAS 541b / MB&B 523b / PHYS 523b, Biological Physics Corey O'Hern

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 Smita Krishnaswamy

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 Thierry Emonet, Joe Howard, and Damon Clark

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 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 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 Steven Kleinstein
Three 2.5–3-month research rotations in faculty laboratories are required during the first year of graduate study. These rotations are arranged by each student with individual faculty members.

CB&B 740a, Introduction to Health Informatics Andrew Taylor
The course provides an introduction to clinical and translational informatics. Topics include (1) overview of biomedical informatics, (2) design, function, and evaluation of clinical information systems, (3) clinical decision-making and practice guidelines, (4) clinical decision support systems, (5) informatics support of clinical research, (6)

privacy and confidentiality of clinical data, (7) standards, and (8) topics in translational bioinformatics. Permission of the instructor required.

CB&B 750b, Core Topics in Biomedical Informatics Samah Jarad
The course focuses on providing an introduction to common unifying themes that serve as the foundation for different areas of biomedical informatics. It is designed for students with programming experience who plan to build databases and computational tools for use in biomedical research. Emphasis is on understanding basic principles underlying informatics approaches to interoperation among biomedical databases and software tools, standardized biomedical vocabularies and ontologies, biomedical natural language processing, predictive analytics, information extraction, deep learning, and other related topics.

CB&B 752b / CPSC 752b / MB&B 752b and MB&B 753b and MB&B 754b / MB&B 753b and MB&B 754b / MB&B 754b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon
Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

Computer Science

A.K. Watson Hall, 203.432.1246
http://cpsc.yale.edu
M.S., M.Phil., Ph.D.

Chair
Zhong Shao

Director of Graduate Studies
Vladimir Rokhlin (108 AKW, 203.432.1278, vladimir.rokhlin@yale.edu)

Professors Dana Angluin (*Emerita*), James Aspnes, Dirk Bergemann,* Ronald Coifman,* Aaron Dollar,* Julie Dorsey, Joan Feigenbaum, Michael Fischer, David Gelernter, Mark Gerstein,* John Lafferty,* Rajit Manohar,* Drew McDermott (*Emeritus*), Dragomir Radev, Vladimir Rokhlin,† Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao, Avi Silberschatz, Daniel Spielman, Leandros Tassiulas,* Nisheeth Vishnoi, Y. Richard Yang, Lin Zhong, Steven Zucker†

Associate Professors Abhishek Bhattacharjee, Amin Karbasi,* Theodore Kim, Smita Krishnaswamy,* Sahand Negahban,* Charalampos Papamanthou, Ruzica Piskac, Philipp Strack,* Jakub Szefer*

Assistant Professors Kim Blenman, Yang Cai, Yongshan Ding, Wenjun Hu,* Julian Jara-Ettinger,* Anurag Khandelwal, Robert Soulé, David van Dijk,* Marynel Vázquez, Andre Wibisono

Senior Lecturers James Glenn, Kyle Jensen,* Stephen Slade

Lecturers Timothy Barron, Andrew Bridy,† Rob Brunstad, Jay Lim, Cody Murphey, Scott Petersen, Brad Rosen, Andrew Sherman,* Inyoung Shin, 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. 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 a 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. 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.

A brochure providing additional information about the department, faculty, courses, and facilities is available from the Graduate Coordinator, Department of Computer Science, Yale University, PO Box 208285, New Haven CT 06520-8285; email, 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 522a, Operating Systems Zhong Shao
The design and implementation of operating systems. Topics include synchronization, deadlocks, process management, storage management, file systems, security, protection, and networking.

CPSC 525b, Mobile and Embedded Systems Lin Zhong
Mobile and embedded systems are computers that are portable, embedded in a larger system, or both. They are usually resource constrained; intimately interact with the physical environment, including human users; and often serve mission-critical or privacy-sensitive applications. This course provides a comprehensive introduction to the inner workings of modern mobile and embedded systems, from hardware architecture to operating systems to algorithms. While the lectures focus on theory, principle, and even historical lessons, significant learning of practical systems hacking skills, including learning itself, come from six programming assignments, involving Linux kernel development, FreeRTOS, and bare metal systems. Prerequisite: CPSC 323.

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 Anurag Khandelwal
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 537a, 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 539b, 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 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 549b / ENAS 907b, Computer Architectures and Artificial Intelligence Richard Lethin
Introduction to the development of computer architectures specialized for cognitive processing, both offline "thinking machines" as well as embedded devices. History of machines starting with early conceptions in defense systems to contemporary initiatives. Instruction sets, memory systems, parallel processing, analog architectures, probabilistic architectures, graph computing architectures, machine-learning architectures. Application and algorithm characteristics.

CPSC 551b, The User Interface David Gelernter
The user interface (UI) in the context of modern design, where tech has been a strong and consistent influence from the Bauhaus and U.S. industrial design of the 1920s and 1930s through the IBM-Eames design project of the 1950s to 1970s. The UI in the context of the windows-menus-mouse desktop, as developed by Alan Kay and Xerox in the 1970s and refined by Apple in the early 1980s. Students develop a detailed design and simple implementation for a UI.

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 Smita Krishnaswamy
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 554b, Software Analysis and Verification Staff
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 556a / ENAS 951a, Wireless Technologies and the Internet of Things Holly Rushmeier
Fundamental theory of wireless communications and its application explored against the backdrop of everyday wireless technologies such as WiFi and cellular networks. Channel fading, MIMO communication, space-time coding, opportunistic communication, OFDM and CDMA, and the evolution and improvement of technologies over time. Emphasis on the interplay between concepts and their implementation in real systems. The labs and homework assignments require Linux and MATLAB skills and simple statistical and matrix analysis (using built-in MATLAB functions).

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 560a, Automata Theory and Formal Languages Andrew Bridy
Introduction to the theory of automata and formal languages, one of the building blocks of theoretical computer science. Major topics covered are finite automata, pushdown automata, and Turing machines, and their associated languages.

CPSC 563a, Algorithms via Continuous Optimization Nisheeth Vishnoi
Continuous 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 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 shortest paths, bipartite matching, flows, linear programming, sampling, and counting. We present approaches including gradient descent, mirror descent, multiplicative weights update method, accelerated gradient descent, Riemannian descent, Newton's method, cutting-plane methods, Langevin dynamics, and Hamiltonian dynamics. Prerequisite: CPSC 365 or CPSC 366 or

permission of the instructor. S&DS 630 and a solid background in calculus, linear algebra, probability, and algorithms are recommended.

CPSC 570b, Artificial Intelligence Brian Scassellati
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, Computational Intelligence for Games James Glenn

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.

CPSC 577b, Natural Language Processing Staff
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 578b, Computer Graphics Julie Dorsey
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 579a, 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 581a, Introduction to Machine Learning Andre Wibisono
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 610a, Topics in Computer Science and Law Joan Feigenbaum
This course focuses on socio-technical problems in computing, i.e., 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 computer security, intellectual property protection, cyber crime, cyber war, surveillance, and online privacy. The course is addressed to graduate students in Computer Science who are interested in socio-technical issues but whose undergraduate 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. Students do term projects (either papers or software artifacts) and present them at the end of the term. In order to ensure that there is enough time for both midterm feedback on project proposals and in-class presentation of the finished projects, enrollment is limited to fifteen. If fewer than fifteen Computer Science graduate students enroll, Yale College undergraduates will be allowed to enroll with permission of the instructor. Prerequisites: the basics of cryptography and computer security (as covered in CPSC 467), networks (as covered in CPSC 433), and databases (as covered in CPSC 437), or permission of the instructor.

CPSC 640b / AMTH 640b, Topics in Numerical Computation Staff
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 674b, Advanced 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. Prerequisite: CPSC 574.

CPSC 677a, Advanced Natural Language Processing Dragomir Radev
Advanced topics in natural language processing (NLP), including related topics such as deep learning and information retrieval. Included are: (1) fundamental material not covered in the introductory NLP class such as text summarization, question answering, document indexing and retrieval, query expansion, graph-based techniques for NLP and IR, as well as (2) state-of-the-art material published in the past few years such as transfer learning, generative adversarial networks, reinforcement learning for NLP, sentence representations, capsule networks, multitask learning, and zero-shot learning. Prerequisite: CPSC 570, CPSC 577, or equivalent, or permission of the instructor.

CPSC 690a, Independent Project I Staff
By arrangement with faculty.

CPSC 691a, Independent Project II Staff
By arrangement with faculty.

CPSC 752b / CB&B 752b / MB&B 752b and MB&B 753b and MB&B 754b / MB&B 753b and MB&B 754b / MB&B 754b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon
Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

CPSC 990a, Ethical Conduct of Research for Master's Students Holly Rushmeier
This course meets on four consecutive Fridays.

CPSC 991a / MATH 991a, Ethical Conduct of Research Holly Rushmeier
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Earth and Planetary Sciences

Kline Geology Laboratory, 203.432.3124
http://earth.yale.edu
M.S., M.Phil., Ph.D.

Chair
David Bercovici

Director of Graduate Studies
Maureen Long

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, Peter Raymond, James Saiers, Mary-Louise Timmermans, John Wettlaufer

Associate Professor Noah Planavsky

Assistant Professors Bhart-Anjan Bhullar, Pincelli Hull, Juan Lora, Alan Rooney, Lidya Tarhan

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 510a, Introduction to Isotope Geochemistry Alan Rooney
An overview of the fundamental principles of stable and radiogenic isotope geochemistry. Emphasis is placed on applications to specific geologic problems, including petrogenesis, geochronology, geothermometry, surface processes, hydrology, and biogeochemistry.

EPS 512a, Structural Geology Mark Brandon
An introduction to the origin and structure of the lithosphere and continental and oceanic crust. Topics include what controls the solid versus fluid behavior of rocks during deformation, and what controls the character and motion of tectonic plates. Laboratory exercises and field trips.

EPS 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 521b, Geophysical Fluid Dynamics Mary-Louise Timmermans
A survey of fluid dynamics, with applications to oceans and atmospheres. Mathematical models illustrate the fundamental dynamical principles of geophysical fluid phenomena such as large-scale flows, waves, boundary layers, and flow stability. Concepts are investigated through laboratory experiments in a rotating water tank. Prerequisite: differential equations and introductory fluid mechanics.

EPS 522b, Physics of Weather and Climate Juan Lora
The climatic system; survey of atmospheric behavior on time scales from days (i.e., weather) to decades (i.e., climate); formulation of mathematical equations describing weather and climate with selected applications to small- and large-scale phenomena.

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 528a, Science of Complex Systems Jun Korenaga
Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations. Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory.

EPS 529b, Introduction to Geodynamics Jun Korenaga
This introductory course starts with the basics of continuum mechanics and covers a range of topics in geodynamics and relevant fields including the structure and dynamics of lithosphere, thermal convection and magmatism, Rayleigh-Taylor instability and plume dynamics, geoid and dynamic topography, and the thermal history of the core and geodynamo.

EPS 535a, Physical Oceanography Alexey Fedorov
An introduction to ocean dynamics and physical processes controlling the large-scale ocean circulation, ocean stratification, the Gulf Stream, wind-driven waves, tides, tsunamis, coastal upwelling, and other oceanic phenomena. Equations of motion. Modern observational, theoretical, and numerous other techniques used to study the ocean. The ocean role in climate and global climate change.

EPS 538a / ASTR 520a, Computational Methods in Astrophysics and Geophysics Paolo Coppi
The analytic and numerical/computational tools necessary for effective research in astronomy, geophysics, and related disciplines. Topics include numerical solutions to differential equations, spectral methods, and Monte Carlo simulations. Applications are made to common astrophysical and geophysical problems including fluids and N-body simulations.

EPS 555a, Rock Formation in Mountain Belts Jay Ague
Examination of the fundamental principles governing the formation of metamorphic and igneous rocks during mountain building. Topics include processes of heat and mass transfer in orogenic belts, generation of igneous rocks in continental and subduction settings, ultra-high-pressure and ultra-high-temperature metamorphism, spatial and temporal patterns of petrologic processes throughout geologic time, and pressure-temperature-time paths of metamorphic and igneous rocks.

EPS 556a, Introduction to Seismology Maureen Long
Earthquakes and seismic waves, P and S waves, surface waves and free oscillations. Remote sensing of Earth's deep interior and faulting mechanisms. Prerequisites: MATH 120, 222, and PHYS 181, or equivalents.

EPS 645a, Paleoecology Pincelli Hull
This course in paleoecology reviews basic ecological concepts in the context of classic and recent papers.

EPS 658b, Seismic Data Analysis Jeffrey Park
This course covers several techniques of seismic data analysis, revisiting some classical results from global seismology that helped to define our knowledge of Earth's interior. Wave-propagation behavior in the context of simple theories of ray tracing, tomography, shear-wave birefringence, free-oscillation frequency shifts, attenuation, receiver functions, surface-wave dispersion, and other observables.

EPS 659a, Time Series Analysis with Geoscience Applications 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 or b / E&EB 930a or b, 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 721a, Topics in Geobiology Lidya Tarhan
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 744a or b, Seminar in Mantle and Core Processes Staff
The seminar covers advanced topics concerning physical and chemical processes in the mantle and core of the Earth and planets. Specific topic and hour are arranged in consultation with enrolled graduate students.

EPS 755a and EPS 756b, Seminar in Earth System Science Staff
The purpose of this yearlong seminar series is to build community and engage students, postdocs, researchers, and faculty in problems at the intersection of multiple components of the earth system. In the fall term, faculty lead discussion on their research and related cutting-edge questions in their field of interest. In the spring term, students and postdocs lead the seminar series on topics related to their current (or planned) research.

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

Senior Lecturer Pauline Lin

Lecturer Timothy Unverzagt Goddard

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. 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. At 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.

Opportunities to obtain experience in teaching language and literature form an important part of this program. Students in East Asian Languages and Literatures normally teach in their third and fourth years in the Graduate School.

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. (en route to the Ph.D.) The successful completion of twelve term courses and languages required in the first two years of study will make a student eligible for an M.A. degree.

Additional program materials are available on the department website, http://eall.yale.edu.

COURSES

Courses in Chinese, Japanese, and Korean languages at the elementary, intermediate, and advanced levels are listed in *Yale College Programs of Study*. See also https://courses.yale.edu.

CHNS 570a, Introduction to Literary Chinese I Pauline Lin
Reading and interpretation of texts in various styles of literary Chinese (*wenyan*), with attention to basic problems of syntax and literary style. Prerequisite: CHNS 151 or CHNS 153 or equivalent.

CHNS 571b, Introduction to Literary Chinese II Pauline Lin
Continuation of CHNS 570. Reading and interpretation of texts in various styles of literary Chinese (*wenyan*), with attention to basic problems of syntax and literary style. Prerequisite: CHNS 570 or equivalent.

EALL 521a / RLST 568a, Introduction to Chinese Buddhist Literature Eric Greene
This class is an introduction to Chinese Buddhist literature. Although written in classical Chinese, Buddhist texts in China were written in a particular idiom that was much influenced by the Indian languages and which can be difficult to understand without special training. This class introduces students who already have some reading ability in literary Chinese to this idiom and the tools and background knowledge needed to read and understand Chinese Buddhist literature. We read a series of selections of some of the most influential Chinese Buddhist texts from various genres including canonical scriptures, apocryphal scriptures, monastic law, doctrinal treatises, and hagiography. Secondary readings introduce the basic ideas of Indian and Chinese Buddhist thought to the extent necessary for understanding our readings. Prerequisite: CHNS 571 or equivalent, or permission of the instructor. Students of Japanese or Korean literature who can read basic *kanbun* or *gugyeol* are also welcome to enroll; no knowledge of modern, spoken Chinese is required.

EALL 536a, Japanese Poetry and Poetics Edward Kamens
Core concepts and traditions of classical Japanese poetry explored through the medium of translation. Readings from anthologies and treatises of the ninth through early twentieth century. Attention to recent critical studies in transcultural poetic theory. Inspection and discussion of related artifacts in the Beinecke Library and the Yale Art Gallery.

EALL 562b, Natsume Sōseki Timothy Goddard
This seminar explores the oeuvre of Natsume Sōseki (1867–1916), the preeminent writer of modern Japan. Readings include a broad sampling of Sōseki's fiction from across his career, as well as selected poems and essays. Discussions situate Sōseki's writings in the context of Japan's rapid modernization and imperial expansion during the Meiji period (1868–1912) and consider Sōseki's enduring legacy in the Japanese literary canon and as a figure of world literature.

EALL 565b / EAST 553b, Japanese Literature after 1970 Timothy Goddard
This course provides a survey of Japanese literature from 1970 to the present. Readings include novels and essays from a diverse range of authors, addressing themes such as identity, language, memory, domesticity, postmodernism, and racial discrimination. Students develop extensive knowledge of contemporary Japanese literature, while also cultivating skills in close reading and research methods. All readings are in English translation; no knowledge of Japanese is required.

EALL 568b, The Literature of Japanese Empire Timothy Goddard
Spanning a period from the 1910s to the 1940s, this course considers the effects of Japanese imperialism on the development of modern literature in East Asia. How did authors from mainland Japan represent the so-called outer territories of the empire? How did authors from colonial Taiwan and Korea navigate issues of language, identity, and culture in their writings? What significance did the semi-colonial city of Shanghai hold in the modern literary imagination? Readings include a broad range of primary sources, including novels, short stories, essays, poems, and travelogues. We also

engage with selections from recent secondary sources to understand how scholars have approached this tumultuous era in East Asian literary history. Graduate students are expected to conduct research in any and all East Asian languages relevant to their topic and in which they are proficient.

EALL 573a, Postwar Japanese Literature, 1945–1970 Timothy Goddard
Spanning a period from 1945 to 1970, this course provides an introduction to Japanese literature after Japan's catastrophic defeat in the Asia-Pacific War. Readings include novels, essays, and poetry by major writers of the era, including Dazai Osamu, Enchi Fumiko, Kawabata Yasunari, Mishima Yukio, and Tanizaki Jun'ichirō. In our discussions, we consider how Japanese writers responded to this moment of profound crisis, exploring such themes as identity, memory, modernity, and the nation.

EALL 581a / FILM 873a, 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 600a / EAST 640a, Sinological Methods Pauline Lin
A research course in Chinese studies, designed for students with background in modern and literary Chinese. Students explore and evaluate the wealth of primary sources and research tools available in China and in the West. For native speakers of Chinese, introduction to the secondary literature in English and instruction in writing professionally in English on topics about China. Topics include Chinese bibliographies; bibliophiles' notes; specialized dictionaries; maps and geographical gazetteers; textual editions, variations, and reliability of texts; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias, compendia, and databases.

EALL 601a, Ancient and Medieval Chinese Poetry Lucas Bender
Readings in ancient and middle-period Chinese poetry, from the beginnings of the tradition through the Song dynasty. Prerequisite: one year of classical/literary Chinese or equivalent, or permission of the instructor.

EALL 608b, 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 715a, Readings in Modern Japanese Literature Timothy Goddard
Readings from a selection of representative texts from modern to contemporary Japanese literature with a focus on comprehension, translation, critical reception, and close reading. Students have the opportunity to select a few texts of interest in consultation with the instructor.

EALL 761a, Topics in Early Chinese Thought Mick Hunter
An examination of certain key problems in the study of early Chinese thought. Topics vary from year to year but in general include intellectual typologies and affiliations, relating received texts and excavated manuscripts, the role of Han editors in shaping pre-Han textual traditions, ruling ideology, and comparisons with other parts of the

ancient world. Discussions and papers are in English. Because readings are different each year, this course may be repeated for credit.

EALL 806b / EAST 806b / FILM 921b, Research in Japanese Film History Aaron Gerow

This seminar covers the methods and problems of researching and writing Japanese film history. We review the theoretical issues involved in historiography in general and film historiography in particular, and then consider how these are pertinent to the study of Japanese cinema history. Our approach is critical, as we examine several recent examples of Japanese film historiography, as well as practical, as we explore various methods and strategies for researching Japanese film history. We particularly focus on the Japanese cinema's historical relation to the nation, especially in terms of how cinema may help us historicize the nation, and vice versa. Students develop their own research project using the unique collections at Yale. Knowledge of Japanese is helpful but not essential.

EALL 874a / HIST 892a, China at Its Borders Denise Ho

This reading seminar examines recent English-language scholarship on China's engagement with the world, focusing on the nineteenth and twentieth centuries. Weekly topics include the following themes: frontiers and borders, the region as a unit of analysis, trading systems and regulation, migration and diaspora, models of modernity and revolution, World War II and the Cold War, socialist internationalism, the era of reform and opening, and China's global ambitions today.

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 Edward Kamens

Introduction to the grammar and style of the premodern literary language (*bungotai*) through a variety of texts. Prerequisite: JAPN 151 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 & Literatures; Film & Media Studies*), Valerie Hansen (*History*), Edward Kamens (*East Asian Languages & Literatures*), Tina Lu (*East Asian Languages & Literatures*), Frances Rosenbluth (*Political Science*), Helen Siu (*Anthropology*), Chloë Starr (*Divinity School*), Jing Tsu (*East Asian Languages & Literatures; Comparative Literature*), Anne Underhill (*Anthropology*), Arne Westad (*History; Global Affairs*), Mimi Hall Yiengpruksawan (*History of Art*)

Associate Professors William Honeychurch (*Anthropology*), Michael Hunter (*East Asian Languages & Literatures*), Hwansoo Kim (*Religious Studies*), Yukiko Koga (*Anthropology*)

Assistant Professors Lucas Bender (*East Asian Languages & Literatures*), Jinyi Chu (*Slavic Languages & Literatures*), Eric Greene (*Religious Studies*), Denise Ho (*History*), Daniel Mattingly (*Political Science*), Quincy Ngan (*History of Art*), Hannah Shepherd (*History*), Emma Zang (*Sociology*)

Senior Lecturer Pauline Lin (*East Asian Languages & Literatures*)

Lecturers Allison Bernard, Xuenan Cao, Philip Gant, Na Sil Heo, Alex Finn Macartney, Kyle Shernuk, Trenton Wilson

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

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, 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, 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

The program of study for completion of the degree on the one-year track consists of eight term courses that must include two terms of language study at or above Yale's third-year level (unless the language requirement has already been met through previous study or native fluency), plus six other courses selected from the University's offerings of advanced language study and seminars related to East Asia at the graduate level. For those who meet the language requirement at matriculation, two of the required eight courses may be advanced training in a particular discipline (e.g., economics, history, political theory, statistics, etc.) with no explicit focus on East Asia, but related to the student's professional goals. The course of study must be approved by the director of graduate studies (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

The program of study for completion of the degree on the two-year track consists of sixteen term courses that must include four terms of language study, two terms of which must be at Yale's fourth-year level (unless the language requirement has already been met through previous study or native fluency), plus twelve other courses selected from the University's offerings of advanced language study and seminars related to East Asia at the graduate level. Students who have achieved advanced proficiency in one East Asian language are strongly encouraged to pursue study of a second East Asian language, but for those who have met the language requirement in one language at matriculation, two of the required sixteen courses may be advanced training in a

particular discipline (e.g., economics, history, political theory, statistics, etc.) with no explicit focus on East Asia, but related to the student's professional goals. The course of study must be approved by the director of graduate studies (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 506a / RLST 628a, Paradise in Buddhism: Pure Land Traditions James Dobbins

Pure Land Buddhism is a tradition with roots in India that developed most extensively in East Asia. Unlike other forms of Buddhism, it centers on a paradise motif and is largely devotional in character. It arises from scriptural stories about a transcendent Buddha named Amida who vows to bring all living beings to enlightenment via an other-worldly realm known as the Pure Land. The seminar examines this tradition historically against the backdrop of Buddhism in general, focusing on the Pure Land sutras and the unfolding of Pure Land Buddhism in Japan. Among the goals of the course is to develop familiarity with the structure of the sutras and with classical Buddhology, the core concepts and strategies of Buddhist doctrine and story-making. It also explores the teachings of several celebrated Japanese Buddhists, the portrayal of women in texts and religious practices, and the demythologization of Pure Land and Amida in the modern period.

EAST 511b / RLST 598b, 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 553b / EALL 565b, Japanese Literature after 1970 Timothy Goddard

This course provides a survey of Japanese literature from 1970 to the present. Readings include novels and essays from a diverse range of authors, addressing themes such as identity, language, memory, domesticity, postmodernism, and racial discrimination. Students develop extensive knowledge of contemporary Japanese literature, while also cultivating skills in close reading and research methods. All readings are in English translation; no knowledge of Japanese is required.

EAST 575a / ANTH 575a, 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 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 806b / EALL 806b / FILM 921b, Research in Japanese Film History Aaron Gerow

This seminar covers the methods and problems of researching and writing Japanese film history. We review the theoretical issues involved in historiography in general and film historiography in particular, and then consider how these are pertinent to the study of Japanese cinema history. Our approach is critical, as we examine several recent examples of Japanese film historiography, as well as practical, as we explore various methods and strategies for researching Japanese film history. We particularly focus on the Japanese cinema's historical relation to the nation, especially in terms of how cinema may help us historicize the nation, and vice versa. Students develop their own research project using the unique collections at Yale. Knowledge of Japanese is helpful but not essential.

EAST 889b / HIST 889b, Research in Japanese History Fabian Drixler, Daniel Botsman, and Hannah Shepherd

After a general introduction to the broad array of sources and reference materials available for conducting research related to the history of Japan since ca. 1600, students prepare original research papers on topics of their own choosing in a collaborative workshop environment. Prerequisite: reading knowledge of Japanese.

EAST 900a or b, Master's Thesis Staff

Directed reading and research on a topic approved by the DGS and advised by a faculty member (by arrangement) with expertise or specialized competence in the chosen field. Readings and research are done in preparation for the required master's thesis.

EAST 910a or b, Independent Study Staff

By arrangement with faculty and with approval of the DGS.

Ecology and Evolutionary Biology

Osborn Memorial Laboratories, 203.432.3837
http://eeb.yale.edu
M.S., Ph.D.

Chair
Thomas Near

Director of Graduate Studies
Carla Staver

Professors Richard Bribiescas (*Anthropology*), Craig Brodersen (*School of the Environment*), Nicholas Christakis (*Sociology*), Liza Comita (*School of the Environment*), Michael Donoghue, 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

Associate Professors Forrest Crawford (*Public Health*), James Noonan (*Genetics*), Carla Staver, Alison Sweeney, David Vasseur

Assistant Professors Nathan Grubaugh (*Public Health*), Martha Munoz, C. Brandon Ogbunu, Alvaro Sanchez, Serena Tucci (*Anthropology*)

Senior Lecturer Marta Martínez Wells

Lecturers Adalgisa Caccone, Linda Puth

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. All first-year students carry out two research rotations. Students have the option of a rotation over their first summer. Students must participate in (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; and (4) symposia of faculty and graduate student research. In addition, during their first two years of study, graduate students must enroll in a minimum of three additional graduate-level courses (numbered 500 and above); a grade of Honors (H) must be earned in 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 two 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.

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.) Students must pass eight graduate-level courses. 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 Deanna Brunson, Office of the Director of Graduate Studies, Department of Ecology and Evolutionary Biology, Yale University, PO Box 208106, New Haven CT 06520-8106; email, deanna.brunson@yale.edu; tel., 203.432.3837; fax, 203.432.2374; website, http://eeb.yale.edu.

COURSES

E&EB 500a and E&EB 501b, Advanced Topics in Ecology and Evolutionary Biology
Casey Dunn
Topics to be announced. Graded Satisfactory/Unsatisfactory.

E&EB 510a / S&DS 501a, Introduction to Statistics: Life Sciences Jonathan Reuning-Scherer and Walter Jetz
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 David Vasseur and 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 Principles of Ecology, Evolutionary Biology, and the Tree of Life Marta Wells
Experimental approaches to organismal and population biology, including study of the diversity of life.

E&EB 525b, Evolutionary Biology Alvaro Sanchez
An overview of evolutionary biology as the discipline uniting all of the life sciences. Evolution explains the origin of life and Earth's biodiversity, and how organisms acquire adaptations that improve survival and reproduction. This course uses reading and discussion of scientific papers to emphasize that evolutionary biology is a dynamic science, involving active research to better understand the mysteries of life. We discuss principles of population genetics, paleontology, and systematics; and application of evolutionary thinking in disciplines such as developmental biology, ecology, microbiology, molecular biology, and human medicine.

E&EB 528b, Ecology and Evolution of Infectious Disease Paul Turner and Vanessa Ezenwa
Overview of the ecology and evolution of pathogens (bacteria, viruses, protozoa) and their impact on host populations. Topics include theoretical concepts, ecological and evolutionary dynamics, molecular biology, and epidemiology of ancient and emerging diseases.

E&EB 545b, Responsible Conduct of Research Casey Dunn
This five-week discussion seminar considers issues related to the responsible conduct of research. Topics addressed include research misconduct, plagiarism, data acquisition and management, mentoring and collaboration, authorship and peer review, the use of animals and humans in scientific research, sexual harassment, diversity, and balancing professional and personal life. Graded Satisfactory/Unsatisfactory. o Course cr

E&EB 546a, Plant Diversity and Evolution Erika Edwards
Introduction to the major plant groups and their evolutionary relationships, with an emphasis on the diversification and global importance of flowering plants.

E&EB 547La, Laboratory for Plant Diversity and Evolution Erika Edwards
Hands-on experience with the plant groups examined in the accompanying lectures; local field trips.

E&EB 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 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 729a, Microbial Ecology and Evolution Alvaro Sanchez
This course examines various topics in the ecology and evolution of microbes, with an emphasis on prokaryotes (Eubacteria, Archaea) and viruses. Microbiology is an incredibly rich field, where microorganisms are studied from perspectives including the gene, genome, individual, population, community, and ecosystem levels. The course uses discussions of classic and contemporary journal articles to show how species interactions including competition, predation, parasitism, mutualism, and microbial communication influence these various levels of biological organization in particular, and evolutionary ecology of microbes in general. Sex and reproduction, genome architecture and reduction, novel evolutionary mechanisms, and challenges imposed by environmental change are examined from a microbial perspective. The result is an understanding of microbes in their natural habitats—whether air, soil, aquatic, or host environments—and of the power in using microbes to elucidate fundamental principles in ecology and evolution. Different discussion topics are emphasized in different years, and this year's course focuses on the following three areas: studying microbial adaptation in laboratory and natural microcosms, evolutionary ecology of emerging infectious diseases, and the role of microbes in biogeochemical cycling especially in the oceans.

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 zooneses, disease emergence, herd immunity, basic vaccinology, and other fundamental concepts. It also focuses on social and cultural factors that fomented these pandemics.

E&EB 854a, The Behavioral Immune System Vanessa Ezenwa
Behavior is the first line of defense against parasites and pathogens. Behavioral defenses allow organisms to minimize contact with infectious agents, and the concept of the "behavioral immune system" was developed to encompass a range of evolved behaviors that help minimize the fitness costs of infection. The COVID-19 pandemic has made the term "social distancing" a household term; however, distancing and many other avoidance strategies are employed by a wide range of organisms to combat infectious agents. In this seminar, we examine our current understanding of the behavioral immune system across the diversity of animals, including humans. Specifically, we explore: (1) the mechanisms of behavioral immunity; (2) the ecological, evolutionary, and epidemiological consequences of these behaviors; and (3) key costs of behavioral immunity that maintain intra- and interspecific variation. To do this, we discuss and synthesize the scientific literature on the behavioral immune system, drawing parallels to work on the physiological immune system. The first weeks of the course focus on instructor-selected papers, and subsequent weeks incorporate student-selected papers.

E&EB 862a, Ecosystem Dynamics of Nature-Based Climate Solutions Carla Staver
Nature-based climate solutions have gained increasing attention in the past decade as possible contributors to reducing our net carbon emissions to the atmosphere, without necessarily reducing gross emissions. Prominent nature-based solutions include forestation (reforestation, afforestation, plantation forestry), avoided deforestation, and soil carbon sequestration. This seminar includes weekly readings and discussion around themes in the management of ecosystem carbon storage. This seminar is intended for Ph.D. students. It is open to master's students and undergraduates by permission of the instructor only, based on a one- or two-paragraph description of interest in the course.

E&EB 901a, Research Rotation I Casey Dunn

E&EB 902b, Research Rotation II Casey Dunn

E&EB 930a or b / EPS 703a or b, 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 (451 College St., 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, Timothy Guinnane, Philip Haile, Marina Halac, Johannes Hörner, Gerald Jaynes, Yuichi Kitamura, Alvin Klevorick, Samuel Kortum, Naomi Lamoreaux, 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*), Robert Shiller, Tony Smith, Aleh Tsyvinski, Edward Vytlacil, Ebonya Washington, Fabrizio Zilibotti

Associate Professors Mitsuru Igami, Ilse Lindenlaub, Michael Peters, Philipp Strack

Assistant Professors Eduardo Davila, José-Antonio Espín-Sánchez, Mira Frick, Charles Hodgson, John Eric Humphries, Zhen Huo, Ryota Iijima, Yusuke Narita, Cormac O'Dea, Nicholas Ryan, Anna Sanktjohanser

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 format of the field qualifying exams will be determined by the faculty in 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 the names of their advisory committee to the DGS's office by February 1 of the third year. (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 field 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 rational for proposing the ad hoc combined degree, and (c) a term-by-term timeline listing all classes, teaching, and required examinations.

6. Both departments must accept the dissertation prospectus.
7. The plan of study is a contract, and the student must receive written permission in advance from both DGSs and the appropriate associate dean of the Graduate School for any changes to the plan.
8. Once everyone agrees and the plan of study is approved, the combined program is recorded in Banner.

Funding and teaching The department that first admitted the student is the "primary department." The student's funding is from the primary department, as is the teaching expectation. Ideally students should obtain teaching experience from both departments.

MASTER'S DEGREES

M.Phil. The M.Phil. degree is awarded to students in the Ph.D. program upon completion of all the requirements for advancement to candidacy for a doctorate in economics except the prospectus and prospectus workshop requirements.

M.A. (en route to the Ph.D.) The M.A. degree is awarded upon completion of at least eight term graduate courses listed or cross-listed by 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 an 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.

Students in doctoral programs other than Economics may earn an M.A. in Economics under the conditions listed in the previous paragraph. Such students automatically earn an M.A. in their own department when awarded a Ph.D., and Yale allows students to earn only one M.A. degree. Consequently, students must apply to have the M.A. in their own department replaced by the Economics M.A. This application must be made to the DGS of Economics and to the DGS of the student's own department. Prior to this application, the student must have taken the first one-term course in at least one of the three first-year two-course sequences in microeconomics, macroeconomics, or econometrics and obtained a grade of at least High Pass. As part of the application, the student must submit a proposed list of economics courses, and this list must be approved by the two DGSs and by the appropriate dean of the Graduate School. The DGS of Economics must approve any deviation from this list, and this approval should be obtained before taking courses not on the list.

Terminal Master's 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 for the M.A. degree en route to Ph.D. for students in doctoral programs other than Economics. 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 Johannes Horner
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 Marina Halac and Ryota Iijima
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 and ECON 523b, Microeconomic Theory Lunch Staff
A forum for advanced students to critically examine recent papers in the literature and present their own work.

ECON 525a, Advanced Macroeconomics I Zhen Huo
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 Michael Peters
Macroeconomic equilibrium in the presence of uninsurable labor income risk. Implications for savings, asset prices, unemployment.

ECON 531b, Mathematical Economics II Eduardo Davila
This course examines the foundations of money and finance from the perspective of general equilibrium with incomplete markets. The relevant mathematical tools from elementary stochastic processes to differential topology are developed in the course. Topics include asset pricing, variations of the capital asset pricing model, the "Hahn paradox" on the value of flat money, default and bankruptcy, collateral equilibrium,

market crashes, adverse selection and moral hazard with perfect competition, credit card equilibrium, and general equilibrium with asymmetric information.

ECON 537a and ECON 538b, Microeconomic Theory Workshop Staff
Presentations by research scholars and participating students.

ECON 540a and ECON 541b, 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 and ECON 543b, 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 Staff
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 548a / PLSC 721a, 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 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 Ed Vytlacil
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 Donald Andrews
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 553a, Econometrics IV: Time Series Econometrics Staff
A sequel to ECON 552, the course proceeds to research level in time series econometrics. Topics include an introduction to ergodic theory, Wold decomposition, spectral theory, martingales, martingale convergence theory, mixing processes, strong laws, and central limit theory for weak dependent sequences with applications to econometric models and model determination.

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 Philip Haile, Yusuke Narita, and Charles Hodgson
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 564a or b, Research Sem in Econometrics Staff

ECON 567a and ECON 568b, 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 and ECON 571b, 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 580a, General Economic History: Western Europe Timothy Guinnane
A survey of some major events and issues in the economic development of Western Europe during the eighteenth and nineteenth centuries, stressing the causes, nature, and consequences of the industrial revolution in Britain and on the Continent, and the implications of the historical record for modern conceptions of economic growth. Prerequisites: simultaneous enrollment in or successful completion of ECON 500 and ECON 510; permission of the instructor.

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 589b, Economic History Workshop Staff
A forum for discussion and criticism of research in progress. Presenters include graduate students, Yale faculty, and visitors. Topics concerned with long-run trends in economic organization are suitable for the seminar. Special emphasis given to the use of statistics and of economic theory in historical research.

ECON 600a, Industrial Organization I Philip Haile and Mitsuru Igami
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 Charles Hodgson
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 and ECON 607b, 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 and ECON 609b, 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 and ECON 639b, 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 or b, 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 672b / MGMT 745b, Behavioral Finance Nicholas Barberis
Much of modern financial economics works with models in which agents are rational, in that they maximize expected utility and use Bayes's law to update their beliefs. Behavioral finance is a large and active field that studies models in which some agents are less than fully rational. Such models have two building blocks: limits to arbitrage, which make it difficult for rational traders to undo the dislocations caused by less rational traders; and psychology, which catalogues the kinds of deviations from full rationality we might expect to see. We discuss these two topics and then consider a number of applications: asset pricing (the aggregate stock market and the cross-section of average returns); individual trading behavior; and corporate finance (security issuance, corporate investment, and mergers).

ECON 675a / MGMT 720a, Models of Operations Research and Management Vahideh Hosseinikhah Manshadi
The course exposes students to main stochastic modeling methods and solution concepts used to study problems in operations research and management. The first half of the class covers analysis of queuing models such as Markovian queues, networks of queues, and queues with general arrival or service distributions, as well

as approximation techniques such as heavy traffic approximation. The second half focuses on control of stochastic processes; it covers finite and infinite-horizon dynamic programming problems, and special classes such as linear quadratic problems, optimal stopping, and multi-armed bandit problems. ½ Course cr

ECON 679a or b, Financial Economics Student Lunch Eduardo Davila
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 and ECON 707b, Prospectus Workshop in International 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 Ana Fieler
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 Costas Arkolakis and Lorenzo Caliendo
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 Costas Arkolakis and Ana Fieler
A study of how consumers and firms are affected by the globalization of the world economy. Topics include trade costs, the current account, exchange rate pass-through, international macroeconomic co-movement, multinational production, and gains from globalization. Prerequisite: intermediate macroeconomics or equivalent.

ECON 728a and ECON 729b, Workshop: International Trade Staff

ECON 730a, Economic Development I Mark Rosenzweig and Mushfiq Mobarak
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 Nicholas Ryan and Kaivan Munshi
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 737a, Economics of Natural Resources Robert Mendelsohn
Linking of abstract economic concepts to concrete policy and management decisions. Application of theoretical tools of economics to global warming, pollution control, fisheries, forestry, recreation, and mining.

ECON 750a or b, 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 or b, Prospectus Workshop in Development Staff
Workshop for students doing research in development to present and discuss work.

ECON 791a / PLSC 534a, Theories of Distributive Justice: Formal Models of Political Theory John Roemer
We survey the main theories of distributive justice proposed by political philosophers since John Rawls, including A. Sen, R. Dworkin, G.A. Cohen, and R. Arneson. We use economic models to study these theories, and we critique them from the economic and philosophical viewpoints. We then read Thomas Piketty's book *Capital in the Twenty-First Century.* If time permits, we introduce a microeconomic theory modeling how people cooperate in economic settings, to be contrasted with Nash equilibrium, a model of how people compete. Prerequisite: microeconomics, at least at the intermediate level, or permission of the instructor.

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
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Director of Graduate Studies
Hong Tang (hong.tang@yale.edu)

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Associate Professors Amin Karbasi, Jakub Szefer, Fengnian Xia

Assistant Professors Wenjun Hu, 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 (MEMS and NEMS), 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

APPLIED PHYSICS

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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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Associate Professors Stuart Campbell, Tarek Fahmy, Rong Fan, Gigi Galiana,* Anjelica Gonzalez, Michelle Hampson,* Henry Hsia,* Farren Issacs,* Themis Kyriakides,† Chi Liu,* Kathryn Miller-Jensen, Michael Murrell, Dana Peters,* Jiangbing Zhou*

Assistant Professors Nicha Dvornek,* Ansel Hillmer,* Michael Mak, Dustin Scheinost,* Gregory Tietjen*

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

† A joint appointment with another department.

CHEMICAL & ENVIRONMENTAL ENGINEERING

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Associate Professors John Fortner, Drew Gentner

Assistant Professors Peijun Guo, Amir Haji-Akbari, Shu Hu, Mingjiang Zhong

Lecturer Katherine Schilling

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

† A joint appointment with another school.

COMPUTER SCIENCE

Chair
Zhong Shao

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Professors Dana Angluin (*Emerita*), James Aspnes, Dirk Bergemann,* Ronald Coifman,* Aaron Dollar,* Julie Dorsey, Joan Feigenbaum, Michael Fischer, David Gelernter, Mark Gerstein,* John Lafferty,* Rajit Manohar,* Drew McDermott (*Emeritus*), Dragomir Radev, Vladimir Rokhlin,† Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao, Avi Silberschatz, Daniel Spielman, Leandros Tassiulas,* Nisheeth Vishnoi, Y. Richard Yang, Lin Zhong, Steven Zucker†

Associate Professors Abhishek Bhattacharjee, Theodore Kim, Smita Krishnaswamy,* Sahand Negahban,* Charalampos Papamanthou, Ruzica Piskac, Philipp Strack,* Jakub Szefer*

Assistant Professors Yang Cai, Wenjun Hu,* Julian Jara-Ettinger,* Amin Karbasi,* Anurag Khandelwal, Robert Soulé, David van Dijk,* Marynel Vázquez, Andre Wibisono

Senior Lecturers James Glenn, Kyle Jensen,* Stephen Slade

Lecturers Timothy Barron, Andrew Bridy,† Rob Brunstad, Cody Murphey, Scott Petersen, Brad Rosen, Andrew Sherman,* Cecillia Xie

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ELECTRICAL ENGINEERING

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Associate Professors Amin Karbasi, Jakub Szefer, Fengnian Xia

Assistant Professors Wenjun Hu, Priyadarshini Panda

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

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MECHANICAL ENGINEERING & MATERIALS SCIENCE

Chair
Udo Schwarz

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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, Corey O'Hern, Vidvuds Ozolins,* Brian Scassellati,* Jan Schroers, Udo Schwarz, Mitchell Smooke

Associate Professors Judy Cha, Madhusudhan Venkadesan

Assistant Professors Rebecca Kramer-Bottiglio, Amir Pahlavan, Diana Qiu, Daniel Wiznia*

Lecturers Beth Anne Bennett, Joran Booth, 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, and biomedical 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 (MEMS and NEMS), 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; laser diagnostics of reacting and nonreacting 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 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; amorphous metals and nanomaterials including nanocomposites; characterization of crystallization and other phase transformations; nanoimprinting; atomic-scale investigations of surface interactions and properties; classical and quantum nanomechanics; nanostructured energy applications; nanoparticle synthesis for energy applications; combinatorial materials science; in situ transmission electron and 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; 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.

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 in Engineering & Applied Science* 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.

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/program, 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. No more than two courses can be Special Investigations, and at least two 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. 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 in order 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, ENAS 521, ENAS 602, ENAS 603.

Chemical & Environmental Engineering (Environmental track) ENAS 641, ENAS 642, and either ENAS 638 or ENAS 640. In addition, there is a math requirement that must be met by taking one of the following courses in the first year: ENAS 500, ENV 728, ENV 753, ENV 758, ENV 781, S&DS 530, S&DS 538, or S&DS 563.

Computer Science See the departmental entry for Computer Science in this bulletin.

Electrical Engineering (Computer Engineering track) Competence must be demonstrated in at least two of the three research areas. At least two courses that cover two different areas are required. In the area of architecture, the course options are ENAS 907, ENAS 940, and ENAS 967. In the area of VLSI, the course options are ENAS 875 and ENAS 876. In the area of computer systems, the course options are CPSC 522, CPSC 523, CPSC 525, CPSC 526, CPSC 533, and ENAS 968.

Electrical Engineering (Microelectronics track) Two of the following four courses: ENAS 511, ENAS 718, ENAS 850, ENAS 986.

Electrical Engineering (System and Signals track) ENAS 502, ENAS 902.

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 572, CPSC 573, ENAS 521, ENAS 541, ENAS 559, ENAS 606, ENAS 615, ENAS 703, ENAS 704, ENAS 708, ENAS 752, ENAS 755, ENAS 777, ENAS 778, ENAS 787, ENAS 848, ENAS 850, ENAS 851, ENAS 902 (if not used to satisfy the math requirement), ENAS 936, ENAS 944, PHYS 628. There is a math requirement that must be met by taking 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 in Engineering & Applied Science. 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.

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 materials are available upon request to the Office of Graduate Studies, School of Engineering & Applied Science, Yale University, PO Box 208292, New Haven CT 06520-8292; email, engineering@yale.edu; 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 502b / S&DS 551b, Stochastic Processes Staff
Introduction to the study of random processes, including Markov chains, Markov random fields, martingales, random walks, Brownian motion, and diffusions. Techniques in probability such as coupling and large deviations. Applications chosen from image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, genetics, and evolution.

ENAS 508b, Responsible Conduct of Research Staff
Required of first-year students. Presentation and discussion of topics and best practices relevant to responsible conduct of research including academic fraud and misconduct, conflict of interest and conflict of commitment, data acquisition and human subjects, use and care of animals, publication practices and responsible authorship, mentor/trainee responsibilities and peer review, and collaborative science. o Course cr

ENAS 509b, Electronic Materials Jung Han
Survey and review of fundamental material issues pertinent to modern microelectronic and optoelectronic technology. Topics include band theory, electronic transport, surface kinetics, diffusion, defects in crystals, thin film elasticity, crystal growth, and heteroepitaxy.

ENAS 510a, Physical and Chemical Basis of Bioimaging and Biosensing Douglas Rothman, Fahmeed Hyder, and Ansel Hillmer
Basic principles and technologies for imaging and sensing the chemical, electrical, and structural properties of living tissues and biological macromolecules. Topics include magnetic resonance spectroscopy, MRI, positron emission tomography, and molecular imaging with MRI and fluorescent probes.

ENAS 511a, 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 519b, Responsible Conduct of Research Staff
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 521b, Classical and Statistical Thermodynamics Peijun Guo
A unified approach to bulk-phase equilibrium thermodynamics, bulk-phase irreversible thermodynamics, and interfacial thermodynamics in the framework of classical thermodynamics, and an introduction to statistical thermodynamics. Both the activity coefficient and the equations of state are used in the description of bulk phases. Emphasis on classical thermodynamics of multicomponents, including concepts of stability and criticality, curvature effect, and gravity effect. The choice of Gibbs free energy function covers applications to a broad range of problems in chemical, environmental, biomedical, and petroleum engineering. The introduction includes theory of Gibbs canonical ensembles and the partition functions, fluctuations; Boltzmann statistics; Fermi-Dirac and Bose-Einstein statistics. Application to ideal monatomic and diatomic gases is covered.

ENAS 522a, Engineering and Biophysical Approaches to Cancer Michael Mak
This course examines the current understanding of cancer as a complex disease and the advanced engineering and biophysical methods developed to study and treat this disease. All treatment methods are covered. Basic quantitative and computational backgrounds are required. Prerequisites: BENG 249 or equivalent and MATH 120 or equivalent.

ENAS 523a, Data and Clinical Decision-Making John Onofrey and Michael Choma
Data and computation are reshaping medicine and clinical decision-making. Examples include acute states of physiological failure such as shock and sepsis as well as failure modes associated with aging (e.g., delirium/acute brain failure, falls). This seminar provides (1) a modern, clinically facing view of physiological failure and (2) a survey of how data and computation are reshaping clinical concepts and practice, including decision-making. Key topics and concepts include medical data types (e.g., imaging, lab values, oximetry); nonlinearity and complexity in physiological resilience and failure; clinically relevant AI/ML methods; data-driven definitions of medical disease; predictive modeling as a distinct field in AI/ML; and clinical decision-making using modern data and computational tools. The course is led by two instructors with complementary backgrounds that include AI/ML, statistics/data science, medical physiology, clinical medicine, and digital health. Guest lecturers from both clinical practice and industry provide additional context. Course work includes scientific literature review, written reports, oral presentations, and a final project. Students interested in AI/ML in medicine in both academic and industry settings with an engineering/medical background would benefit from this course. The course provide the requisite background for physiology and assumes a basic understanding of AI/ML but has no strict prerequisites.

ENAS 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 541b / CB&B 523b / MB&B 523b / PHYS 523b, Biological Physics Corey O'Hern
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, Physiological Systems 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 551a, 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 558b, Introduction to Biomechanics Michael Murrell

An introduction to the biomechanics used in biosolid mechanics, biofluid mechanics, biothermomechanics, and biochemomechanics. Diverse aspects of biomedical engineering, from basic mechanobiology to characterization of materials behaviors and the design of medical devices and surgical interventions.

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

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 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 569b, 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, Computational Vision and Biological Perception Steven Zucker
An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students.

ENAS 585b / INP 585b, Fundamentals of Neuroimaging Douglas Rothman and Fahmeed Hyder
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 Ronald Adrezin
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 603b, Energy, Mass, and Momentum Processes Michael Loewenberg
Application of continuum mechanics approach to the understanding and prediction of fluid flow systems that may be chemically reactive, turbulent, or multiphase.

ENAS 606b, Polymer Chemistry and Physics Mingjiang Zhong
A graduate-level introduction to the physics and physical chemistry of macromolecules. This course covers the static and dynamic properties of polymers in solution, melt and surface adsorbed states and their relevance in industrial polymer processing, nanotechnology, materials science, and biophysics. Starting from basic considerations of polymerization mechanisms, control of chain architecture, and a survey of polymer morphology, the course also extensively addresses experimental methods for the study of structure and dynamics via various scattering (light, x-ray, neutron) and

spectroscopic methods (rheology, photon correlation spectroscopy) as integral components of polymer physics.

ENAS 615a, Synthesis of Nanomaterials Lisa Pfefferle
This course focuses on the synthesis and engineering of nanomaterials. We also introduce different types of nanomaterials, unique properties at the nanoscale, measurement, and important applications of nanomaterials (including biomedical, electronic, and energy applications). Synthesis methods covered include gas phase and high vacuum techniques (CVD, MOCVD) as well as wet chemistry techniques such as reduction of metal salts, sonochemistry, and sol gel methods. Taking sample applications, we discuss the properties necessary for each, and how to control these properties through synthesis control, such as by using templating methods.

ENAS 621a, Principles and Applications of Energy Technology Shu Hu
This course covers a range of applications in energy supply and energy-efficient consumption, with a focus on the basic understanding of physical and chemical processes. How the energy technology provides sustainable planetary solutions is discussed. Course modules are arranged for the comparative study of solar-to-chemical and solar-to-electricity energy conversion processes, thus providing students an interdisciplinary perspective on electrochemistry, solid-state physics, photochemistry, and nanoscience. Topics include nanostructured solar cells, fuel cells, solar fuel devices, CO_2 capture and utilization, petrochemical catalysis, solar-thermal combined cycles, and quantum phenomena in catalysis and surface sciences. These topics supplement the graduate study in energy conversion, energy storage, and nanoscale transport phenomena.

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 641a, Biological Processes in Environmental Engineering Jordan Peccia
Fundamental aspects of microbiology and biochemistry, including stoichiometry, kinetics, and energetics of biochemical reactions, microbial growth, and microbial ecology, as they pertain to biological processes for the transformation of environmental contaminants; principles for analysis and design of aerobic and anaerobic processes, including suspended- and attached-growth systems, for treatment of conventional and hazardous pollutants in municipal and industrial wastewaters and in groundwater.

ENAS 642b, Environmental Physicochemical Processes Menachem Elimelech
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 649a, Policy Modeling Edward H Kaplan
Building on earlier course work in quantitative analysis and statistics, Policy Modeling provides an operational framework for exploring the costs and benefits of public policy decisions. The techniques employed include "back of the envelope" probabilistic models, Markov processes, queuing theory, and linear/integer programming. With an eye toward making better decisions, these techniques are applied to a number of important policy problems. In addition to lectures, assigned articles and text readings, and short problem sets, students are responsible for completing a take-home midterm exam and a number of cases. In some instances, it is possible to take a real problem from formulation to solution, and compare the student's own analysis to what actually happened. Prerequisites: Decision Analysis and Game Theory, Data Analysis and Statistics, or a demonstrated proficiency in quantitative methods.

ENAS 673b, Air Quality and Energy Drew Gentner
The production and use of energy are among the most important sources of air pollution worldwide. It is impossible to effectively address the impacts and regulation of air quality without understanding the impacts and behavior of emissions from energy sources. Through an assessment of emissions and physical/chemical processes, the course explores advanced topics (at the graduate level) on the behavior of pollutants from energy systems in the atmosphere. Topics include traditional and emerging energy technology, climate change, atmospheric aerosols, tropospheric ozone, as well as transport/modeling/mitigation.

ENAS 700a, 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 703a, Introduction to Nanomaterials and Nanotechnology Judy Cha
Survey of nanomaterial synthesis methods and current nanotechnologies. Approaches to synthesizing nanomaterials; characterization techniques; device applications that involve nanoscale effects.

ENAS 718b, Advanced Electron Devices Staff
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 748b, 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 758b, Multiscale Models of Biomechanical Systems Stuart Campbell
Current methods for simulating biomechanical function across biological scales, from molecules to organ systems of the human body. Theory and numerical methods; case studies exploring recent advances in multiscale biomechanical modeling. Includes computer laboratory sessions that introduce relevant software packages.

ENAS 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 805b, Biotechnology and the Developing World Anjelica Gonzalez
This interactive course explores how advances in biotechnology enhance the quality of life in the developing world. Implementing relevant technologies in developing countries is not without important challenges; technical, practical, social, and ethical aspects of the growth of biotechnology are explored. Readings from *Biomedical Engineering for Global Health* as well as recent primary literature; case studies, in-class exercises, and current events presentations. Guest lecturers include biotechnology researchers, public policy ethicists, preventive research physicians, public-private partnership specialists, and engineers currently implementing health-related technologies in developing countries.

ENAS 806b, Photovoltaic Energy Fengnian Xia
Electricity from photovoltaic solar cells is receiving increasing attention due to growing world demand for clean power sources. This course primarily emphasizes device physics of photovoltaics; statistics of charge carriers in and out of equilibrium; design of solar cells; and optical, electrical, and structural properties of semiconductors relevant to photovoltaics. Two laboratory sessions and a final project aid students in

understanding both the applications and limitations of photovoltaic technology. The main objectives of this course are to equip students with the necessary background and analytical skills to understand and assess established and emerging photovoltaic technologies; to familiarize students with the diverse range of photovoltaic materials; and to connect materials properties to aspects of cell design, processing, and performance.

ENAS 825a, Physics of Magnetic Resonance Spectroscopy in Vivo Graeme Mason
The physics of chemical measurements performed with nuclear magnetic resonance spectroscopy, with special emphasis on applications to measurement studies in living tissue. Concepts that are common to magnetic resonance imaging are introduced. Topics include safety, equipment design, techniques of spectroscopic data analysis, and metabolic modeling of dynamic spectroscopic measurements.

ENAS 850a, Solid State Physics I Yu He
A two-term sequence (with ENAS 851) 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, Solid State Physics II Vidvuds Ozolins
A two-term sequence (with ENAS 850) 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 876a, Silicon Compilation Rajit Manohar
A course for seniors and first-year graduate students on compiling computations into digital circuits using asynchronous design techniques. Emphasis is on the synthesis of circuits that are robust to uncertainties in gate and wire delays by the process of program transformations. Topics include circuits as concurrent programs, delay-insensitive design techniques, synthesis of circuits from programs, timing analysis and performance optimization, pipelining, and case studies of complex asynchronous designs.

ENAS 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 907b / CPSC 549b, Computer Architectures and Artificial Intelligence Richard Lethin
Introduction to the development of computer architectures specialized for cognitive processing, both offline "thinking machines" as well as embedded devices. History of machines starting with early conceptions in defense systems to contemporary initiatives. Instruction sets, memory systems, parallel processing, analog architectures, probabilistic architectures, graph computing architectures, machine-learning architectures. Application and algorithm characteristics.

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 951a / CPSC 556a, Wireless Technologies and the Internet of Things Wenjun Hu
Fundamental theory of wireless communications and its application explored against the backdrop of everyday wireless technologies such as WiFi and cellular networks. Channel fading, MIMO communication, space-time coding, opportunistic communication, OFDM and CDMA, and the evolution and improvement of technologies over time. Emphasis on the interplay between concepts and their implementation in real systems. The labs and homework assignments require Linux and MATLAB skills and simple statistical and matrix analysis (using built-in MATLAB functions).

ENAS 952a, Internet Engineering Leandros Tassiulas

ENAS 963b, Network Algorithms and Stochastic Optimization Leandros Tassiulas
This course focuses on resource allocation models as well as associated algorithms and design and optimization methodologies that capture the intricacies of complex networking systems in communications computing as well as transportation, manufacturing, and energy systems. Max-weight scheduling, back-pressure routing, wireless opportunistic scheduling, time-varying topology network control, and energy-efficient management are sample topics to be considered, in addition to Lyapunov stability and optimization, stochastic ordering, and notions of fairness in network resource consumption.

ENAS 968b, Cloud FPGA Jakub Szefer
An intermediate- to advanced-level course focusing on digital design and use of Field Programmable Gate Arrays (FPGAs). In addition, it centers around the new computing paradigm of Cloud FPGAs, where the FPGAs 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). 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 also learn about FPGA tools from two major vendors: Xilinx and Intel (formerly Altera). The practical aspects focus on designing systems using commercial Cloud FPGA infrastructures: Amazon F1 service (Xilinx FPGAs) or through the Texas Advanced Computing Center (Intel FPGAs). Students learn about cloud computing; interfacing servers to FPGAs, PCIe, and AXI

protocols; and how to write software that runs on the cloud servers and leverages the FPGAs for acceleration of various computations. The course features a half-term project where students design, implement, test, and evaluate an accelerator design, such as Bitcoin miner, deep neural network computations, cryptographic circuits, or others. Prerequisites: familiarity with digital design basics and some experience with HDLs 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 Staff
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

Director of Graduate Studies
Catherine Nicholson (106a LC, 203.432.2226)

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

Associate Professors Marta Figlerowicz, Cajetan Iheka, Catherine Nicholson, Emily Thornbury, R. John Williams

Assistant Professors Anastasia Eccles, Marcel Elias, Ben Glaser, Alanna Hickey, Jonathan Howard, Elleza Kelley, Naomi Levine, Ernest Mitchell, Priyasha Mukhopadhyay, Joseph North, Jill Richards, 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 medieval, one early-modern, one eighteenth- and/or nineteenth-century, one twentieth- and/or twenty-first-century.
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 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 five 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 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.

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 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 Renaissance Studies

The Department of English Language and Literature also offers, in conjunction with the Renaissance Studies Program, a combined Ph.D. in English Language and Literature and Renaissance Studies. For further details, see Renaissance Studies.

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. See Degree Requirements under Policies and Regulations.

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 502b / MDVL 666b, Old English II Emily Thornbury
Readings in a variety of pre-Conquest vernacular genres, varying regularly, with supplementary reading in current scholarship. Current topic: the Exeter anthology of Old English poetry, comprising saints' lives, lyrics, elegies, wisdom poetry, riddles, and more.

ENGL 503a / HIST 800a / MDVL 565a, Circa 1000 Valerie Hansen and Emily Thornbury
The world in the year 1000, when the different regions of the world participated in complex networks. Archaeological excavations reveal that the Vikings reached L'Anse aux Meadows, Canada, at roughly the same time that the Kitan people defeated China's Song dynasty and established a powerful empire stretching across the grasslands of Eurasia. Europeans tried to figure out whether the Vikings were a sign of Doomsday, and if so, whether a series of cultural experiments might stave off the end-time, even as the Icelanders tried to decide whether they wanted to be European. In this seminar, students read interpretative texts based on archaeology and primary sources, prepare projects in teams, work with material culture, and develop skills of cross-cultural analysis. Mandatory field trip to the Metropolitan Museum of Art in New York on the second Saturday of the fall term.

ENGL 521b / CLSS 624b / HIST 532b / MDVL 621b, Advanced Manuscript Studies N. Raymond Clemens
This course builds on the foundation provided by MDVL 620 by focusing on both regional Latin hands and the vernacular hands that grew from the Latin tradition. The backbone of the course is Middle English paleography (no prior experience needed), but the course surveys French, Italian, Hebrew, and German hands as well. Prerequisite: MDVL 620 or MDVL 571 or equivalent study of Latin paleography strongly suggested.

ENGL 533b / MDVL 533b, Medieval Drama Jessica Brantley
This seminar explores the dramatic traditions of late-medieval England from many angles in order to construct a rich, contextual reading of theatrical culture in the period. The biblical cycle drama—sometimes known as Corpus Christi or mystery plays—forms the center of the course, and we consider evidence from all four extant cycles, while concentrating primarily on the N-Town plays. We read the cycle drama in the context of other important genres including liturgical drama, morality plays, saints' plays, mummings and disguisings, and royal entries. Recent critical interest in the histories of performance leads us consider the difference enactment makes to the literary objects we study. But we also think about what it means to read a medieval play, particularly how the visual imagination works for a solitary reader.

To this end, we investigate medieval artistic forms that touch the drama without (perhaps) being properly theatrical: liturgy, pageantry, song, spectacle, recitation, book illumination, sculpture, and stained glass. We also attend to the physical forms in which medieval drama is preserved—i.e., the manuscripts in which we find the texts and performance records. Finally, we consider the legacies of medieval drama as engaged by contemporary playwrights, including Sarah Ruhl (*Passion Play*) and Branden Jacobs-Jenkins (*Everybody*).

ENGL 545a / CPLT 582a / FREN 802a / MDVL 502a, Chaucer and Translation Ardis Butterfield

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

ENGL 574a / CPLT 684a / ITAL 720a / RNST 684a, Renaissance Epic David Quint

This course looks at Renaissance epic poetry in relationship to classical models and as a continuing generic tradition. It examines epic type scenes, formal strategies, and poetic architecture. It looks at themes of exile and imperial foundations, aristocratic ideology, and the role of gender. The main readings are drawn from Vergil's *Aeneid,* Lucan's *Bellum civile,* Tasso's *Gerusalemme liberata,* Camões's *Os Lusíadas,* and Spenser's *Faerie Queene*.

ENGL 598b, The Materiality of Textual Culture in Early Modern Britain and in Colonial America Peter Stallybrass

This course examines the materiality of textual culture in early modern Britain and Europe and in colonial America, drawing upon the collections at the Beinecke Library, Yale Center for British Art, and Yale Art Gallery. There is a particular focus upon the bible and liturgical books, Shakespeare, English poetry in manuscript and print, letter writing, and children's ABCs. At the same time, we explore language as a material practice, analyzing what is called in linguistics the T/V distinction (Thou/You in English, Tu/Vos in Latin, Tu/Vous in French, Du/Sie in German, etc.), and also investigating the development of new[ish] words (nation; modern; innovation; novelty; the news and newspaper; culture; manuscript; assassin; hammock; canoe; cannibal; tribade; fetish; trifle; trinket; trivial; trumpery; trash; reform/re-form/reformer/reformed; papist; protestant; puritan; trinitarian; socinian; quaker; orthodox/heterodox; sprezzatura) and the transformation in meaning of old ones (individual; revolution; price/prize/praise; culture [again]; nation [again]; gentle). More generally, we explore the problem of what the "new" meant both in terms of material culture and language between 1350 and 1700.

ENGL 605b / CPLT 638b, Shakespeare's *Tempest,* Cultural Translation, and the Genealogies of Race Lawrence Manley and Ayesha Ramachandran

This course explores current debates over questions of premodern race, racialization, and race-thinking through the lens of *The Tempest* and its literary and critical afterlives. Almost since its first performance, Shakespeare's play has served as an index of England's (and Europe's) engagement with its "others": it is (arguably) a play both about and against empire, a meditation on indigenous and settler relations, a study in language and social stratification, a wry dramatization of gender dynamics, and an exemplary case in the making and deconstruction of race. Its classical and contemporary early modern sources are already concerned with these problems, which are in turn reimagined by Shakespeare for his time and then repurposed by the diverse range of writers who adapt from his work. The process of adapting *The Tempest* to different media and cultural situations over the past century (and more) has further elaborated these complex intersections: from Browning and Renan to Auden, from Césaire and Lamming to Virahsawmy, from Darío and Rodó to Fanon and Retamar, from Brathwaite to Cliff and Wynter, Shakespeare's play is an occasion for exploring processes of cultural translation and the critical problems of race, gender, and (post)colonialism. While examining the transhistorical travels of *The Tempest,* this seminar introduces and examines the current state of criticism and theory with regard to adaptation, race, and empire.

ENGL 668a / CPLT 809a / ITAL 668a / RNST 668a, Translating the Renaissance Jane Tylus

Would there have been a Renaissance without translation? We approach this question by beginning with the first modern treatise on translation, by the Florentine chancellor Leonardo Bruni, and moving on to consider the role of translation in Florence's and Tuscany's growing cultural and political mastery over the peninsula—and in Italy's cultural domination of Europe. We go on to explore the translation of "medieval" into "early modern" Europe, the translation of visual into verbal material, and the role of gender in the practice of translation. Students engage in their own translation projects as we dedicate the last part of the seminar to the diffusion of the Petrarchan sonnet tradition in early modern Europe.

ENGL 729b / CPLT 724b, Literature and Philosophy from Locke to Kant Jonathan Kramnick

This is a class on epistemology, aesthetics, and literary form. We read major works in empiricism and moral philosophy alongside poetry and fiction in several genres. We ask, for example, how do poetry, fiction, and the visual arts recruit and account for perceptual experience or consider material and natural objects? What happens when the empirical psychology of consciousness or the categories of the sublime, beautiful, and picturesque take narrative or poetic form? What sort of ethical models follow from formal or generic decisions? We focus throughout on how these topics have been discussed across the history of literary studies, and we pay close attention to current debates in the field, including those prompted by new formalisms and materialisms, critical race studies, cognitive literary studies, and the digital humanities. Authors include Locke, Behn, Defoe, Pope, Addison, Hume, Burke, Sterne, Smith, Kant, and Wordsworth.

ENGL 774a, Romanticism and Anti-Romanticism Leslie Brisman
Romanticism is traditionally conceived as the "great turn inward," where interest in exploring the complexities and depths of the human mind replaces a focus on heroic action and social interaction. But the great Romantic poets were equally concerned with interpersonal relations and political problems and reform. Some of the great recent criticism of Romantic poets emphasizes the anti-Romantic elements within the great Romantic poems. This course attempts to focus on both. Readings are mostly the work of Blake, Coleridge, Wordsworth, Shelley, and Keats, with some attention to Byron, Charlotte Smith, Scott, and the minor poets.

ENGL 777b / CPLT 777b / GMAN 777b, Poems and Their Theories Paul North
A task lies before us: to go back and understand the importance that critical theory, in its inception and throughout its life, gave to poems. Poems and theories shared ideals from the turn of the nineteenth century to at least the end of the twentieth, at a minimum in German, French, and English. They dreamed of taking a vacation from language, of returning to the sensible, of imagining communities, of revising the model of *Bildung* and culture, of rethinking history, of critiquing the nation-state and capitalism, among other dreams. Why this shared project between poetry and theory? What did theory find in the resources of literature, the genius idea, the past, and other foreignnesses that seemed so vital to critiquing the perceived present? Readings include Hölderlin, Schlegel, Novalis, Wordsworth, Shelley, Baudelaire, Celan, Benjamin, Heidegger, Arendt, de Man, Lacoue-Labarthe, Sedgwick, Kristeva, Jacobs.

ENGL 807a, Charles Dickens and George Eliot Stefanie Markovits
Overview of the works of Charles Dickens and George Eliot through exploration of a series of paired texts that allow perspective on two different approaches to a variety of novelistic modes, including the *Bildungsroman,* the historical novel, and the political novel.

ENGL 816b, How to Read Anastasia Eccles and Priyasha Mukhopadhyay
A practice that underpins the discipline of literary studies, "reading" is nevertheless an elusive and unstable object of study, referring to everything from a cognitive process of decoding to a heterogeneous set of social practices to a scholarly method or ethos. This course surveys the critical approaches that have claimed reading as either a special topic or an organizing principle. Working across the fields of book history, literary ethics, cognitive literary studies, digital humanities, phenomenology, queer theory, literary sociology, and the philosophy of aesthetics, we focus on the impasses and openings between historical and theoretical orientations to the subject. Our aim is less to stabilize the thing we call reading than to track how it shifts as it moves across methodological contexts and attaches itself to different kinds of objects (novels, poems, audiobooks, ephemera, data). In the context of these diverse methods and case studies, students are also invited to reflect on their own developing practices as readers and as writers. The assignments for the course combine literary analysis and archival research.

ENGL 867a / AMST 717a, Writing Reconstruction Michael Warner
This course treats the afterwork of the Civil War and the 15th Amendment, as writers in various ways imagined the meaning of the war, the possibility of multiracial democracy, and the reality of fracture. The course begins with Civil War writing in a range of genres, including poetry by Whitman and Melville as well as writings by Douglass, Alcott, Keckley, and others. It touches on readings about Reconstruction in the South by white writers such as Constance Fenimore Woolson, Albion Tourgée, Joel Chandler

Harris, and Thomas Nelson Page, alongside the African American tradition from Douglass through Charles Chesnutt and Ida B. Wells. We read *The Adventures of Huckleberry Finn* and various works by Stephen Crane, including "The Monster," and conclude with the great novel of unfinished business, *Absalom, Absalom!*

ENGL 885b / AMST 625b, The Transpacific Midcentury Sunny Xiang
This course situates war and empire at the cross-section of political geography, critical historiography, and cultural studies. Put another way, it uses the concept-term "Transpacific Midcentury" to undertake an extended meditation on the methodological categories that organize our intellectual work and everyday thinking: period, area, and archive. My hope is that our conversations over the term allow us to unsettle, distort, reject, and remake these seemingly stable categories. Questions that guide our thinking include: How do we periodize a mid-century cold war between superpowers that spun off into multiple colonial wars, civil wars, guerrilla wars, and cultural wars? How does the archipelagic imaginary of the transpacific complicate the continental biases of area studies and ethnic studies? How might cultural texts help us fashion informed hypotheses about a historical period saturated with new ideas about race, gender, media, travel, governance, and consumerism? In exploring these questions, we engage writers, thinkers, and artists such as Gina Apostol, Samuel Delany, Vernadette Gonzalez, Jodi Kim, Myung Mi Kim, Christina Klein, Richard Mason, Craig Santos Perez, Teresia Teaiwa, and Lisa Yoneyama.

ENGL 896b, Postcolonial, Global, and the Decolonial Cajetan Iheka
What is postcolonialism? Is it even possible to define this term? How can we locate it spatially and temporally? In other words, when does it start and has it ended? What spatial areas are covered by the concept? Is the "post" in postcolonialism the same as the "post" in postmodernism? How relevant is the term today or has it been supplanted? What are the pitfalls of the term? What is its relationship to ideas of the world, the global, and the decolonial? These are some of the overarching questions that guide our readings in this course. We explore the various definitions and critiques of the idea of the postcolonial as a conceptual category. Our readings and discussions also consider recent explorations in the field as it pertains to globalization and new critical approaches such as ecocriticism. Readings include the works of Frantz Fanon, Aimé Césaire, Sylvia Wynter, Édouard Glissant, Kwame Anthony Appiah, Anne McClintock, Jennifer Wenzel, Edward Said, Homi Bhabha, Gayatri Spivak, and Achille Mbembe. The course prepares students to respond to key issues in postcolonial theory, analyze the work of the major thinkers in the field, and examine literary texts and other cultural productions from a postcolonial perspective. Students craft an original essay that puts postcolonialism in conversation with one or two primary texts with a view to transforming our understanding of theoretical concepts and/or the literary works.

ENGL 914a, Historicism Caleb Smith
This is a seminar on historicism as a mode of knowing, thinking, and writing in literary studies. What kinds of claims do historicists make, and what kinds of evidence do they provide? How do they connect archival research to close reading and other interpretive practices? What are historicism's prevailing genres and modes? Pursuing these questions, we explore how critics use history and literature to explain each other. In practice, this means reading works of historicist theory and criticism as our primary, rather than secondary sources—studying academic genres like book chapters and articles "for craft" to see how they tell their stories and develop their arguments. The

syllabus includes representative examples from several intellectual movements of the past fifty years, including new historicism (Miller), Marxist criticism (Ngai), historical poetics (Jackson), and Black studies (Hartman).

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

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

ENGL 920b / CPLT 917b / FILM 601b, Foundations of Film and Media Dudley Andrew and John Peters

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 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 943b / AFAM 858b, Hurston, Hughes, and Black Modernisms Shane Vogel
This course considers some of the key concepts and tensions in the development of black modernisms through a focus on two of its major innovators: Zora Neale Hurston and Langston Hughes. We consider their work across the first half of the twentieth century and the scholarly debates and intellectual formations that developed in response to their work in the second half. We pay special attention to formal experimentation across genres and to the relationship between literature and performance. Topics include folklore and the folk; migration; memory; transnationalism; gender and sexuality; political writings; the question of archives; musicality; drama and performance; religion; the Federal Writers Project; and autobiography. While Hurston and Hughes serve as the focus of the course, the inquiry is a wide-ranging engagement with black modernisms, understood as an ongoing project.

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 971b / AMST 734b / CPLT 645b / FREN 871b, Fictions of Canada: Colonialism, Nationalism, Postcolonialism Katie Trumpener
This seminar explores the literature(s) of Canada in its long history, its considerable linguistic and cultural range, and its complex relationship to political history. Like Canada itself, Canadian literature represents a "contact zone" between First Nations peoples, French and British settlers, and immigrants from Eastern Europe, East and South Asia, and the Caribbean. Particular focus on Canada's diverse early literatures (from Jesuit hymn to epistolary novel); on the prominent role of women writers across Canadian literature history; on the emergence of an experimental Québécois literature (utilizing Montreal patois as a new literary language) in an era also marked by secularization, modernization, and political separatism; on English Canadian attempts to rethink colonial history; and on the critiques of Canada's ongoing decolonization process by new generations of indigenous, immigrant, and ethnic writers. This course explores both literary history and literary form; and the work of internationally famous novelists and poets (Leonard Cohen, Marie-Claire Blais, Margaret Atwood, Alice Munro, Michael Ondaatje) and their innovative local counterparts. Throughout the term, moreover, our discussion of written literary texts (poems, novels, plays) is supplemented by primarily oral texts (Canadian anthems, ballads, folk, rock, and punk songs in a range of Canadian languages). We are thus listening to even as we are reading Canada.

ENGL 981b / AFAM 775b / AMST 771b, Affect Theory Tav Nyong'o
This seminar traces the emergence of affect, sense, feeling, and mood as critical keywords in American studies. Particular attention is paid to the manner in which queer theorists such as Eve Kosofsky Sedgwick, Lauren Berlant, Ann Cvetkovich, Heather Love, Jennifer Doyle, Jonathan Flatley, and José Esteban Muñoz developed the concept in what has been called "the affective turn" in queer and feminist aesthetics. The

philosophical basis of affect theory in the writings of Spinoza, Heidegger, and Deleuze forms the core of the seminar. We also look to an alternate genealogy for affect politics in the writings of Bergson and Deleuze on fabulation. We consider the psychoanalytic take on affect, in particular the object relations school of Klein and Winnicott, and we read critics who contrast affect theory with trauma theory. Marxist contributions to affect theory include readings from Virno (on humor), Hardt and Negri (on affective labor), and Rancière (on the distribution of the sensible). The writings of Jasbir Puar and Brian Massumi on the affective politics of contemporary war, empire, and societies of control are also considered, as are writings by Fred Moten, Saidiya Hartman, and Frank Wilderson on optimism and pessimism as moods/modalities of black studies.

ENGL 983b / WGSS 725b, Disability and Sexuality Joseph Fischel and Jill Richards
The course examines how intimacies, pleasures, bodies, genders, and sexualities take shape across the spectrum of ability. The course draws from an array of scholarly approaches to dis/ability to theorize normative parameters around sex and sociality, and to imagine alternatives. Scholarly theoretic texts are integrated with cultural artifacts, including poetry, visual art, cinema, podcasts, and other media. Topics include embodiment and gender pluralism, the social model and its discontents, pregnancy and reproductive justice, HIV/AIDS, pornography and representation, toxicity and contagion, care work and dependency, and vulnerability.

ENGL 990b, The Teaching of English Benjamin Glaser and Sunny Xiang
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 991b, Public Criticism Workshop Langdon Hammer and Meghan O'Rourke
A workshop in which graduate students develop their critical writing about literature and culture for nonspecialist audiences. We survey writing for diverse publics in a range of venues in order to explore the formal and intellectual possibilities of criticism today, as well as in the recent past. Students experiment in forms such as the book review, long-form essay, lyric essay, and profile. Questions discussed include how to convey specialized knowledge to a broad audience; how to establish and manage style, voice, and address; how to combine criticism and reporting or narrative; how magazine editors select and develop the writing they publish; how to edit writing for publication; how to pitch a piece. We host class visits from editors and writers. Applications, including a short writing sample and short personal statement describing your interest in public writing, are reviewed in fall 2021 for participation in the spring 2022 workshop.

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 Jill Richards
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 996a and ENGL 997b, Journal Article Workshop John Williams and Catherine Nicholson
A workshop for graduate students revising a seminar paper, dissertation chapter, or other draft for publication in an academic journal. Topics of discussion include the genres and forms of critical writing; mechanics and diplomacy of peer review; techniques and ethics of citation; and how to be a helpful reader of others' work in progress. Applications, including article drafts, to be reviewed at the start of the fall term. Assignments include weekly readers' reports on others' drafts. ½ Course cr per term

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
Oswald Schmitz (137 Kroon, 203.436.5276, oswald.schmitz@yale.edu)

Professors Mark Ashton, Michelle Bell, Gaboury Benoit, Graeme Berlyn, Mark Bradford, Craig Brodersen, Liza Comita, Michael Dove, Daniel Esty, Justin Farrell, Eli Fenichel, 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 Marian Chertow, Kenneth Gillingham, Nyeema Harris, Narasimha Rao

Assistant Professors 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 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. 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.

Joint Master's Degree Program (School of the Environment and School of Engineering & Applied Science) The School of the Environment (YSE) also offers, in conjunction with the School of Engineering & Applied Science (SEAS), a joint master's degree program leading to a Master of Environmental Management (M.E.M.) or a Master of Environmental Science (M.E.Sc.) from YSE, and a Master of Science (M.S.) from SEAS. For further details, see Engineering & Applied Science.

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 Oswald Schmitz

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 & 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 & Literatures*), David Bromwich (*English*), Paul Bushkovitch (*History*), Francesco Casetti (*Humanities; Film & Media Studies*), Katerina Clark (*Comparative Literature; Slavic Languages & 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 & Literatures*), Bruce Gordon (*Divinity; History*), Philip Gorski (*Sociology*), Timothy Guinnane (*Economics*), Alice Kaplan (*French*), Paul Kennedy (*History*), John MacKay (*Slavic Languages & Literatures; Film & 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 & 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 & 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 & Literatures; Film & Media Studies; Women's, Gender, & Sexuality Studies*), Jinyi Chu (*Slavic Languages & 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 & Medicine*)

Lecturers Paris Aslanidis (*Hellenic Studies; Political Science*), George Syrimis (*Hellenic Studies; Religious Studies*)

Senior Lectors Irina Dolgova (*Slavic Languages & Literatures*), Marion Gehlker (*German*), Krystyna Illakowicz (*Slavic Languages & Literatures*), Maria Kaliambou

(*Hellenic Studies*), Ruth Koizim (*French*), Constantine Muravnik (*Slavic Languages & Literatures*), Julia Titus (*Slavic Languages & Literatures*), Karen von Kunes (*Slavic Languages & 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. Students specializing in Russia and East Europe, for example, will concentrate their efforts in that area, but will also take courses that address Europe-wide problems or the countries of West and Central Europe. 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

When applying to the program, students will specify as an area of primary concentration either (1) Russia and East Europe, or (2) West and Central Europe. All students must complete sixteen graduate-level term courses (or their equivalent) in the various fields related to European and Russian studies.

Students in their first year must enroll in one course focusing on methodology in a field of study, e.g., History, Comparative Literature, Sociology, or Political Science. Students are required to take at least one course in at least three of the four fields of study relevant to the program, i.e., history (including history of art, history of science, and history of music), literature, social sciences, and law. Students can fulfill this three-field requirement by taking Europe-related graduate-level courses from across the University. 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. For students focusing on Russia and East Europe, two of the sixteen required courses (excluding language courses) must concern the nations of West and Central Europe. Conversely, for those focusing on West and Central Europe, two courses must concern Russia and East Europe.

For the purposes of this program, language courses in modern European languages count toward the sixteen required courses, even though they have undergraduate course numbers and undergraduate grade modes. If a student takes a language course to fulfill the 16-credit degree requirement, the language course cannot be taken for audit. Students with previous language preparation may in certain cases receive documentation of their language proficiency on the basis of this work. By the time the degree is completed, all students must demonstrate at least L4 proficiency in two modern European languages other than English. Those wishing to focus on Russia and East Europe will need to demonstrate knowledge of Russian or an East European language; those focusing on West and Central Europe will need to demonstrate knowledge of one of the appropriate regional languages. In all cases, students are required to demonstrate proficiency in two European languages by the end of the third term at Yale. The only exception to this rule is completion of the appropriate full sequence of Yale language classes, certified by the Yale instructor or the director of graduate studies (DGS). Students who wish to take Yale department examinations in French, German, Italian, Portuguese, Spanish, or other West European languages should register for a placement examination or a complete proficiency examination (with reading, oral, and grammar portions) with the appropriate Yale department. 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 with competence in an East European language (such as Polish, Czech, Ukrainian, Hungarian, and others by special arrangement) or other European languages must take Yale department-administered examinations. Students who have met the language proficiency degree requirement may study a non-European language related to the student's academic and professional goals if the courses are approved by the DGS.

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 applicable professional school, with notation made on each application that this is 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 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 E&RS 950, which may count toward the sixteen required courses. E&RS 950 may not be taken for audit. Students may

register for one additional independent study to prepare topics and begin research. The master's thesis must be prepared according to department guidelines and is due in two copies in the student's second year on an early-April date 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 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, 203.785.3624
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*), Gary Friedlaender (*Orthopaedics & Rehabilitation*), Patrick Gallagher (*Pediatrics*), Erica Herzog (*Internal Medicine*), Robert Homer, S. David Hudnall, Steven Kleinstein, Yuval Kluger, Christine Ko (*Dermatology*), Diane Krause (*Laboratory Medicine*), Francis Lee (*Orthopaedics & Rehabilitation*), Chen Liu, Vincent Marchesi, Gilbert Moeckel, Ruth Montgomery (*Rheumatology*), Jon Morrow, Michael Murray (*Genetics*), Jordan Pober (*Immunobiology*), David Rimm, Jeffrey Sklar, David Stern

Associate Professors Demetrios Braddock, Hyung Chun (*Internal Medicine*), Ayman El-Guindy (*Pediatrics*), Carlos Fernandez-Hernando (*Comparative Medicine*), Karin Finberg, Joanna Gibson, Stephanie Halene (*Hematology*), Anita Huttner, Ryan Jensen (*Therapeutic Radiology*), Samuel Katz, Themis Kyriakides, Don Nguyen, Manoj Pillai (*Hematology*), Katerina Politi, Yibing Qyang (*Internal Medicine*), Yajaira Suarez (*Comparative Medicine*), Qin Yan

Assistant Professors William Damsky (*Dermatology*), Pallavi Gopal, Brian Hafler (*Neurology*), Il Song Hahn, Jeffrey Ishizuka (*Medical Oncology*), Morgan Levine, Zachary Levine, Peggy Myung (*Dermatology*), Kurt Schalper, 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 Molecular Medicine, Pharmacology, and Physiology track (MMPP), within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Course requirements Experimental Pathology students must pass PATH 640, Developing and Writing a Scientific Research Proposal; PATH 650, Cellular and

Molecular Biology of Cancer; and PATH 690, Molecular Mechanisms of Disease. All MMPP students are required to take and pass PATH 680, Seminar in Molecular Medicine, Pharmacology and Physiology. Passes in three additional graduate-level, one-term courses are required, which can include courses in biochemistry, genetics, immunology, cell biology, and pathology, to be chosen in consultation with the director of graduate studies (DGS), according to the student's background and interest. All requirements of the Graduate School of Arts and Sciences, including the Honors requirement, must be met. In year one, students must also take a seminar course (one in each term) and do three laboratory rotations. Prior to registering for a second year of study, students must successfully complete PATH 660, The Responsible Conduct of Research. In their 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. Students must also maintain an overall High Pass average. Student progress toward these goals is reviewed at the end of the second term.

Qualifying examination The qualifying examination of the Experimental Pathology graduate program comprises: (1) enrollment in the BBS/Pathology course Developing and Writing a Scientific Research Proposal (PATH 640) in the fall term of year two and preparation of a proposal on the topic of the student's research; student 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.

1. The qualifying examination committee, consisting of three faculty members, will be chosen to examine the student. At least one of the committee members must have a primary appointment in the Department of Pathology, and the thesis adviser is not on the exam committee. 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 itself, 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.
2. All oral exams will follow the same general format. The oral examination will focus on the student's ability to present and defend the research proposal. The student should come to the exam with a short (30–40 minute) presentation of the thesis-related proposal, with visual aids. The actual presentation will take longer since exam committee faculty will interrupt with questions. The committee can also ask questions on topics covered during the reading period and general topics in experimental pathology that will have been covered in courses. The final evaluation by the exam committee faculty takes into account the student's performance on the examination and performance in lab (based on the adviser's evaluation, solicited by the DGS). A written summary of the qualifying examination evaluation will be prepared by the examination committee chairperson and submitted to the DGS. If

the student does not pass the exam, the committee has the option of recommending an additional course of reading and/or written work. The DGS has final discretion in approving or modifying the recommendations of the committee.

Prospectus 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, and preferably in the second year. Students must then submit a written thesis describing the research and present a thesis research seminar.

Additional requirements There is no foreign language requirement. In accordance with the BBS program, Ph.D. students are expected to participate in two terms (or the equivalent) of teaching. Students are not expected to teach during their first year. Teaching assignments in fulfillment of the requirement must be approved in advance by the DGS.

M.D./PH.D. STUDENTS

M.D./Ph.D. students must satisfy the requirements listed above for the Ph.D. with the following modifications: Two laboratory rotations are required. Assisting in teaching of one course is required. Five courses are required for the Ph.D., including PATH 640, Developing and Writing a Scientific Research Proposal; PATH 650, Cellular and Molecular Biology of Cancer; and PATH 690, Molecular Mechanisms of Disease. In addition, students are required to register for School of Medicine courses in OCS (Online Course Selection), https://students.yale.edu/ocs.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations. Awarded only to students who are continuing for the Ph.D. Students are not admitted for this degree.

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 this degree if they have successfully completed the course requirements for the Ph.D. degree (three laboratory rotations, PATH 640, PATH 650, PATH 660, PATH 690, three elective courses, and two seminar courses), and received a grade of Honors in at least one core course (i.e., excluding rotations and seminar courses). 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 Director of Graduate Studies, Department of Experimental Pathology, Yale University, PO Box 208023, New Haven CT 06520-8023; 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 625b, Pathobiology of Neurodegeneration Vincent Marchesi
Aging individuals throughout the world suffer from neurodegenerative diseases that resist treatment and prevention and are among the costliest chronic diseases in the United States. This course is about their causes, complications, and the rationale behind the treatments that are now available. We begin by reviewing normal brain functions and how they are impaired and then evaluate the evidence linking toxic protein deposits of amyloid and tau to Alzheimer's dementia. Our inability to design effective anti-amyloid treatments has turned our attention to many other pathogenic factors. These include toxic mutations, blood vessel damage, myelin dysfunction, inflammation, autophagy, and neuronal cell death. We also explore immune therapy, brain training, protective lifestyles, false alarms and uncertain claims, and the economics of dementia. Prerequisite: students interested in this course should email a brief description of their background and future goals to vincent.marchesi@yale.edu. Enrollment limited.

PATH 630b / ENAS 535b, Biomaterial-Tissue Interactions Themis Kyriakides
Study of the interactions between tissues and biomaterials, with an emphasis on the importance of molecular- and cellular-level events in dictating the performance and longevity of clinically relevant devices. Attention to specific areas such as biomaterials for tissue engineering and the importance of stem/progenitor cells, as well as biomaterial-mediated gene and drug delivery.

PATH 640a / B&BS 640a, Developing and Writing a Scientific Research Proposal Katerina Politi and Jean-Ju Chung
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, Cellular and Molecular Biology of Cancer David Stern and Qin Yan
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 681a, Advanced Topics in Cancer Biology Kurt Schalper and 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 and Ranjit Bindra
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, Molecular Mechanisms of Disease Demetrios Braddock and Carlos Fernandez-Hernando
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
John Durham Peters

Director of Graduate Studies
Francesco Casetti

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

Senior Lecturer Marc Lapadula

Lecturers Oksana Chefranova, Thomas Allen Harris, Brian Meacham, Camille Thomasson

FIELDS OF STUDY

Film and Media Studies is an interdisciplinary field drawing on the study of the history of art, national cultures and literatures, literary theory, philosophy, anthropology, feminist and queer studies, race and representation, and other areas. To study film and media at Yale, every doctoral student must be accepted into a combined program involving another discipline. Film and Media Studies offers a combined Ph.D. with 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 both film-media studies and another discipline, the candidate is advised to coordinate a plan of study involving comprehensive knowledge of one or more areas of specialization. Such areas include:

1. Historiography, including archival history, history of technology, silent film.
2. Aesthetics: theories of the image, adaptation, film/philosophy, avant-garde film.
3. European film: British-Irish, French, German and Nordic, Italian, Slavic.
4. American culture: Hollywood, independent film, African American cinema.
5. World film: global image exchange; cinema in Asia, Latin America, and Africa.
6. Documentary as an aesthetic, cultural, and ideological practice.
7. Cinema in its relations with other arts and other media.
8. Screen cultures, screened images, post-cinema, theory and history of media.

Through course work, examinations, and the dissertation, the candidate links a film and media specialty with material and methods coming from the participating discipline. Directors of graduate studies from both programs monitor the candidate's plans and progress.

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

In addition to the combined 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 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 two core seminars in Film and Media Studies (FILM 601 and FILM 603) as well as at least four additional Film and Media Studies seminars. Course requirements vary for participating departments. By October 1 of the third year, all students must have fulfilled an assignment related to foundational texts and films. Later that year, students advance to candidacy by completing qualifying examinations and a dissertation prospectus.

1. Qualifying examinations follow the regulations of the participating department with at least one member of the Film and Media Studies Executive Committee participating.
2. The dissertation prospectus is presented to a faculty committee or the entire faculty of the participating department. The prospectus is also submitted to the prospectus committee of Film and Media Studies for approval.
3. 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 and the DGS of the participating department are also invited to participate. 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.

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).

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 601b / CPLT 917b / ENGL 920b, Foundations of Film and Media Dudley Andrew and John Peters
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 Francesco Casetti
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 690a / CPLT 913a, Radical Cinemas of Latin America Moira Fradinger
An introductory overview of Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required.

FILM 693b / AFAM 724b / AMST 732b / HSAR 759b / WGSS 693b, Imaging War, Imagining Peace: Memory, Justice, and Repair Laura Wexler
This course explores the ways in which both war and peace have been imagined and represented, and how those visual practices might be unlearned and reimagined. What do images and imaginings of war and peace leave out of view, and how can we bring both underlying social vulnerability and extant networks of protest and resistance into greater visibility? How might we avoid automatized reiterations of well-worn locations and scenarios of violence, for example in constructions of "the enemy," and develop new approaches to the nationalist, racialized, and gendered stakes of conflict? What alternative acts of intervention, witnessing, and reparation might we create so as to see emergencies more freshly—at a time of conflict, as well as in anticipation and in retrospect? Can the visual archives of violence be reframed and recirculated to shape more firmly the potential of justice, cohabitation, and peace? How can visualizations of antiwar movements and peace actions be mobilized more effectively? This team-taught course is inspired by the documentary work of Susan Meiselas. Her distinctive photographic practice with communities in Nicaragua, El Salvador, Chile, Kurdistan, and elsewhere, her repeated return to sites of conflict over time, and her collaboration with the subjects of her images, as well as her extensive and innovative archival work, serve as one model for the kinds of approaches we want to explore and foster. In addition, our work is guided by close study of authors such as Leni Riefenstahl, Virginia Woolf, Alain Resnais, Susan Sontag, Sigmund Freud, Errol Morris, Judith Butler, Ariella Azoulay, Diana Taylor, Thy Phu, David Shneer, Amitav Ghosh, Anne McClintock, Grace Paley, Maaza Mengiste, Viet Thanh Nguyen, Karla Cornejo Villavicencio, Jenny Holzer, Walid Raad, Harun Farocki, Sam Durant, Sim Chi Yin, and more.

FILM 729a / CPLT 716a / GMAN 730a, German New Waves in Cold War Europe Katie Trumpener

Before 1961, Berlin was the best place in Europe to follow both Eastern and Western Europe's emerging cinematic New Waves. And first in East, then in West Germany, young filmmakers developed distinctive approaches to political and documentary filmmaking, to the Nazi past and the Cold War, to class, gender, and social transformation. This course juxtaposes the two German New Waves, focusing on aesthetic ferment, institutional barriers, and transformation. Features, documentaries, and experimental films by Gerhard Klein, Konrad Wolf, Alexander Kluge, Herbert Vesely, Edgar Reitz, Jean-Marie Straub and Danièle Huillet, Jürgen Böttcher, Heiner Carow, Frank Beyer, Wim Wenders, Rainer Werner Fassbinder, Helke Sander, Helke Misselwitz, read against other Eastern and Western New Wave films (i.e., by Lindsay Anderson, Karel Reisz, Andrzej Munk, Alain Resnais, Mikhail Kalatozov, Milos Forman).

FILM 735a / AMST 832a, 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 778a / RUSS 695a, Russian Literature and Film in the 1920s and 1930s Katerina Clark

This course presents a historical overview, incorporating some of the main landmarks of the 1920s and 1930s including works by Pilnyak, Bakhtin, the Formalists, Platonov, Mayakovsky, Bulgakov, Zoshchenko, Eisenstein, Protazanov, Pudovkin, the Vasilyev "brothers," and G. Aleksandrov.

FILM 810a / AMST 729a / WGSS 746a, Visual Kinship: Families and Photographs Laura Wexler

Exploration of the history and practice of family photography from an interdisciplinary perspective. Study of family photographs from the analog to the digital era, from snapshots to portraits, and from instrumental images to art exhibitions. Particular attention to the ways in which family photographs have helped establish gendered and racial hierarchies and examination of recent ways of reconceiving these images.

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 873a / EALL 581a, 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 921b / EALL 806b / EAST 806b, Research in Japanese Film History Aaron Gerow
This seminar covers the methods and problems of researching and writing Japanese film history. We review the theoretical issues involved in historiography in general and film historiography in particular, and then consider how these are pertinent to the study of Japanese cinema history. Our approach is critical, as we examine several recent examples of Japanese film historiography, as well as practical, as we explore various methods and strategies for researching Japanese film history. We particularly focus on the Japanese cinema's historical relation to the nation, especially in terms of how cinema may help us historicize the nation, and vice versa. Students develop their own research project using the unique collections at Yale. Knowledge of Japanese is helpful but not essential.

French

Humanities Quadrangle, 3rd floor, 203.432.4900
http://french.yale.edu
M.A., M.Phil., Ph.D.

Chair
Pierre Saint-Amand

Directors of Graduate Studies
Pierre Saint-Amand
Jill Jarvis

Professors R. Howard Bloch, Dominique Brancher (*Visiting*), Ardis Butterfield (*English*), Carolyn Dean (*History*), Marie-Hélène Girard (*Visiting*), Alice Kaplan, Pierre Saint-Amand, Maurice Samuels

Associate Professors Morgane Cadieu, Thomas Connolly

Assistant Professors Jill Jarvis, Christophe Schuwey

Affiliated faculty Carol Armstrong (*History of Art*), John Merriman (*History*)

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 sixteen 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. 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. PROGRAM

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 Renaissance Studies (in conjunction with the Renaissance 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.

The combined Ph.D. in French and African American Studies 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.

Students in the combined Ph.D. program in French and Renaissance Studies will take nine courses in French and seven in Renaissance Studies. Students must learn Latin and Italian. The oral examination will consist of seven topics: four in French and three in Renaissance Studies. Both the dissertation prospectus and the final dissertation must be approved by the French department and the program in Renaissance Studies. For further details see Renaissance 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. (en route to the Ph.D.) Students enrolled in the Ph.D. program may petition for the M.A. degree after a minimum of one year of study in residence, upon completion of one of the language requirements and eight courses, of which at least six are in French. Two grades of Honors in French graduate courses are required.

Program materials are available on the department's website at http://french.yale.edu/academics/graduate-program.

COURSES

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.

FREN 700b / HIST 654b, 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 802a / CPLT 582a / ENGL 545a / MDVL 502a, Chaucer and Translation Ardis Butterfield
An exploration of the works of Geoffrey Chaucer (ca. 1340–1400), brilliant writer and translator. Using modern postcolonial as well as medieval theories of translation, memory, and bilingualism, we investigate how texts in French, Latin, and Italian are transformed, cited, and reinvented in his writings. Some key questions include: What happens to language under the pressure of crosslingual reading practices? What happens to the notion of translation in a multilingual culture? How are ideas of literary history affected by understanding Chaucer's English in relation to the other more prestigious language worlds in which his poetry was enmeshed? Texts include material in French, Middle English, Latin, and Italian. Proficiency in any one or more of these languages is welcome, but every effort is made to use texts available in modern English translation, so as to include as wide a participation as possible in the course.

FREN 867b, Slavery and the French Enlightenment Pierre Saint-Amand
This course studies the encounter between eighteenth-century philosophers and the question of slavery. It examines the clash between the Enlightenment claim to universalism and the historical slave trade. Readings include the writings of the philosophes (Montesquieu, Voltaire, Rousseau, the *Encyclopédie*), testimonies of the victims of the trade (Equiano, Cugoano), the discourse of abolitionists (Condorcet, Grégoire), and plays devoted to the discussion of slavery (Gouges, Pigault-Lebrun).

Our approach to those texts expands into a variety of critical and theoretical arguments spanning a number of disciplines (history, anthropology, economics, and ecology). Conducted in French.

FREN 871b / AMST 734b / CPLT 645b / ENGL 971b, Fictions of Canada: Colonialism, Nationalism, Postcolonialism Katie Trumpener
This seminar explores the literature(s) of Canada in its long history, its considerable linguistic and cultural range, and its complex relationship to political history. Like Canada itself, Canadian literature represents a "contact zone" between First Nations peoples, French and British settlers, and immigrants from Eastern Europe, East and South Asia, and the Caribbean. Particular focus on Canada's diverse early literatures (from Jesuit hymn to epistolary novel); on the prominent role of women writers across Canadian literature history; on the emergence of an experimental Québécois literature (utilizing Montreal patois as a new literary language) in an era also marked by secularization, modernization, and political separatism; on English Canadian attempts to rethink colonial history; and on the critiques of Canada's ongoing decolonization process by new generations of indigenous, immigrant, and ethnic writers. This course explores both literary history and literary form; and the work of internationally famous novelists and poets (Leonard Cohen, Marie-Claire Blais, Margaret Atwood, Alice Munro, Michael Ondaatje) and their innovative local counterparts. Throughout the term, moreover, our discussion of written literary texts (poems, novels, plays) is supplemented by primarily oral texts (Canadian anthems, ballads, folk, rock, and punk songs in a range of Canadian languages). We are thus listening to even as we are reading Canada.

FREN 874a / CPLT 816a, Marketing and Literature Christophe Schuwey
Books are not only the medium of great literary works. They are also competing commercial products that, in order to be bought and/or read, must attract and retain attention, spark interest, and excite or meet a specific need. This course examines how markets, production techniques, habits, fashions, or advertising practices shape literary production. Drawing from the Beinecke collections, we study a wide range of diverse early modern French books to rethink the way we approach literature in general, from titles to typography, from structure to the very content of a work.

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 899b / CPLT 897b, Modernity Maurice Samuels
The seminar studies literature and art from nineteenth-century France alongside theoretical and historical reflections to explore the significance of modernity. How did historical forces shape cultural trends? How did literature and art define what it means to be modern? Writers to be studied include Balzac, Baudelaire, Flaubert, Maupassant, and Zola. Theorists include Benjamin, Durkheim, Foucault, Marx, Simmel, and Weber.

We also examine the painting of Manet and his followers. Reading knowledge of French required.

FREN 958a / WGSS 783a, Social Mobility Today Morgane Cadieu
The seminar examines the representation of upward mobility, social demotion, and interclass encounters in contemporary literature and cinema. Topics include emancipation and determinism; inequality, precarity, and class struggle; social mobility and migration; the interaction between social class and literary style; intersectionality; mixed couples; labor and the workplace; homecomings. We also discuss ways of approaching a contemporary corpus. Works by Angot, Eribon, Ernaux, Houellebecq, Linhart, Louis, NDiaye, Taïa. Films by Cantet, Diop, Kechiche, Klotz. Theoretical readings by Berlant, Bourdieu, Foucault, Nancy, Rancière. Members of the seminar have the opportunity to compare French mobilities to other literary traditions. Conducted in English. No knowledge of French required.

FREN 965b / AFST 965b / CPLT 729b, On Violence: Politics and Aesthetics across the Maghreb Jill Jarvis
A study of twentieth-century Maghrebi texts and films that document, theorize, and critique forms of political violence. How might aesthetic works—novels, plays, poems, torture and prison testimonies, political cartoons, films—run counter to state-sanctioned memory projects or compel rethinking practices of testimony and justice for a postcolonial time? Works by Kateb, Djebar, Mechakra, Djaout, Alleg, Boupacha, Meddeb, Barrada, Binebine, Laâbi, Rahmani, Mouride. Theoretical readings by Fanon, Mbembe, Khatibi, Kilito, Dorlin, Benjamin, Spivak, Derrida, Lazali. Conducted in English. Prerequisite: reading knowledge of French.

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
Marc Hammarlund
Zhaoxia Sun

Professors Allen Bale, Susan Baserga (*Molecular Biophysics & Biochemistry*), W. Roy Breg, Jr. (*Emeritus*), Kristen Brennand (*Psychiatry*), Martina Brueckner (*Pediatrics/ Cardiology*), Keith Choate (*Dermatology*), Lynn Cooley, Daniel DiMaio, Casey Dunn (*Ecology & 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 & Molecular Physiology*), 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, Chris Cotsapas (*Neurology*), Daniel Greif (*Internal Medicine/Cardiology*), Marc Hammarlund, Smita Krishnaswamy, Peining Li, Janghoo Lim, Jun Lu, Stefania Nicoli (*Internal Medicine/Cardiology*), James Noonan, Sabrina Nunez, In-Hyun Park, Curt Scharfe, Zhaoxia Sun, Andrew Xiao

Assistant Professors Nadya Dimitrova (*Molecular, Cellular, & Developmental Biology*), Rama Kastury, Monkol Lek, Bluma Lesch, Mandar Muzumdar, Zachary Smith, Michele Spencer-Manzon, Kaelyn Sumigray, Siyuan Wang, Frederick Wilson (*Internal Medicine/ Oncology*), Hui Zhang

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.

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 Smita Krishnaswamy
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 675a, Graduate Student Seminar: Critical Analysis and Presentation of Scientific Literature Mandar Muzumdar
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 900a / CBIO 900a / MCDB 900a, Research Skills and Ethics I Shirin Bahmanyar
This course consists of a weekly seminar that covers ethics, writing, and research methods in cellular and molecular biology as well as student presentations ("rotation talks") of work completed in the first and second laboratory rotations.

GENE 901b / CBIO 901b / MCDB 901b, Research Skills and Ethics II Joerg Bewersdorf
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 Shirin Bahmanyar
First laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

GENE 912a / CBIO 912a / MCDB 912a, Second Laboratory Rotation Shirin Bahmanyar
Second laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

GENE 913b / CBIO 913b / MCDB 913b, Third Laboratory Rotation Shirin Bahmanyar

Third laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

Germanic Languages and Literatures

Humanities Quadrangle, 203.432.0788
http://german.yale.edu
M.A., M.Phil., Ph.D.

Chair
Kirk Wetters

Directors of Graduate Studies
Fatima Naqvi [F]
Rüdiger Campe [Sp]

Professors Rüdiger Campe, Fatima Naqvi, Paul North, Brigitte Peucker (*Emerita*), Kirk Wetters

Assistant Professor Katrin Truestedt

Affiliated faculty Jeffrey Alexander (*Sociology*), Jennifer Allen (*History*), Thomas Connolly (*French*), Paul Franks (*Philosophy*), Gundula Kreuzer (*Music*), Steven Smith (*Political Science*), David Sorkin (*History*), Nicola Suthor (*History of Art*), Katie Trumpener (*Comparative Literature; English*)

FIELDS OF STUDY

German literature and culture from the Middle Ages to the twenty-first century in Germany, Austria, and Switzerland; literary and cultural theory; literature and philosophy; literature and science; media history and theory; visuality and German cinema.

REQUIREMENTS FOR THE PH.D. DEGREE

The faculty in German considers teaching to be essential to the professional preparation of graduate students. Four terms of teaching are required, 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. (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 eight graduate term courses and the demonstration of reading knowledge of another foreign language chosen in consultation with the DGS.

Further information is available upon request to the Registrar, Department of Germanic Languages and Literatures, Yale University, PO Box 208210, New Haven CT 06520-8210; email, german@yale.edu.

COURSES

GMAN 501b, Methods of Teaching German as a World Language Theresa Schenker
This course introduces a variety of language teaching principles and methods and discusses best practices in language teaching. Students get to know the most important second-language acquisition theories as background to our discussions on effective language teaching. We combine the principles of language teaching with observed classroom techniques as we discuss and prepare lesson plans for language-learning classrooms.

GMAN 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 Ethic*s. 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 607a, Goethe's *Faust* Kirk Wetters and Jan Hagens
Goethe's *Faust,* with special attention to *Faust II* and to the genesis of *Faust* in its various versions throughout Goethe's lifetime; emphasis on the work in context of Goethe's time and in the later reception and criticism.

GMAN 643a / CPLT 656a, Georg Büchner's Revolutions Rudiger Campe
Georg Büchner's (1813–1837) work is a work across times and places. In *Danton's Death* he reenacts the French Revolution, in the pamphlet *Hessian Messenger* he calls for revolution in German lands. Büchner's other, simultaneous, revolution is one of language and literature. In the narrative *Lenz* and the theater play *Woyzeck,* Büchner turns the Romanticism of his own time upside down, and the two works resurface only ca. 1900 as trailblazers of social naturalism and modernist (postdramatic) theater. Celan, in *The Meridian,* gives an idiosyncratic account of Büchner's travel across times and places. This course contextualizes the close reading of Büchner's work with materials from the French Revolution, early socialists, and Marx; French, German, and British Romanticism; prose and theater ca. 1900 when Büchner is rediscovered; and Celan.

GMAN 650a / CPLT 524a, Critique and Crisis Kirk Wetters
In our time, when everyone is suspected of being hypercritical, it is not surprising that the limits of critique, its function, and institutional location are called to question. The idea of "post-critique" has been much discussed in recent years. This course develops critical models, primarily from the German tradition, in order to show the great variety of options available beyond the "hermeneutics of suspicion." Topics include post-critique, the history of critique/criticism, the Romantic concept of critique, traditional vs. critical theory, historicism, philology vs. hermeneutics, science (Wissenschaft) vs.

the critique of positivism. Main protagonists include Kant, Schiller, Schlegel, Nietzsche, Dilthey, Max Weber, Lukács, Husserl, Benjamin, Adorno, Koselleck, Szondi, Gadamer, Gumbrecht, Latour, Felski.

GMAN 657b / CPLT 790b, Writing Scenes: Toward a Theory of the Literary Act Rudiger Campe
For a long time, thinking about producing literature has been dominated by the legalism of authorship. The notion of the "writing scene" allows us to rethink the production of literature in broader ways: technologies of writing, the writing body, systems of writing, etc. This course looks at investigations into the act of writing by Benjamin, Blanchot, Foucault, Barthes, Flusser, Latour; theories of cultural production by Cassirer, Jameson, Goody, Kittler, Bolter, Rheinberger; and vignettes of writing scenes in Quintilian, Christine de Pisan, Dante, Descartes, Goethe, Blake, Hegel, Flaubert, F. Douglass, V. Woolf, Kafka, Proust, Cixous.

GMAN 687b / CPLT 522b, Heimito von Doderer's *The Strudlhof Steps* Kirk Wetters
Spanning the fin-de-siècle to the postwar, high modernism and popular fiction, Heimito von Doderer's classic 1951 novel of the city of Vienna was published in English only recently, in 2021. Unclassifiable in its combination of romanticism, realism, and modernism, *The Strudlhof Steps* has won over many generations of readers, critics, scholars, and other novelists (including recently Daniel Kehlmann, for whom Doderer's novel is "the best German language novel of the 20th century"). This course undertakes a slow reading of Doderer's 900-page bestseller, with attention to many relevant contexts, including: the theory and history of the novel, modernism in art and architecture, the complex genesis of *The Strudlhof Steps,* selections of Doderer's other writings, the historical context (especially the interwar period, the rise of fascism, and the question of Habsburg nostalgia). Strongly recommended to avid readers of fiction. Knowledge of German is helpful.

GMAN 689b / CPLT 624b, Alienation, Reconciliation: From Hegel to the Ecological Rift Rudiger Campe
Alienation has been explored in social, economic, or environmental respects, and thinkers differ widely according to how, where, and when to identify the other of alienation, a non-alienated way of life or reconciliation. This course discusses alienation and reconciliation along these lines in Rousseau, Hegel, Marx; Simmel, Lukács, Sartre; Lefebvre, J.B. Foster, J.W. Moore; and others.

GMAN 715a, Trajectories in Contemporary German Literature Staff
This course introduces students to the fast-shifting terrain and political stakes of contemporary German literature. The program is updated every year. Topics may include: new realisms versus alternative history writing and post-apocalyptic fiction; Black German Afrofuturisms; multilingual transmigrant literatures; #ClimateClassQueerness and other digital media writing; theater as the new public sphere; political poetry now. We also discuss authors' published poetologies, such as literary award acceptance speeches. Seminar includes opportunities to draft a journal article, learn to write about literature beyond academia, and/or practice creative writing. Conducted in German.

GMAN 730a / CPLT 716a / FILM 729a, German New Waves in Cold War Europe
Katie Trumpener
Before 1961, Berlin was the best place in Europe to follow both Eastern and Western Europe's emerging cinematic New Waves. And first in East, then in West Germany, young filmmakers developed distinctive approaches to political and documentary filmmaking, to the Nazi past and the Cold War, to class, gender, and social transformation. This course juxtaposes the two German New Waves, focusing on aesthetic ferment, institutional barriers, and transformation. Features, documentaries, and experimental films by Gerhard Klein, Konrad Wolf, Alexander Kluge, Herbert Vesely, Edgar Reitz, Jean-Marie Straub and Danièle Huillet, Jürgen Böttcher, Heiner Carow, Frank Beyer, Wim Wenders, Rainer Werner Fassbinder, Helke Sander, Helke Misselwitz, read against other Eastern and Western New Wave films (i.e., by Lindsay Anderson, Karel Reisz, Andrzej Munk, Alain Resnais, Mikhail Kalatozov, Milos Forman).

GMAN 777b / CPLT 777b / ENGL 777b, Poems and Their Theories Paul North
A task lies before us: to go back and understand the importance that critical theory, in its inception and throughout its life, gave to poems. Poems and theories shared ideals from the turn of the nineteenth century to at least the end of the twentieth, at a minimum in German, French, and English. They dreamed of taking a vacation from language, of returning to the sensible, of imagining communities, of revising the model of *Bildung* and culture, of rethinking history, of critiquing the nation-state and capitalism, among other dreams. Why this shared project between poetry and theory? What did theory find in the resources of literature, the genius idea, the past, and other foreignnesses that seemed so vital to critiquing the perceived present? Readings include Hölderlin, Schlegel, Novalis, Wordsworth, Shelley, Baudelaire, Celan, Benjamin, Heidegger, Arendt, de Man, Lacoue-Labarthe, Sedgwick, Kristeva, Jacobs.

GMAN 900a or b, Directed Reading Staff
By arrangement with the faculty.

Global Affairs

Jackson Institute for Global Affairs
Horchow Hall, 203.432.3418
http://jackson.yale.edu/study
M.A.S., M.A.

Director
James Levinsohn (*Global Affairs; School of Management*)

Directors of Graduate Studies
Marnix Amand
James Levinsohn

Director of Student Affairs
Lily Sutton (lily.sutton@yale.edu)

Professors David Engerman (*History; Global Affairs*), Pinelopi Goldberg (*Economics*), Robert Hecht (*School of Medicine*), Paul Kennedy (*History; Global Affairs*), James Levinsohn (*School of Management; Global Affairs*), Samuel Moyn (*Law*), Catherine Panter-Brick (*Anthropology; Global Affairs*), Frances Rosenbluth (*Political Science; Global Affairs*), Kenneth Scheve (*Political Science; Global Affairs*), Ian Shapiro (*Political Science; Global Affairs*), Timothy Snyder (*History*), Aleh Tsyvinski (*Economics; Global Affairs*), Arne Westad (*History; Global Affairs*), Steven Wilkinson (*Political Science*), Ernesto Zedillo (*International Economics & Politics*)

Associate Professors Alexandre Debs (*Political Science*), Marci Shore (*History*), Jonathan Wyrtzen (*Sociology; International Affairs*)

Senior Lecturers Marnix Amand, Sigga Benediktsdottir, Asha Rangappa, Justin Thomas

Lecturers Cara Fallon (*Global Health*), William (Casey) King, Nicholas Lotito (*Political Science*), Nathaniel Raymond, Edward Wittenstein

Senior Fellows Susan Biniaz, Eric Braverman, Staffan de Mistura, Howard Dean, Janine di Giovanni, Obiageli (Oby) Ezekwesili, Robert Ford, Chris Fussell, Clare Lockhart, Stanley McChrystal, Blair Miller, David Rank, Stephen Roach, Paul Simons, Emma Sky, Rory Stewart, Shoshana Stewart, Harry Thomas, Bisa Williams

The Jackson Institute for Global Affairs offers degree programs and nurtures scholarship with a strong interdisciplinary and policy-oriented international focus. The programmatic interests of the institute focus on development; ethics, leadership, and political life; empirical and research methods; global economics; global security; human rights; democracy; transparency and governance; and IGOs and international cooperation and diplomacy.

The Jackson Institute for Global Affairs administers the two-year Master of Arts (M.A.) and the one-year Master of Advanced Study (M.A.S.) degrees in Global Affairs. The seventy to eighty students in the M.A. program combine fundamental training in core disciplines in Global Affairs with an individualized curriculum that has relevance to current international issues. Students in the M.A.S. program select courses based on their individual academic and professional goals. In addition to courses in the Global

Affairs program, students take courses throughout the Yale Graduate School of Arts and Sciences and Yale's professional schools.

Students matriculating before fall 2021 are eligible to receive the M.A. (Master of Arts) degree from the Graduate School of Arts and Sciences. Students matriculating in fall 2021 will be eligible to receive either the M.A. degree from the Graduate School of Arts and Sciences or, if they transfer completed course work, the M.P.P. (Master in Public Policy) degree from the Jackson School of Global Affairs, opening in fall 2022. Students matriculating in fall 2022 or later will be eligible to receive the M.P.P. degree from the Jackson School of Global Affairs.

FIELDS OF STUDY

The programs are designed to combine breadth of knowledge of the basic disciplines of global affairs with depth of specialization in a particular academic discipline, geographic area, specialized functional issue, and/or professional field. The M.A. program is designed primarily for students seeking an advanced degree before beginning a career in global affairs; joint degrees are offered with the School of the Environment, the Law School, the School of Management, and the School of Public Health. The M.A.S. program is aimed at mid-career professionals with extensive experience in a field of global affairs such as, but not limited to, international security, diplomacy, and development.

SPECIAL REQUIREMENTS FOR THE M.A. DEGREE

The M.A. in Global Affairs requires two years of graduate study at Yale. To complete the degree, students must pass sixteen courses, including the core requirements, demonstrate proficiency in a modern language, complete a summer internship or project, and maintain the grade average specified below.

Core Students take GLBL 801, GLBL 802, and GLBL 803 during the first year of enrollment. Any exceptions are to be made at the discretion of the director of graduate studies (DGS).

Language requirement The equivalent of four terms of language study at Yale is required to graduate. This competence must be demonstrated through successful completion of a Yale L4 class or by testing into a Yale L5 class. International students who completed secondary school or a university degree in a language other than English will be considered to have met the language requirement. Students may study language as part of their Yale program. Any exceptions are to be made at the discretion of the DGS.

Summer internship requirement All students enrolled in the Global Affairs M.A. program are required to use the summer between the first and second years of the program to further their professional or academic education. It is expected that this requirement be fulfilled by obtaining experience through full-time employment or a full-time internship. The requirement may, with special permission, also be fulfilled by completing independent research or language study.

Each first-year student must file a form with the director of the career development office before June 1 stating the nature of the student's summer internship or alternative for committee approval and submit a self-evaluation form by September 14.

Expectation of academic performance M.A. candidates are required to achieve at least two grades of Honors, while maintaining a High Pass average. To remain in good academic standing at the end of the first year, M.A. students are expected to complete half of the course work required for the degree, with at least a High Pass average and one grade of Honors. Students who do not have at least a High Pass average or the required number of courses at the end of the first year will not be allowed to continue in the program.

SPECIAL REQUIREMENTS FOR THE M.A.S. DEGREE

The M.A.S. in Global Affairs requires one year of graduate study at Yale. To complete the degree, students must pass eight courses in one year of full-time study. Courses are chosen in consultation with the DGS at the start of each term. The program of study is customized to a student's individual academic and professional goals.

SPECIAL REQUIREMENTS FOR THE JOINT-DEGREE MASTER'S PROGRAMS

Joint-degree candidates must fulfill all of the requirements of both programs in which they are enrolled before receiving either degree. Joint-degree students must take at least twelve graduate-level courses toward the Global Affairs program requirements from Arts and Sciences departments or from professional schools other than the one granting the joint degree toward the Global Affairs program requirements. Three of these will be GLBL 801, GLBL 802, and GLBL 803, though the DGS may waive a portion of the core for a joint-degree candidate. Two of the twelve courses may be language courses. Under exceptional circumstances, however, the program may substitute one or more courses taken in the first year of study at the professional school granting the joint degree to count toward the twelve required courses.

Applicants to the joint-degree programs must apply separately, by the appropriate deadline, to the Graduate School for the Global Affairs M.A. program and to the professional school involved. Decisions on admissions and fellowship support are made independently by each school. Students are encouraged to apply to both programs simultaneously. They may also apply during their first year at Yale to the second program for a joint degree. If accepted into the new program, they must receive approval for credit allocation upon registration from both degree programs.

For more information, visit http://jackson.yale.edu/study, email jackson.institute@yale.edu, or call 203.432.3418.

COURSES

GLBL 505a, Environmental Security in the Middle East Staff
This course examines how environmental, water, food, energy, and climate change have increasingly become linked to human and national security in the Middle East. It begins by exploring the state of the environment in the region and how the policies of the Middle East governments have led to serious environmental degradation and subsequent loss of jobs, migration, social tension, violence, and regional conflicts. Drawing on an in-depth analysis of contemporary case/country studies, students learn how these problems can serve as major human and national security threats. This interdisciplinary course is of interest to students with background/interest in environmental science/engineering, ecology, geography, geosciences, social/political

sciences, public policy, security and peace building, international relations, diplomacy, and global affairs.

GLBL 509a / PLSC 509a, Philosophy of Science for the Study of Politics Ian Shapiro
An examination of the philosophy of science from the perspective of the study of politics. Particular attention to the ways in which assumptions about science influence models of political behavior, the methods adopted to study that behavior, and the relations between science and democracy. Readings include works by both classic and contemporary authors.

GLBL 529a / WGSS 529a, Sexuality, Gender, Health, and Human Rights Ali Miller
This course explores the application of human rights perspectives and practices to issues in regard to sexuality and health. Through reading, interactive discussion, paper presentation, and occasional outside speakers, students learn the tools and implications of applying rights and law to a range of sexuality and health-related topics. The overall goal is twofold: to engage students in the world of global sexual health and rights policy making as a field of social justice and public health action; and to introduce them to conceptual tools that can inform advocacy and policy formation and evaluation. Class participation, short reaction papers, and a final paper are required.

GLBL 550a, Introduction to Python for Global Affairs William King
In the second decade of the twenty-first century, "big data" analytics and techniques have fundamentally transformed policy decisions both in the United States and throughout the globe. NGOs, NPOs, political campaigns, think tanks, and government agencies more and more recruit policy analysts with the necessary skills to embrace novel, data-driven approaches to policy creation and evaluation. This course is designed to help students meet this growing demand. It is an introductory course in Python programming and data analysis for policy students with no prior coding experience. Unlike massive introductory classes, this course is deliberately small, designed to provide the necessary support for humanists to make a smooth and nurturing transition to "tech humanists." Ultimately, students should be comfortable using what they've learned in further Yale courses in programming and statistics, or in research and policy after leaving Yale. They should know enough to productively collaborate on projects with engineers, understand the potential of such work, have sufficient background to expand their skills with more advanced classes, and perform rudimentary data analyses and make policy recommendations based on these analyses.

GLBL 552b, Asia Now: Human Rights, Globalization, Cultural Conflicts Jing Tsu
This course examines contemporary and global issues in Asia (east, southeast, northeast, south), in a historical and interdisciplinary context that includes international law, policy debates, cultural issues, security, military history, media, science and technology, and cyber warfare.

GLBL 570a, Negotiating International Agreements: The Case of Climate Change Susan Biniaz
This class is a practical introduction to the negotiation of international agreements, with a focus on climate change. Through the climate lens, students explore cross-cutting features of international agreements, the process of international negotiations, the development of national positions, advocacy of national positions internationally, and the many ways in which differences among negotiating countries are resolved. The seminar also examines the history and substance of the climate change regime,

including, *inter alia,* the 1992 UN Framework Convention on Climate Change, the 1997 Kyoto Protocol, the 2009 Copenhagen Accord, the 2015 Paris Agreement, and recent developments. There will be two mock negotiations.

GLBL 574a, International Human Rights Samuel Moyn
This course surveys a selection of topics in contemporary human rights law, with attention to broader principles and problems in international law, as well as to cognate fields like international criminal and international humanitarian law. A consistent focus is how the United States relates to the international human rights system—and how, conversely, that system impinges on diverse areas of American law and policy. The course also takes up the ways in which both the international system and the rights jurisprudence of other countries might differ from approaches in American law, as for example in socioeconomic rights adjudication or the regulation of religious practice. Self-scheduled examination. Follows Law School calendar.

GLBL 580a, Russian Intelligence, Information Warfare, and Social Media Asha Rangappa
This course explores the evolution of information warfare as a national security threat to the United States and democratic countries around the world. Beginning with the KGB's use of "active measures" during the Cold War, the course looks at how propaganda and disinformation campaigns became central to the Putin regime and how social media has facilitated their expansion. We examine the psychology of disinformation and how media "bubbles" and existing social fissures in the United States, such as racism and political polarization, provide ripe vulnerabilities for exploitation by foreign actors. Using Russia's efforts in U.S. presidential elections and during COVID as examples of this new form of warfare, students explore potential policy solutions in the realm of Internet regulation, civic education, media literacy, and human "social capital" as defenses against this growing threat. Guest speakers with expertise in Russian intelligence, information warfare, psychology, and other disciplines complement the discussion.

GLBL 586b, International Law Oona Hathaway
This course will offer an introduction to international law. Students will learn the basic minimum that every lawyer should know about the international dimensions of law in the modern world. The course is also meant to serve as a gateway to the rest of the international law curriculum: It will offer a foundation on which students who are interested in further study of the particular topics covered in the class can later build. The course will cover both the public and private dimensions of international law, offering an introduction to varied topics including international trade, international tax, international business transactions, environmental law, criminal law, human rights law, and the law of armed conflict. The course will also offer an introduction to domestic law topics that intersect with international law, including foreign relations and national security law. As each new topic is introduced, the class will not only examine that new topic in detail, but will also explore how it relates to what the class has already discussed. By considering together topics usually taught separately, students will begin to see how different subjects under the broad umbrella of international law are interconnected. And by learning about a variety of issue areas and making direct comparisons across them, students will gain an understanding of each topic that can be had only by viewing it in a comparative perspective.

GLBL 588a, Public Order of the World Community: A Contemporary International Law W. Michael Reisman
This introduction to contemporary international law studies the role of authority in the decision-making processes of the world community, at the constitutive level where international law is made and applied and where the indispensable institutions for making decisions are established and maintained, as well as in the various sectors of the public order that is established. Consideration is given to formal as well as operational prescriptions and practice with regard to the participants in this system (states, intergovernmental and nongovernmental organizations, political parties, pressure groups, multinational enterprises, other private associations, private armies and gangs, and individuals); the formal and informal arenas of interaction; the allocation of control over and regulation of the resources of the planet; the protection of people and the regulation of nationality; and the allocation among states of jurisdiction to make and apply law. In contrast to more traditional approaches, which try to ignore the role of power in this system, that role will be candidly acknowledged, and the problems and opportunities it presents will be explored. Special attention is given to (1) theory; (2) the establishment, transformation, and termination of actors; (3) control of access to and regulation of resources, including environmental prescriptions; (4) nationality and human rights; and (5) the regulation of armed conflict. Scheduled examination or paper option. *Also LAW 20040*.

GLBL 591b, The Law of the Sea W. Michael Reisman
This seminar considers intensively some current problems concerning combating piracy; protection of the marine environment and conservation; maritime boundary delimitation; procedures for determining the boundaries of outer continental shelves; the Seabed Authority; rights and obligations of states not party to the U.N. Convention on the Law of the Sea; the Arctic and the controversy on whaling. There will also be a workshop on using ArcGIS. Follows Law School academic calendar.

GLBL 592a, Intelligence, Espionage, and American Foreign Policy Ted Wittenstein
The discipline, theory, and practice of intelligence; the relationship of intelligence to American foreign policy and national security decision-making. Study of the tools available to analyze international affairs and to communicate that analysis to senior policy makers. Case studies of intelligence successes and failures from World War II to the present.

GLBL 603a, Political Economy of Terrorism Nicholas Lotito
This course takes a political economy approach to the interaction of two central global challenges: terrorism and development. It interrogates two central questions: Are political and economic underdevelopment a "root cause" of terrorism? And under what conditions does terrorism cause or further underdevelopment? The course considers whether international development policy can improve security outcomes, and vice versa. Topics include foreign aid, democracy promotion, failed states, and civil war. Paper required.

GLBL 616a, China's Rise and the Future of Foreign Policy David Rank
China's return to its traditional role as a regional—and, increasingly, global—power has implications for the political, security, and economic structures that have been the foundation of the international system since the end of the Second World War. This course looks at the impact China's ascent has had, the challenges a rising China will pose for policy makers in the years ahead, and the internal issues China will need to

address in the years ahead. It does so from the perspective of a practitioner who spent nearly three decades working on U.S. foreign policy and U.S.-China relations.

GLBL 620a, Global Crises Response Harry Thomas
With a special emphasis on the United States, this course explores how the international community responds to humanitarian crises and military interventions. We examine the roles and responsibilities of members of the diplomatic corps, senior military officials, nongovernmental organizations, and international financial organizations in order to understand the skill sets required for these organizations to be effective. Through readings, discussions, role-play, writing exercises, and other tools, we learn how organizations succeed and sometimes fail in assisting individuals and nations in peril. We examine emerging regional hot spots, with an emphasis on sub-Saharan Africa, Eastern Europe, the Middle East, and Southeast Asia. We explore the challenges facing the governments, civil society organizations, and businesses in the aftermath of crises and the impact on citizens. We review the effectiveness of regional organizations like the Association of Southeast Asian Nations (ASEAN), the Organisation of Islamic Cooperation (OIC), and the African Union (AU) in assisting governments rebuild and stabilize their societies. We have several role-playing simulations during which students play the role of an individual or organization responsible for briefing counterparts on key events.

GLBL 624b, Contemporary China Research Seminar Paul Gewirtz, Jamie Horsley, Robert Williams, and Susan Thornton
Research and writing on contemporary problems related to China, including but not limited to legal issues. The class meets roughly six times during the term to discuss particular China-related issues (occasionally with a guest) and at the end of the term for student presentations of their research. The remainder of the term, students work on their research and writing projects and individually meet with the instructors to discuss their work. Paper required. Enrollment limited to fifteen. Permission of the instructors required. *Also LAW 21179.* Prerequisite (non-Law students): in addition to listing this course among permission-of-instructor selections, students should submit a statement of interest explaining their background related to China and research ideas they are considering no later than 4:30 p.m. on October 29, 2019. Decisions on admission to the class will be made primarily on the basis of the statements.

GLBL 634a, The Skill of Seeing Others: How to Understand Other People and Make Them Feel Seen and Understood David Brooks
There is one skill at the center of every healthy family, organization, social movement, and nation: the ability to see where other people are coming from and understand their diverse points of view. And yet we live in an age in which many people feel unseen and misunderstood: people on right and left looking at each other in blinking incomprehension, people of different races feeling that others have no clue about the realities of their daily existence, lonely people in families and neighborhoods feeling no one knows them well. So what is this skill? We look across disciplines at people who have mastered pieces of this skill: psychologists, biographers, historians, novelists, anthropologists, social change agents, and so on. We not only study this skill but also seek to practice it.

GLBL 637b, Reopening and Reimagining Africa Harry Thomas
It is time to "reopen and reimagine Africa." This course requires students to research and redesign policies that will help African nations emerge economically stronger and

with a population that is better educated and healthier by 2050. Similarly, students examine, analyze, and support and/or criticize the long-term policies of African nations. This requires students to engage with up-and-coming African scholars, businesspersons, educators, and policy makers to ensure that the recommendations are not conceived in a vacuum. This course also has to examine the obstacles and challenges of great-power competition among the United States, PRC, Russia, and the EU on Africa when designing alternative or status quo policies.

GLBL 641a, The Challenge of Politics Roderick Stewart
This course examines the recent failures of Western governments, the populist response, and the possible solutions. It considers these issues through five main areas of government policy—the environment, defense, criminal justice, rural policy, and international development—from the perspective of a civil servant, a legislator, and a cabinet minister. It explores the impossible burden of public expectations and the temptation to respond with either political fantasies or technocratic arguments. It describes the struggle to make citizens engage in politics, and how social media can function as a tool both for the extremes and for the radical center. Among other issues, it explores how lobbying muffles environmental policies, how jargon allows violence to flourish in prisons, and what such pressures mean for international development. Students consider the role of classical virtue in modern politics. And ultimately the course examines how all these factors shape the question of what we wish our societies to be.

GLBL 646a, Four Conflicts through a Human Rights Lens Janine di Giovanni
This course focuses on four conflicts of the 1990s—Bosnia, Sierra Leone, Rwanda, and Kosovo—specifically through the lens of human rights, which are all linked by a common theme: humanitarian intervention. In some cases, it went horribly wrong, Rwanda and Bosnia being prime examples. In other cases—Sierra Leone—the wars were able to end. The 1990s was the era of supposed "humanitarian intervention" and "just" wars, when doctrines such as "The Blair Doctrine" presided and were used to save civilian lives. Can we learn from what happened in that decade given the horror of Syria, Yemen, Afghanistan, and Iraq today? The course uses a mix of video footage from the wars from reputable journalists as well as testimonies, texts, and articles from the time. Students also examine the 1990s conflicts under the Right to Protect doctrine of Kofi Annan and compare how humanitarian intervention was used then—as opposed to now, in the case of the Syrian war. An important dimension of the course is lessons learned. The Blair Doctrine is examined. There are several guest speakers throughout the term who were directly involved in these conflicts.

GLBL 678a / PLSC 678a, Japan and the World Frances McCall Rosenbluth
The historical development of Japan's international relations since the late Tokugawa period; World War II and its legacy; domestic institutions and foreign policy; implications for the United States; and interactions between nationalism and regionalism.

GLBL 687a, Correcting Monopolistic Democracies: Fixing Africa's Politics Staff
Learn why democracy as a principle and practice is analytically assessed by a strong percentage of African people as failing them economically, socially, and politically. According to a 2018 survey by Afrobarometer that also measures the "Supply of Democracy," only 34 percent of Africans polled evaluated their countries to be both a democracy and one with which they are satisfied. This course is relevant to students

with an interest in development issues, especially the intersection between politics, citizenship, governance, economic policies, institutions, and investment. Students gain a deep knowledge of the findings from recent research into the quality of politics in Africa—especially Nigeria—and the role institutions, culture, incentives, poverty, and middle-class apathy plays in stagnating the continent's democratic objectives. The course reveals that for countries to improve governance and economic performance, they must address the factors that distort their political culture, systems, and outcomes. The course explains the construct of Triangular Pillars of Democracy, which is built from the findings of the #FixPolitics research. The triangulated pillars are modeled after the economic definition of types of markets to evaluate the roles and influence of the electorate, political class, and constitutional/political framework/regulators. The analysis of the demand side, supply side, and regulatory roles of citizens, politicians, and institutions in the Nigerian political system remarkably provides deep insight into why many African countries are trapped in the practice of "monopolistic democracy." As democracy struggles across the globe to satisfy the needs of citizens and regain their trust and legitimacy, this course provides students with perhaps a realistic and practical set of solutions that can correct distorted and skewed political systems. As the #FixPolitics research revealed, it will take the activities of the demand side of the triangular pillars to raise the political influence of the electorate in any system and center them in governance as originally intended by democracy.

GLBL 692a, The Politics of American Foreign Policy Howard Dean
This seminar addresses the domestic political considerations that have affected American foreign policy in the post-World War II world. The goals are to give historical context to the formation of major existing global governance structures, give students an opportunity to research how major foreign policy decisions in the past were influenced by contemporary political pressure, and assess what effect those pressures have had on today's global issues. Case studies include but are not limited to Truman and the Marshall Plan; Johnson and the Vietnam War; Nixon and the opening of China; Reagan and the collapse of the Soviet Union; George H.W. Bush and Iraq; Clinton and the Balkans; and Obama and the development of a multipolar foreign policy for a multipolar world. Students assume the role of decision-makers under political pressure and are asked to generate a point of view regarding past, present, and future foreign policy decisions.

GLBL 713a, Middle East Politics Emma Sky
Exploration of the international politics of the Middle East through a framework of analysis that is partly historical and partly thematic. How the international system, as well as social structures and political economy, shape state behavior. Consideration of Arab nationalism; Islamism; the impact of oil; Cold War politics; conflicts; liberalization; the Arab-spring, and the rise of the Islamic State.

GLBL 716b, Political Epidemiology Gregg Gonsalves
Political epidemiology is the study of the impact of welfare regimes, political institutions, and specific policies on health and health equity. This course emphasizes the last among these—the effects of specific policies—on health outcomes in infectious diseases and other areas of human health and development. The course takes an issues- and methods-based approach, looking at how to evaluate the effects of political determinants of health (e.g., immigration, education, fiscal and environmental policies) through experimental and quasi-experimental methods, as well as various

techniques associated with policy modeling (e.g., Markov models, systems dynamics, microsimulation, spatial models). Prerequisite: EPH 505 or a similar introductory course in statistics. STAT 541, MATH 241, or a similar introductory course in probability is recommended but not required, and a review of probability is offered in the first discussion section.

GLBL 719a, Turning Points in Peace-Building Bisa Williams
This course examines the myriad challenges that must be addressed when the fighting has stopped. Once a peace agreement is signed, the real deal-making begins. Former rebels negotiate with their military commanders about relinquishing arms and working for a living; communities look for "peace dividends"; refugees weigh options to return home; governments try to assert authority despite their new role or how weakened they have become; and compatriots who opposed the peace settlement relentlessly try to undermine it. The international community, which often leads the warring parties to the table, takes on a new role as well, informing and sometimes deforming outcomes. Led by a veteran U.S. diplomat, this course considers peace-building processes from the perspectives of formerly warring parties, diplomats, NGOs, civil society, and the media, providing students an opportunity to develop strategies for building durable peace following conflict.

GLBL 721a, Resolving Africa's Economic Philosophy Dilemma: Pathway to Inclusive Economic Growth and Prosperity Staff
What is the clear economic philosophy of countries in Africa, and could it be that the absence of one is the biggest constraint to achieving economic diversification and sustained growth that will lift citizens out of poverty? Strong factual and empirical evidence abounds on the superior performance of countries that embraced the market economy system and produced higher levels of growth and that have lifted more people than Africa's one billion population out of poverty. However, the suspicion of "western economic models" explains why many countries on the continent are tentative or half-hearted, or outright reject capitalism as an efficient philosophy to allocate scarce resources. Political and policy leaders in Africa often look to China and India as worthy models of "owned economic vision" but often miss the role that market economy philosophy has played in the trajectory of their performance from about the end of the twentieth century to the present. Students who are interested in public policy and in private sector and international development gain insight on how ideological vestiges that followed from the effects of the colonial and Cold War eras infected the political economy of Africa and convinced most of Africa's public leadership to be wary of capitalist philosophy and principles on which economic policies are framed, adopted, and executed across Africa. Students analytically engage the structure of the GDP of the entire continent and a few sample countries, as well as the composition and quality of growth from key economic indicators, and simulate possibilities in a market economy model. The exercise is designed to help the class appreciate the role that evidence-informed policy making may hold as the key to positioning a more inclusive type of capitalism that addresses inequalities in Africa.

GLBL 727a, Development in Crisis David Engerman and Roderick Stewart
Development assistance has been in a perennial state of crisis since its founding in the aftermath of World War II. This course is taught by a historian of international development and by a practitioner who has run development programs in the field and managed a large development agency. The course engages both with economic theories

and with practical case studies of development in action. It examines the different justifications given for development over the past seventy years and the impact of domestic politics on development programs. The course seeks to understand both the forces that have shaped the past and present of development and those that will shape its future.

GLBL 730a, Managing the Clean Energy Transition: Contemporary Energy and Climate Change Policy Making Paul Simons
This seminar explores the principal challenges facing key global economies in managing their respective transitions to a clean energy future and the goals of the Paris agreement, while simultaneously meeting their energy security needs and keeping their economies competitive. By the end of the course, students should be familiar with key features of the global energy and climate change architecture, principal challenges facing policy makers around the world in balancing energy and climate goals, and prospects for the development of key fuels and technologies as we advance toward a net zero emissions world. After a solid grounding in energy and climate scenarios, the course explores the role of renewables, energy efficiency, and clean energy technologies in the energy transition; corporate and financial sector climate initiatives; economic tools including carbon pricing; and the shifting roles of fossil fuels in the clean energy transition. Throughout the course, students also track preparations for the historic COP26 meeting in Glasgow to be held in late 2021. The final session of the course brings all class topics together through a student role play of the 2022 G20 ministerial meeting on energy and climate change, with class members presenting and debating country and regional plans to accelerate the clean energy transition.

GLBL 756a / PLSC 756a, The European Union David Cameron
Origins and development of the European Community and Union over the past fifty years; ways in which the often conflicting ambitions of its member states have shaped the EU; relations between member states and the EU's supranational institutions and politics; and economic, political, and geopolitical challenges.

GLBL 781a, Banking Crises and Financial Stability Sigridur Benediktsdottir
This course focuses on systemic risk, banking crises, financial stability and macroprudential policies. An emphasis will be on systemic risk and prudential policies in peripheral economies. Peripheral economies is defined here as peripheral European economies and emerging economies. Prerequisites: ECON 115 and 116, or equivalent.

GLBL 789a and GLBL 790b, Leadership Stanley McChrystal
This yearlong course (with GLBL 790) examines the practical execution of leadership in today's environment. Using a combination of historical case studies and recent events, we review how dramatic changes in technology, society, politics, media, and globalization have increased the complexity of the tasks facing modern leaders. Although the course includes the military aspects of leadership, the overall objective is to study leadership in a wider context, identifying the common factors shared by politics, business, education, warfare, and other fields. Specific topics include the changing leadership environment; the role of the leader; driving change; making difficult decisions; dealing with risk; coping with failure; navigating politics; and the effect of modern media. For course dates and application, see http://jackson.yale.edu/apply/glbl-790.
½ Course cr per term

GLBL 792a, Ethical Choices in Public Leadership Eric Braverman
All public leaders must make choices that challenge their code of ethics. Sometimes, a chance of life or death is literally at stake: how and when should a leader decide to let some people die, or explicitly ask people to die to give others a chance to live? At other times, while life or death may not be at stake, a leader must still decide difficult issues: when to partner with unsavory characters, when to admit failure, when to release information or make choices transparent. The pandemic today makes clearer than ever the consequences of decisions in one community that can affect the entire world. This interdisciplinary seminar draws on perspectives from law, management, and public policy in exploring how leaders develop their principles, respond when their principles fail or conflict, and make real-world choices when, in fact, there are no good choices. Permission of the instructor required; application at https://jackson.yale.edu/apply/glbl-792/. Attendance at first session is mandatory.

GLBL 793a / HIST 790a, Relations of the Great Powers since 1890 Paul Kennedy and Arne Westad
Reading seminar. Among the topics covered are the "New Imperialism," the military and naval arms race prior to 1914, the relationship between domestic politics and foreign affairs, the First World War and the alteration of the Great Power order, the "new diplomacy," appeasement, the rise of the dictator-states, the origins of the Second World War, military and strategic results of the war, the Cold War, reconfigurations of the 1970s and '80s, the end of the Cold War, post-Cold War relations. There is a heavy emphasis on historiography and an encouragement to relate economic and strategical trends to diplomatic. Open to undergraduate seniors with permission of the instructors.

GLBL 794a / HIST 791a, Ports, Cities, and Empires Paul Kennedy and Jay Gitlin
A study of the relationship between imperialism and urbanism from the early modern period to the twentieth century. Topics include Roman medieval precedents; the uses and meanings of walls; merchant colonies and Latin Quarters; modernist urban planning and the International Style in Africa and the Middle East; comparative metro system in Paris, Algiers, and Montreal; decolonization and imperial nostalgia. Cities to be discussed include Delhi/New Delhi, New Orleans, Dublin, Cape Town, Tel Aviv, Addis Ababa, and many others. Undergraduates require permission of the instructors.

GLBL 799a, Independent Project Staff
By arrangement with Jackson Institute Senior Fellows.

GLBL 801a, Economics: Principles and Applications Jim Levinsohn
This course deals with the application of basic microeconomic analysis to public policy issues. The principal goal is to teach students the process of economic reasoning and how to apply that reasoning to policy issues in the real world. The course covers the basic topics in microeconomic theory: consumer theory, production theory, market models from competition to monopoly, theories of labor and capital markets, and models of externalities and other common market failures. Some calculus will be used without apology along with a great deal of algebra and graphical analysis.

GLBL 802a, Applied Methods of Analysis Justin Thomas
This course is an introduction to statistics and their application in public policy and global affairs research. It consists of two weekly class sessions in addition to a discussion section. The discussion section is used to cover problems encountered in the lectures and written assignments, as well as to develop statistical computing skills.

Throughout the term we cover issues related to data collection (including surveys, sampling, and weighted data), data description (graphical and numerical techniques for summarizing data), probability and probability distributions, confidence intervals, hypothesis testing, measures of association, and regression analysis. The course assumes no prior knowledge of statistics and no mathematical knowledge beyond calculus.

GLBL 838b / ANTH 538b, Culture and Politics in the Contemporary Middle East
Marcia Inhorn

This interdisciplinary seminar is designed to introduce students to some of the most pressing contemporary cultural and political issues shaping life in the Middle East and North Africa. The course aims for broad regional coverage, with particular focus on several important nation-states (e.g., Egypt, Saudi Arabia, Afghanistan, Iran, Iraq) and Western interventions in them. Students should emerge with a keener sense of Middle Eastern regional histories and contemporary social issues, as described by leading scholars in the field of Middle Eastern studies and particularly Middle Eastern anthropology. Following a historical introduction, the course is organized around three core themes—Islam, politics, modernity—with movement from the macropolitical level of Islamic discourse and state politics to the most intimate domains of gender, family life, and contemporary youth culture. Through reading, thinking, talking, and writing about a series of book-length monographs, students gain broad exposure to a number of exigent issues in the Middle Eastern region, as well as to the ethnographic methodologies and critical theories of Middle East anthropologists. Students are graded on seminar participation, leadership of seminar discussions, two review/analysis papers, and a comparative written review of three books. Required for Council on Middle East Studies (CMES) graduate certificate students. Recommended for Middle East concentrators in other disciplines.

GLBL 842a, Introduction to Special Operations Christopher Fussell

For nearly twenty years, the world has seen the role, funding, and employment of U.S. Special Operations Forces (SOF) increase in ways that might seem unrecognizable to previous generations of civilian and military leaders. As the world transitions from two decades of SOF-heavy conflict into Great Power Competition among nation states, an understanding of the SOF community's history, evolution, and future will be critical for those trying to navigate national security questions in the decades to come. This course looks specifically at historic utilization of these forces and at post-9/11 expansion of authorities, funding, and mission-sets; and it considers what their proper role and function may look like moving forward. Students gain a foundational understanding of a relatively small component of the U.S. military with an outsized strategic position on the global stage.

GLBL 849a, Big Data and Global Policies William King

Cell phones, twitter accounts, human genetic sequencing, trade figures, Web content, video surveillance, drone-collected bits and bytes, national security, and investigative sifting have generated a massive and ever-growing torrent of information. The term "big data" has recently been coined to capture this shift in the way we live and think. This course defines big data, investigates big data analytical and visualization methods, and explores implications of big data analyses on a variety of sectors including global policy, human trafficking, national security, global capitalism, and global health and finance.

GLBL 860a and GLBL 861b, Development in Action Shoshana Stewart
This course is an immersion into the "how" of international development, done through a case study of and practicum with Turquoise Mountain, an NGO working to preserve heritage in areas of conflict. This is a yearlong, single credit course, and enrollment in GLBL 860 must be followed by enrollment in GLBL 861. Students complete six classroom sessions in the first part of the year and then a two-week practicum over spring break in Jordan. (Students who cannot spend spring break in Jordan for the course should not enroll). We take an in-depth look at the elements of building and running successful projects, including: How do you build community support? How do you work with refugees and others affected by conflict, or work with government bureaucracies? How do you create a sustainable financial model for programs? The practicum allows students to work on an element of the project, which may include any parts of Turquoise Mountain's work, from economic development, vocational training, primary education, and health, to sustainable tourism, historic building restoration, heritage, and culture. This is an opportunity for students to explore this kind of work for their career planning and to get a sense of the practical realities of development work (whether they want to work in the field, or work alongside development projects in the future). ½ Course cr per term

GLBL 889a, World Fellows Seminar Emma Sky
Enrollment limited to those graduate and professional school students selected as Associate World Fellows. Associates join 16 leaders from across the globe to learn, share, connect, and challenge through their participation in the weekly "Good Society" seminar, the Distinguished Speaker weekly dinner series, and other events throughout the fall term. See http://worldfellows.yale.edu/associate for details. 0.5 GSAS credit. Graded Satisfactory/Unsatisfactory. ½ Course cr

GLBL 905a / PLSC 695a, International Security Alex Debs
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.

GLBL 960a, Economic Analysis of High-Tech Industries Edward Snyder
This course applies industrial organization frameworks from economics to high-tech industries. Students, individually and in teams, use those frameworks to assesses competition among high-tech firms and to develop insights about the market capitalizations of individual firms. A further important objective is to understand how the ecosystem for high-tech industries is affecting business and society.

GLBL 999a, Directed Reading Staff
By arrangement with faculty.

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
Noel Lenski (203.432.1361)

Professors Sunil Amrith, Lauren Benton, Ned Blackhawk, David Blight, Daniel Botsman, Edyta Bowjanowska, Paul Bushkovitch, Deborah Coen, Stephen Davis, Carolyn Dean, Fabian Drixler, Carlos Eire, David Engerman, Paul Freedman, Joanne Freeman, John Gaddis, Beverly Gage, Bruce Gordon, Greg Grandin, Valerie Hansen, Robert Harms, Matthew Jacobson, Paul Kennedy, Benedict Kiernan, Jennifer Klein, Regina Kunzel, Naomi Lamoreaux, Noel Lenski, Kathryn Lofton, Mary Lui, Daniel Magaziner, J.G. Manning, Ivan Marcus, John Merriman, Joanne Meyerowitz, Alan Mikhail, Samuel Moyn, Nicholas Parrillo, Mark Peterson, Stephen Pitti, Naomi Rogers, Paul Sabin, Stuart Schwartz, Timothy Snyder, David Sorkin, John Harley Warner, Arne Westad, John Witt, Taisu Zhang

Associate Professors Jennifer Allen, Paola Bertucci, Rohit De, Marcela Echeverri Muñoz, Anne Eller, Crystal Feimster, Elizabeth Hinton, Andrew Johnston, Isaac Nakhimovsky, Joanna Radin, William Rankin, Edward Rugemer, Marci Shore, Elli Stern, Jonathan Wyrtzen

Assistant Professors Alvita Akiboh, Sergei Antonov, Denise Ho, Benedito Machava, Nana Quarshie, Carolyn Roberts, Hannah Shepherd

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. Students who plan to apply for outside grants at the beginning of their third year are recommended to take the Prospectus Tutorial (HIST 995) during their second year, and it is required for students in European history. The tutorial should result in a full draft of the dissertation prospectus. 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 994, HIST 995, HIST 998) count toward the course work requirement but do not count toward the Honors requirement.

Two of the ten courses must be research seminars in which the student produces an original research paper from primary sources. The Prospectus Tutorial 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 examination tutorials (HIST 994) with one of their examiners.

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 50 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 write a historiographical essay of maximum 8,000 words. 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 by all students, and those who took the Prospectus Tutorial (HIST 995) during their second year are encouraged to hold the colloquium at the beginning of their fifth 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), 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 three term courses) only after successful completion of the first year.

Students normally serve as teaching fellows during four terms to acquire professional training. Ordinarily, students teach in their third and fourth 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 as part-time acting instructors (PTAIs), 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. 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 University Dissertation Fellowship (UDF), which finances a full year of research and writing without any teaching duties. Students may choose to take the UDF at any point after they have advanced to candidacy and before the end of their sixth year. Students are prohibited from teaching when they are on the UDF. The department strongly recommends that students apply for a UDF only after completing the first chapter conference and that they have drafted at least two chapters before starting the fellowship.

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 Renaissance Studies

The Department of History offers, in conjunction with the Renaissance Studies Program, a combined Ph.D. in History and Renaissance Studies. For further details, see Renaissance 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 Anne Eller and Daniel Magaziner

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 504a / CLSS 895a, Survey of Greek and Latin Historical Sources Noel Lenski
Familiarizes students with the major sources for Greek and Roman history in the original languages. Covers material to be tested on comprehensive examinations for the Ph.D. in the combined program in Classics and History.

HIST 509a / CLSS 835a, Problems in Hellenistic History Joseph Manning
The course explores current problems in Hellenistic history and how the period is related to premodern global history. We read in depth from current literature on key themes.

HIST 521b / CLSS 880b, 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 532b / CLSS 624b / ENGL 521b / MDVL 621b, Advanced Manuscript Studies N. Raymond Clemens
This course builds on the foundation provided by MDVL 620 by focusing on both regional Latin hands and the vernacular hands that grew from the Latin tradition. The backbone of the course is Middle English paleography (no prior experience needed), but the course surveys French, Italian, Hebrew, and German hands as well. Prerequisite: MDVL 620 or MDVL 571 or equivalent study of Latin paleography strongly suggested.

HIST 540a / MDVL 660a, Introduction to Research in Medieval History Paul Freedman
The seminar provides an introduction to research in medieval European history: often-used source genres, methods, and research tools. We focus on working with primary sources in original languages, occasionally in their original manuscript and early printed form. A working knowledge of a medieval language is, therefore, desirable. Yale is particularly fortunate in that the Beinecke Rare Book and Manuscript Library possesses much relevant material, including medieval manuscripts and early printed bibles.

HIST 545a / MDVL 545a, Medieval Towns Paul Freedman
European towns from their transformations of the late Roman Empire to 1500. The political, religious, and commercial functions of towns, their government, and the degree of autonomy they possessed are the main topics covered. Comparisons among geographic regions with special attention to regions of precocious developmental and political autonomy such as northern Italy and Flanders.

HIST 564b / RNST 501b, The Renaissance beyond Italy Carlos Eire
An introduction to the Renaissance beyond Italy, focused on reading and analyzing key texts.

HIST 565a / RLST 522a, Early Modern Spain Carlos Eire
Reading and discussion in sixteenth- and seventeenth-century Spanish texts (all available in English translation) and also in recent scholarship on early modern Spain.

HIST 596a / JDST 761a / MDVL 596a / RLST 773a, Jewish History and Thought to 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 598a / JDST 846a / RLST 771a, Jewish Emancipation in the Nineteenth Century David Sorkin

A study of the various forms of emancipation politics in the nineteenth century. Conventional historiography has identified Haskalah (Jewish Enlightenment) and religious reform as the predominant forms of emancipation politics. This course explores neglected forms of emancipation politics including: the citizen intercessor, lawyers using law, organized community politics, cooperation with the state, opposition to the state, horizontal alliances, public protests, private diplomacy, etc.

HIST 603a / JDST 806a / MDVL 603a / RLST 616a, Jews and Christians in the Formation of Europe, 500–1500 Ivan Marcus

This seminar explores how medieval Jews and Christians interacted as religious societies between 500 and 1500.

HIST 609b / CLSS 839b, Ancient Greek Magic: Spells, Curses, Incantations Jessica Lamont

This seminar explores private ritual practices in the ancient Mediterranean often categorized as "magical," through the lens of literary, epigraphic, and material evidence for spells, curses, and incantations. The seminar begins in the world of Mesopotamia, Egypt, and Phoenicia in order to assess later Greek borrowings; the primary focus, however, is on the circum-Mediterranean basin from the archaic period through Late Antiquity. Examined rituals include conditional self-curses attached to oaths, spells, incantations, revenge curses, binding-curses (defixiones), prayers for justice, curse effigies, amulets, and erotic curses used for seduction. Attention is paid to methodological problems of categorization in the historiography of ancient "magic," in addition to debates about the place of such rituals within the broader framework of Greek and Roman religion. Knowledge of Greek and Latin recommended.

HIST 654b / FREN 700b, 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 660a, Twentieth-Century Europe Jennifer Allen

This reading seminar examines the history of twentieth-century Europe through recent scholarship that employs a range of methods and styles. Rather than attempting to establish a historiographical canon, the course offers an introduction to major themes that have occupied historians of this period and geography. After exploring the defining questions of the nineteenth century in order to understand the longer roots of many concerns of the twentieth, we turn to the topics of migration, war, revolution, anti-Semitism, democracy, the Cold War, decolonization, multiculturalism, and neoliberalism.

HIST 680a, Russian History to 1725 Paul Bushkovitch

The major phases of Russian history from the tenth century, covering the major historiographical controversies and sources. Russian or German helpful but not required.

HIST 685b, Imperial Russia Sergei Antonov
This reading course focuses on Russian government and society between the outbreak of the Crimean War in 1853 and the consolidation of the revolutionary Bolshevik regime in the early 1920s. Particular attention is paid to new scholarship that emerged from the opening of the archival collections in the former Soviet Union and led to new perspectives and avenues of inquiry. Among these are exciting new histories of Russian regions and ethnic/religious minorities, legal culture and institutions, and economy and industrialization. All readings are in English, with Russian options also available.

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

HIST 715b / AFAM 764b / AMST 715b, 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 721a / AFAM 626a / RLST 626a, African American Religious History Nicole Turner
African American religions have been central to the African American experience since Africans arrived in North America. An amalgam of traditional African religions, Christianity, Islam, Judaism, and African American ingenuity, African American religions are dynamic and multifaceted. Although they are often depicted as sources of black resilience and emblems of black resistance, they have also been critiqued for marginalizing and racializing black people, as well as encoding archaic gender paradigms and reinforcing class divisions. This course explores the ways histories of African American religions have produced these various interpretive frames. Questions that animate the course include: What role have African American religions played in African American life? How have scholars studied the history of African American religions and ultimately shaped the discourse about African American religious life, and by extension African American history? The course engages foundational works, such as Albert Raboteau's *Slave Religion* and Evelyn Brooks Higginbotham's *Righteous Discontent,* as well as newer works like Judith Weisenfeld's *New World A-Coming* and Matthew Harper's *The End of Days*.

HIST 723b / AMST 687b / WGSS 697b, Colonial Domesticity and Reproductive Relations Lisa Lowe
In this interdisciplinary seminar, we study the central importance of kinship, family, and domestic labor to the social reproduction of racial colonial processes. Settler

colonialism, colonial slavery, overseas empire, and their aftermaths depend not only on the brute force of war, captivity, and occupation; they are also sustained and contested through culture, language, forms of family and household, and the social reproduction of race, gender, intimacy, and filiation. We trace a genealogy of "colonial domesticity" that considers histories of the sexual violation and separation of slave women from their children, compulsory boarding schools for Native Americans, racialized gendered divisions of care labor, transnational Asian adoption, and contemporary migrant detention and family separation; this genealogy also includes alternative forms of kinship, domesticity, generation, and relation. Readings include historical and anthropological studies of colonialism, feminist debates on social reproduction, and literary and visual culture materials by Maria Mies, Ann Laura Stoler, Silvia Federici, Tithi Bhattacharya, Ruha Benjamin, Kalindi Vora, Thavolia Glymph, Saidiya Hartman, Dorothy Roberts, Audra Simpson, Jodi Byrd, Amy Kaplan, Evelyn Nakano Glenn, Laura Briggs, Elizabeth Freeman, Chandan Reddy, Alys Weinbaum, Louise Erdrich, Mary Prince, Toni Morrison, Patricia Powell, Chang-rae Lee, Octavia Butler, and others. Permission of the instructor required.

HIST 736b, Research in Twentieth-Century U.S. Political and Social History Beverly Gage

Projects chosen from the post-Civil War period, with an emphasis on twentieth-century social and political history, broadly defined.

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

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

HIST 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 753a, Advanced Research in Federal Indian Law Ned Blackhawk
This seminar is designed to provide advanced research, writing, and study in the fields of federal Indian law and American Indian legal history. Investigating contemporary issues in American Indian policy and law, students in this course delve into the precedents, doctrine, and historical contexts that shape contemporary Indian law and practice. Group work on tracking Indian legal cases within the federal course systems, the drafting of briefs and case notes on contemporary cases, and assessing broader changes over time in federal Indian policy formation form the bulk of the class examinations.

HIST 760a, American Legal History John Witt
A highly selective tour, with emphasis on transformative moments and foundations. Subjects include legal controversies over European empires in the New World; legal theory of the American Revolution and creation of the U.S. Constitution; advent of the laws of capitalism and slavery; the jurisprudence of the Civil War and Reconstruction; the rise of the modern state and its accompanying intellectual formations and legal crises; the civil rights era and its aftershocks; the mass incarceration phenomenon; immigration law in the construction of the United States; and conservative legal mobilization. Materials include elite sources from the U.S. Supreme Court and elsewhere, as well as social history of the law from the bottom up. Special attention to the role of legal institutions in American economic development; relationships between law and society; and questions about the significance of studying law's history.

HIST 769a / AFAM 605a / AMST 686a / PHUM 686a, Introduction to Documentary Studies Matthew Jacobson
This mixed graduate/undergraduate seminar surveys documentary work in three media —film, photography, and sound—since the 1930s, focusing on the documentary both as a cultural form with a history of its own and as a parcel of skill sets and storytelling and production practices to be studied and mastered. Readings and discussions cover important scholarly approaches to documentary as a genre, as well as close readings of documentaries themselves and practitioners' guides to various aspects of documentary work. Topics include major trends in documentary practice across the three media, documentary ethics, aesthetics and truth-claims, documentary's relationship to the scholarly disciplines and to journalism, and documentary work as political activism. Class meetings include screenings/viewings/soundings of documentary works, and practitioners' panels and workshops with Yale documentarians (including Charles Musser, Zareena Grewal, Elihu Rubin, Gretchen Berland, and Laura Wexler) and local New Haven documentarians such as Jake Halpern (Yale '97, *This American Life*). Students' final projects may take the form of a traditional scholarly paper on some aspect of documentary history or a particular documentary producer, or an actual piece of documentary work—a film treatment, a brief video, a set of photographs, a sound documentary, or script.

HIST 790a / GLBL 793a, Relations of the Great Powers since 1890 Paul Kennedy and Arne Westad

Reading seminar. Among the topics covered are the "New Imperialism," the military and naval arms race prior to 1914, the relationship between domestic politics and foreign affairs, the First World War and the alteration of the Great Power order, the "new diplomacy," appeasement, the rise of the dictator-states, the origins of the Second World War, military and strategic results of the war, the Cold War, reconfigurations of the 1970s and '80s, the end of the Cold War, post-Cold War relations. There is a heavy emphasis on historiography and an encouragement to relate economic and strategical trends to diplomatic. Open to undergraduate seniors with permission of the instructors.

HIST 791a / GLBL 794a, Ports, Cities, and Empires Paul Kennedy and Jay Gitlin

A study of the relationship between imperialism and urbanism from the early modern period to the twentieth century. Topics include Roman medieval precedents; the uses and meanings of walls; merchant colonies and Latin Quarters; modernist urban planning and the International Style in Africa and the Middle East; comparative metro system in Paris, Algiers, and Montreal; decolonization and imperial nostalgia. Cities to be discussed include Delhi/New Delhi, New Orleans, Dublin, Cape Town, Tel Aviv, Addis Ababa, and many others. Undergraduates require permission of the instructors.

HIST 793b, Research in Modern International/Global History Arne Westad

This seminar provides an opportunity for graduate students to write a research paper on international/global history, broadly defined to include diplomacy, economic relations, social movements, cultural and intellectual connections, and other topics. The first part of the seminar includes readings and class discussions that focus on hands-on strategies and tactics for historical research and academic writing. Later seminar meetings are oriented toward benchmarks and workshops on students' own research projects.

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

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

HIST 800a / ENGL 503a / MDVL 565a, Circa 1000 Valerie Hansen and Emily Thornbury

The world in the year 1000, when the different regions of the world participated in complex networks. Archaeological excavations reveal that the Vikings reached L'Anse aux Meadows, Canada, at roughly the same time that the Kitan people defeated China's Song dynasty and established a powerful empire stretching across the grasslands of Eurasia. Europeans tried to figure out whether the Vikings were a sign of Doomsday, and if so, whether a series of cultural experiments might stave off the end-time, even as the Icelanders tried to decide whether they wanted to be European. In this seminar, students read interpretative texts based on archaeology and primary sources, prepare projects in teams, work with material culture, and develop skills of cross-cultural analysis. Mandatory field trip to the Metropolitan Museum of Art in New York on the second Saturday of the fall term.

HIST 806a, Early Modern Latin America: Social and Cultural History and Historiography Stuart Schwartz
This course considers the recent historiography of colonial Latin America and the Caribbean with an Atlantic and cross-imperial frame.

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 amorphously 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 833b, 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 836a / AFST 836a, Histories of Postcolonial Africa: Themes, Genres, and the Phantoms of the Archive Benedito Machava
This course is both historiographic and methodological. It is meant as an introduction to the major themes that have dominated the study of postcolonial Africa in recent years, and the material circumstances in which they were produced. We pay close attention to the kinds of sources and archives that scholars have employed in their works, and how they addressed the challenges of writing contemporary histories in Africa. We center our weekly meetings around one key text and one or two supplementary readings. We engage with works on politics, violence, environment and technology, women and gender, affect, fashion, leisure, and popular culture.

HIST 839a / AFST 839a, Environmental History of Africa Robert Harms
An examination of the interaction between people and their environment in Africa and the ways in which this interaction has affected or shaped the course of African history.

HIST 884a, Readings in the History of Modern Japan Daniel Botsman
This course offers students an opportunity to explore recent English-language scholarship on the history of modern Japan (post-1868).

HIST 889b / EAST 889b, Research in Japanese History Daniel Botsman, Fabian Drixler, and Hannah Shepherd
After a general introduction to the broad array of sources and reference materials available for conducting research related to the history of Japan since ca. 1600, students prepare original research papers on topics of their own choosing in a collaborative workshop environment. Prerequisite: reading knowledge of Japanese.

HIST 892a / EALL 874a, China at Its Borders Denise Ho
This reading seminar examines recent English-language scholarship on China's engagement with the world, focusing on the nineteenth and twentieth centuries. Weekly topics include the following themes: frontiers and borders, the region as a unit of analysis, trading systems and regulation, migration and diaspora, models of modernity and revolution, World War II and the Cold War, socialist internationalism, the era of reform and opening, and China's global ambitions today.

HIST 904a / SAST 839a, Writing Postcolonial Histories of South Asia: Decolonization, Democracy, and Development Rohit De
Until recently, scholarly histories of South Asia concluded with independence; the period after was presented as the province of political scientists and economists. This was both the result of changing archival practices of postcolonial states as well as the belief, nurtured by the state, that history as a progressive narrative ended with independence. This seminar engages with the newly emerging work to understand models, theoretical questions, and archival methods to study postcolonial India, Pakistan, Sri Lanka, Bangladesh, and Nepal. Postcolonial here refers not only to the period after the end of colonialism, but also "the condition produced by being worked over by colonialism." It focuses on how after independence, anti-colonial movements sought to overcome colonial legacies, built multiethnic polities, constructed and developed national economies, and took their place and reshaped the international stage. The topics and events covered—be they histories of partition, economic planning, mass violence, state science, universal franchise, non-alignment, urban planning, reproductive health—are in dialogue with histories of decolonization and postcolonial state building across the Global South. The course focuses on identifying new archives and techniques of reading, ranging from court litigation to expert commissions, oral histories, diplomatic records, and radio and cinema.

HIST 913a / HSHM 713a, Geography and History Bill Rankin
A research seminar focused on methodological questions of geography and geographic analysis in historical scholarship. We consider approaches ranging from the Annales School of the early twentieth century to contemporary research in environmental history, history of science, urban history, and more. We also explore interdisciplinary work in social theory, historical geography, and anthropology and grapple with the promise (and drawbacks) of GIS. Students may write their research papers on any time period or geographic region, and no previous experience with geography or GIS is necessary. Open to undergraduates with permission of the instructor.

HIST 921b / HSHM 710b, Problems in Science Studies Joanna Radin
Exploration of the methods and debates in the social studies of science, technology, and medicine. This course covers the history of the field and its current intellectual, social, and political positioning. It provides critical tools—including feminist, postcolonial, and new materialist perspectives—to address the relationships among science, technology, medicine, and society.

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 937a / AFAM 752a / HSHM 761a, Medicine and Empire Carolyn Roberts
A reading course that explores medicine in the context of early modern empires with a focus on Africa, India, and the Americas. Topics include race, gender, and the body; medicine and the environment; itineraries of scientific knowledge; enslaved, indigenous, and creole medical and botanical knowledge and practice; colonial contests over medical authority and power; indigenous and enslaved epistemologies of the natural world; medicine and religion.

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 948b / HSHM 780b, History beyond the Archive Nana Osei Quarshie
This course focuses on three broad themes. First, we examine the social construction of "the archive." What forms of knowledge accumulation constitute a historical repository? Second, we examine the role of the archive in the interplay of ethnography and historiography. How do ethnographic history, historical ethnography, and history of the present differ? Lastly, we examine the necessity of the archive and consider various alternative grounds upon which history can be constructed. What might it mean to imagine a history (or a history of science, medicine, and technology) beyond the archive?

HIST 961b, Public History Workshop Joanne Meyerowitz and Joanne Freeman
This course introduces students to genres of public history. Guest speakers—from Yale and beyond—offer lessons on podcasts, op-eds, exhibitions, and other forms of presenting historical scholarship to a wider public. Students engage in their own individual and collaborative public history projects. Open to graduate students at all levels.

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

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. Open only to students pursuing the Graduate Certificate in Environmental Humanities.
½ Course cr per term

HIST 965a / ANTH 541a / ENV 836a / PLSC 779a, Agrarian Societies: Culture, Society, History, and Development Kalyanakrishnan Sivaramakrishnan 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 967a, Intellectual History as Storytelling Marci Shore

This seminar explores the discipline of intellectual history from the perspective of the historian's role as author of that history. Topics include the challenges of working with highly personal and subjective sources; the moral dilemmas of relativism; and the relationship between voyeurism and empathy. How do historians relate to novelists grappling with similar material? How can we narrate the history of ideas? How can we write nonfiction about people whose worldviews involved elaborate fantasies about the past, present, and future? How can we situate abstract ideas in concrete times, places, and lives? How do we integrate narrative and analysis? When is it justified to write about the present? The relationship between lunacy and genius is often very intimate; we discuss how historians can approach morally ambiguous historical protagonists be they communist poets, surrealist novelists, fascist philosophers, or others. We focus on storytelling, on history as both art and *Wissenschaft*. Readings include novels, essays, narrative nonfiction, and the genres in between.

History of Art

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Director of Graduate Studies
Pamela Lee (Loria 751, 203.432.2674, pamela.lee@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 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.

History of Art and Renaissance Studies

The Department of the History of Art offers, in conjunction with the Renaissance Studies Program, a combined Ph.D. in the History of Art and Renaissance Studies. For further details, see Renaissance 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. (en route to the Ph.D.) This degree is awarded after the satisfactory completion of eight term courses and after evidence of proficiency in one required foreign language.

Program materials are available online at http://arthistory.yale.edu.

COURSES

HSAR 529a / AMST 630a / RLST 819a, Religion and Museums 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 535b / RUSS 655b, Russian Style: Material Culture and the Decorative Arts in Imperial Russia Molly Brunson
This seminar examines the historical development of a national style in Russian decorative arts and material culture from the eighteenth century to the early twentieth. Although known for borrowing liberally from western European artistic traditions, Russian imperial culture—from the baroque and neoclassical courts of Elizabeth and Catherine to the exported "native" imaginaries of the Ballets Russes—also sought to distinguish itself in design, scale, manufacture, and style. Structured around a series of case studies, this seminar considers highlights from the history of Russian decorative arts, all while exploring broader questions about the transnational movement of style, the intersection of nationalism and design, the invention of "native" cultures, and the materialities of empire and modernity. Topics include the branding of Catherine the Great; Russia's natural resources and trade networks; consumer culture in St. Petersburg; the materialism of realism; the Abramtsevo artists' colony and the discovery of folk art; *russkii stil'* (Russian Style) at the World's Fairs; curating ethnographies and archaeologies; and the "relics" of the Romanovs. Organized as an intensive research seminar, this course brings the central conceptual and theoretical concerns of visual and material culture studies (e.g., materiality and thing theory, ornament and the decorative, the socioeconomics of taste) to a historical and object-based consideration of Russian style. Significant use is made of the museum and library collections at Yale and nearby.

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 593a / MDVL 593a, The Body as Medium in Medieval Art and Culture
Jacqueline Jung

Since the publication of pioneering studies by Caroline Walker Bynum in the late 1980s, the European Middle Ages has come to be recognized not as an "age of spirituality" but as an emphatically body-oriented culture. The paradoxical bodies of Christ (at once wholly divine and wholly human) and his Virgin Mother were the subject of extensive speculation, scrutiny, and loving devotion in literature, theology, and art; the fragmented remains of the saints were housed in glittering containers for the faithful to venerate; and the living bodies of charismatic men and women became both the vehicles for their own communion with the divine and objects themselves for the devotional (or skeptical) gazes of others. It is the latter facet of medieval visual culture to which this seminar is dedicated. Although we look closely at works of art in various media (especially manuscript painting and sculpture), in which bodies function as representational signs, our main objective is to understand the variety of ways in which active, living bodies could serve as communicative media in spheres both public and private, religious and secular. Topics include the physical and sensory apparatus of the body in medieval science and medicine; the body as vehicle for the individual's communication with God; the stigmatic body; the rapturous or possessed body as site of discernment; the tortured body as teaching tool; the self-punished body as mimetic spectacle; the courtly body as aesthetic object; and the dissected body as revelation of both personal virtues and cosmic forces. Reading knowledge of French and German is highly recommended but not required.

HSAR 690a, Cézanne and His Afterlives Carol Armstrong

This course looks at the actual and possible afterlives of Cézanne's life of painting through a series of pairings of other figures with this progenitor of twentieth-century abstraction. Beginning with Cézanne's own pairing of his early work with that of Manet, and proceeding through Émile Zola's fictionalization of Cézanne in *L'Oeuvre* of 1886, the seminar considers Cézanne's work in light of critics and philosophers who wrote about him—such as Rainer Maria Rilke, Roger Fry, Clement Greenberg, and Maurice Merleau-Ponty; later painters to whom his work was important, from Émile Bernard and Maurice Denis to Matisse, Braque, Picasso, Mondrian, de Kooning, and others; and later authors and thinkers in various fields whose ideas may fruitfully be compared to his way of picturing reality, from Virginia Woolf and Albert Einstein to R.D. Laing and Luce Irigaray. In each case, the pairing serves both as a two-way screen of mutual inflection and as a means of complicating and reconfiguring the chronologies and teleologies of what has come to be called modernism. Readings, presentations, and class discussions, one short preliminary paper, and a final research paper.

HSAR 705a, Representing the American West Jennifer Raab
The American West holds a powerful place in the cultural and political imagination of the United States. Taught at the Beinecke, this course examines settler colonial art and visual culture from the early republic to the present, considering changing conceptions of the land across media—from maps, aquatints, and guidebooks to paintings, panoramas, and photographs. We consider the representation of railroads, National Parks, ghost towns, and highways; terms such as distance, aridity, seriality, mythology, and the frontier; artists' engagement with ecological questions; the construction of whiteness in and through the landscape; and sites of indigenous resistance. The seminar foregrounds research and writing, with the term structured around the conceptualization and development of student papers emerging from the Beinecke's extraordinary collection of Western Americana. Prior permission of the instructor is required.

HSAR 759b / AFAM 724b / AMST 732b / FILM 693b / WGSS 693b, Imaging War, Imagining Peace: Memory, Justice, and Repair Laura Wexler
This course explores the ways in which both war and peace have been imagined and represented, and how those visual practices might be unlearned and reimagined. What do images and imaginings of war and peace leave out of view, and how can we bring both underlying social vulnerability and extant networks of protest and resistance into greater visibility? How might we avoid automatized reiterations of well-worn locations and scenarios of violence, for example in constructions of "the enemy," and develop new approaches to the nationalist, racialized, and gendered stakes of conflict? What alternative acts of intervention, witnessing, and reparation might we create so as to see emergencies more freshly—at a time of conflict, as well as in anticipation and in retrospect? Can the visual archives of violence be reframed and recirculated to shape more firmly the potential of justice, cohabitation, and peace? How can visualizations of antiwar movements and peace actions be mobilized more effectively? This team-taught course is inspired by the documentary work of Susan Meiselas. Her distinctive photographic practice with communities in Nicaragua, El Salvador, Chile, Kurdistan, and elsewhere, her repeated return to sites of conflict over time, and her collaboration with the subjects of her images, as well as her extensive and innovative archival work, serve as one model for the kinds of approaches we want to explore and foster. In addition, our work is guided by close study of authors such as Leni Riefenstahl, Virginia Woolf, Alain Resnais, Susan Sontag, Sigmund Freud, Errol Morris, Judith Butler, Ariella Azoulay, Diana Taylor, Thy Phu, David Shneer, Amitav Ghosh, Anne McClintock, Grace Paley, Maaza Mengiste, Viet Thanh Nguyen, Karla Cornejo Villavicencio, Jenny Holzer, Walid Raad, Harun Farocki, Sam Durant, Sim Chi Yin, and more.

HSAR 804b / ANTH 787b / ARCG 787b, East Asian Objects and Museums: Collection, Curation, and Display Anne Underhill
This course explores the East Asian art and anthropological collections at Yale's museums and at other major museums in North America and East Asia. Students study collections and their histories; gain experience in museum practices; and learn from specialists through class visits to other relevant museums in the United States.

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 Kalyanakrishnan Sivaramakrishnan and Paul Sabin

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. Open only to students pursuing the Graduate Certificate in Environmental Humanities.
½ Course cr per term

History of Science and Medicine

Humanities Quadrangle, 203.432.1365
http://hshm.yale.edu
M.A., M.Phil., Ph.D.

Chair
Deborah Coen

Director of Graduate Studies
Joanna Radin

Faculty Sakena Abedin (*History of Science & Medicine*), Paola Bertucci (*History*), Deborah Coen (*History*), Ivano Dal Prete (*History*), Kelly O'Donnell (*History of Science & Medicine*), Nana Quarshie (*History*), Joanna Radin (*History of Medicine*), Chitra Ramalingam (*History of Science & Medicine*), Marco Ramos (*History of Science*), William Rankin (*History*), Carolyn Roberts (*African American Studies; History; History of Medicine*), Naomi Rogers (*History; History of Medicine; Women's, Gender, & Sexuality Studies*), John Harley Warner (*History of Medicine; History*)

Affiliated faculty Rene Almeling (*Sociology*), Toby Appel (*Librarian for Medical History*), Alexi Baker (*Collections Manager, HSI*), Marisa Bass (*History of Art*), Randi Epstein (*English*), Melissa Grafe (*Librarian for Medical History*), Dimitri Gutas (*Emeritus; Near Eastern Languages & Civilizations*), Ann Hanson (*Classics*), Jessica Helfand (*Yale College*), Marcia Inhorn (*Anthropology*), Kathryn James (*Curator, Early Modern Books & Manuscripts, Beinecke Library*), Amy Kapczynski (*Law*), Jennifer Klein (*History*), Stephen Latham (*Director, Interdisciplinary Center for Bioethics*), Lisa Messeri (*Anthropology*), Joanne Meyerowitz (*History*), Alan Mikhail (*History*), Jennifer Raab (*History of Art*), Ayesha Ramachandran (*Comparative Literature*), Kevin Repp (*Curator, Modern European Books & Manuscripts, Beinecke Library*), Paul Sabin (*History*), Jason Schwartz (*Public Health*), Gordon Shepherd (*Neuroscience*), Rebecca Tannenbaum (*History*), R. John Williams (*English; Film & Media 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 twelve courses during the 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 to the three core Problems seminars, students are 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.

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

This is the required workshop for the Graduate Certificate in Environmental Humanities. The workshop meets six times per term to explore concepts, methods, and pedagogy in the environmental humanities, and to share student and faculty research. Each student pursuing the Graduate Certificate in Environmental Humanities

must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. The fall term each year emphasizes key concepts and major intellectual currents. The spring term each year emphasizes pedagogy, methods, and public practice. Specific topics vary each year. Students who have previously enrolled in the course may audit the course in a subsequent year. Open only to students pursuing the Graduate Certificate in Environmental Humanities. ½ Course cr 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 710b / HIST 921b, Problems in Science Studies Joanna Radin
Exploration of the methods and debates in the social studies of science, technology, and medicine. This course covers the history of the field and its current intellectual, social, and political positioning. It provides critical tools—including feminist, postcolonial, and new materialist perspectives—to address the relationships among science, technology, medicine, and society.

HSHM 713a / HIST 913a, Geography and History Bill Rankin
A research seminar focused on methodological questions of geography and geographic analysis in historical scholarship. We consider approaches ranging from the Annales School of the early twentieth century to contemporary research in environmental history, history of science, urban history, and more. We also explore interdisciplinary work in social theory, historical geography, and anthropology and grapple with the promise (and drawbacks) of GIS. Students may write their research papers on any time period or geographic region, and no previous experience with geography or GIS is necessary. Open to undergraduates with permission of the instructor.

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 761a / AFAM 752a / HIST 937a, Medicine and Empire Carolyn Roberts
A reading course that explores medicine in the context of early modern empires with a focus on Africa, India, and the Americas. Topics include race, gender, and the body; medicine and the environment; itineraries of scientific knowledge; enslaved, indigenous, and creole medical and botanical knowledge and practice; colonial contests over medical authority and power; indigenous and enslaved epistemologies of the natural world; medicine and religion.

HSHM 780b / HIST 948b, History beyond the Archive Nana Osei Quarshie
This course focuses on three broad themes. First, we examine the social construction of "the archive." What forms of knowledge accumulation constitute a historical repository? Second, we examine the role of the archive in the interplay of ethnography and historiography. How do ethnographic history, historical ethnography, and history of the present differ? Lastly, we examine the necessity of the archive and consider various alternative grounds upon which history can be constructed. What might it mean to imagine a history (or a history of science, medicine, and technology) beyond the archive?

HSHM 920a or b, Independent Reading Staff
By arrangement with faculty.

HSHM 930a or b, Independent Research Staff
By arrangement with faculty.

Immunobiology

Anlyan Center (TAC) S625, 203.785.3857
http://immunobiology.yale.edu
M.S., M.Phil., Ph.D.

Chair
David Schatz

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Carla Rothlin (TAC 625, 203.737.4679, carla.rothlin@yale.edu)

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João Pereira (TAC 541A, 203.737.2089, joao.pereira@yale.edu)

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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, Akiko Iwasaki, Paula Kavathas (*Laboratory Medicine*), Steven Kleinstein (*Pathology*), Ruslan Medzhitov, Jordan Pober, Carla Rothlin, Craig Roy (*Microbial Pathogenesis*), David Schatz

Associate Professors Stephanie Eisenbarth (*Laboratory Medicine*), Ann Haberman, John MacMicking (*Microbial Pathogenesis*), Eric Meffre, João Pereira, Kevin O'Connor (*Neurology*), Lauren Sansing (*Neurology*)

Assistant Professors Grace Chen, Ellen Foxman (*Laboratory Medicine*), Daniel Jane-Wit (*Internal Medicine*), Nikhil Joshi, Carrie Lucas, Noah Palm, Aaron Ring, Andrew Wang, 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. (en route to the Ph.D.) Students who complete at least one year of resident graduate study at Yale with the quality of work judged satisfactory by the Department of Immunobiology faculty and who have satisfied ten courses with an average grade point average of High Pass (graded) may petition for the award of the M.S. degree. Students must petition through the Registrar's Office of the Graduate School in early October for the December award of the M.S. and by the middle of March for the May award. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

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 http://bbs.yale.edu.

IBIO 530a / MBIO 530a / MCDB 530a, Biology of the Immune System Eric Meffre
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 537a, Immunobiology Seminar: Inflammatory Diseases Jordan Pober, Jeffrey Bender, and Andrew Wang
This course is conducted as an advanced seminar considering both review articles and primary literature describing current investigations into the immunological mechanisms underlying a spectrum of human diseases, including those known to be inflammatory, allergic, or autoimmune disorders (systemic lupus erythematosus, rheumatoid arthritis, inflammatory bowel disease, asthma) as well as prevalent clinical pathologies with immune and inflammatory drivers (metabolic syndrome, stroke, cancer metastasis). Prerequisites: IBIO 530 and IBIO 531. Enrollment limited to fifteen, with preference given to students who require participation in IBIO seminars to complete their course requirements.

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 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.

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*)
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Professors Amy Arnsten (*Neuroscience; Psychology*), Anton Bennett (*Pharmacology; Comparative Medicine*), Hilary Blumberg (*Psychiatry; Child Study Center; Radiology & Biomedical Imaging*), Hal Blumenfeld (*Neurology; Neuroscience; Neurosurgery*), Angélique Bordey (*Neurosurgery; Cellular & Molecular Physiology*), Kristen Brennand (*Psychiatry; Genetics*), Tyrone Cannon (*Psychology; Psychiatry*), John Carlson (*Molecular, Cellular, & Developmental Biology*), Marvin Chun (*Psychology; Neuroscience*), Lawrence Cohen (*Cellular & Molecular Physiology*), Daniel Colón-Ramos (*Cell Biology; Neuroscience*), R. Todd Constable (*Radiology & Biomedical Imaging; Neurosurgery*), Kelly Cosgrove (*Psychiatry; Radiology & Biomedical Imaging; Neuroscience*), Michael Crair (*Neuroscience; Ophthalmology & Visual Science*), Pietro De Camilli (*Cell Biology; Neuroscience*), Jonathan Demb (*Ophthalmology & Visual Science; Cellular & Molecular Physiology*), Ralph DiLeone (*Psychiatry; Neuroscience*), Barbara Ehrlich (*Pharmacology; Cellular & Molecular Physiology*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology; Physics*), Paul Forscher (*Molecular, Cellular, & Developmental Biology*), Charles Greer (*Neurosurgery; Neuroscience*), 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, & Reproductive Sciences*), Arthur Horwich (*Genetics; Pediatrics*), Jonathon Howard (*Molecular Biophysics & Biochemistry; Physics*), Fahmeed Hyder (*Radiology & Biomedical Imaging; Biomedical Engineering*), Yong-Hui Jiang (*Genetics*), Elizabeth Jonas (*Internal Medicine; Neuroscience*), Leonard Kaczmarek (*Pharmacology; Cellular & Molecular Physiology*), Haig Keshishian (*Molecular, Cellular, & Developmental Biology*), Jeffery Kocsis (*Neurology; Neuroscience*), Michael Koelle (*Molecular Biophysics & Biochemistry*), Anthony Koleske (*Molecular Biophysics & 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, & Developmental Biology; Cell Biology*), Evan Morris (*Radiology & Biomedical Imaging; Biomedical Engineering; Psychiatry*), Angus Nairn (*Psychiatry; Pharmacology*), Michael Nitabach (*Cellular & Molecular Physiology; Genetics*), Marina Picciotto (*Psychiatry; Pharmacology; Neuroscience*), Vincent Pieribone (*Cellular & 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 & Molecular Physiology; Chemical & Environmental Engineering*), Laurie Santos (*Psychology*), Joseph Santos-Sacchi (*Surgery; Cellular & Molecular Physiology; Neuroscience*), Nenad Sestan (*Neuroscience; Comparative Medicine; Genetics; Psychiatry*), Fred Sigworth (*Cellular & Molecular Physiology; Biomedical*

Engineering), Dana Small (*Psychiatry; Psychology*), Stephen Strittmatter (*Neurology; Neuroscience*), Jane Taylor (*Psychiatry; Psychology*), Susumu Tomita (*Cellular & 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 & Molecular Physiology; Ophthalmology & Visual Science*), Z. Jimmy Zhou (*Ophthalmology & Visual Science; Cellular & Molecular Physiology; Neuroscience*), Steven Zucker (*Computer Science; Biomedical Engineering*)

Associate Professors Nii Addy (*Psychiatry; Cellular & Molecular Physiology*), Meenakshi Alreja (*Psychiatry; Neuroscience*), Alan Anticevic (*Psychiatry; Psychology*), Sviatoslav Bagriantsev (*Cellular & Molecular Physiology*), Abhishek Bhattacharjee (*Computer Science*), Thomas Biederer (*Neurology; Neuroscience*), Charles Bruce (*Neuroscience*), William Cafferty (*Neurology; Neuroscience*), Jessica Cardin (*Neuroscience*), Sreeganga Chandra (*Neurology; Neuroscience*), Steve Chang (*Psychology; Neuroscience*), Damon Clark (*Molecular, Cellular, & 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 & Molecular Physiology; Neuroscience*), Marc Hammarlund (*Genetics; Neuroscience*), Michelle Hampson (*Radiology & Biomedical Imaging; Psychiatry; Child Study Center*), Michael Higley (*Neuroscience*), Avram Holmes (*Psychology*), Erdem Karatekin (*Cellular & Molecular Physiology; Molecular Biophysics & Biochemistry*), In-Jung Kim (*Ophthalmology & Visual Science; Neuroscience*), Hedy Kober (*Psychiatry; Psychology*), Smita Krishnaswamy (*Genetics; Computer Science*), Alex Kwan (*Psychiatry; Neuroscience*), Ifat Levy (*Comparative Medicine; Psychology; Neuroscience*), Janghoo Lim (*Genetics; Neuroscience*), Angeliki Louvi (*Neurosurgery; Neuroscience*), Dhasakumar Navaratnam (*Neurology; Neuroscience*), Timothy Newhouse (*Chemistry*), In-Hyun Park (*Genetics*), Maria Piñango (*Linguistics*), Michael Schwartz (*Neuroscience*), Justus Verhagen (*Neuroscience*), Weimin Zhong (*Molecular, Cellular, & Developmental Biology*), Jiangbing Zhou (*Neurosurgery; Biomedical Engineering*)

Assistant Professors Moitrayee Bhattacharyya (*Pharmacology*), Joel Butterwick (*Pharmacology*), Rui Chang (*Cellular & Molecular Physiology; Neuroscience*), Dylan Gee (*Psychology*), Jason Gerrard (*Neurosurgery; Neuroscience*), Elizabeth Goldfarb (*Psychiatry; Psychology*), Pallavi Gopal (*Pathology*), Junjie Guo (*Neuroscience*), Abha Gupta (*Pediatrics; Neuroscience*), Brian Hafler (*Ophthalmology & Visual Science; Pathology*), Ellen Hoffman (*Child Study Center*), Monika Jadi (*Psychiatry; Neuroscience*), James Jeanne (*Neuroscience*), Al Kaye (*Psychiatry*), Liang Liang (*Neuroscience*), Samuel McDougle (*Psychology*), John Murray (*Psychiatry; Neuroscience; Physics*), Anirvan Nandy (*Neuroscience*), Michael O'Donnell (*Molecular, Cellular, & Developmental Biology*), Candie Paulsen (*Molecular Biophysics & Biochemistry*), Albert Powers (*Psychiatry; Psychology*), Helena Rutherford (*Child Study Center; Psychology*), Dustin Scheinost (*Radiology & Biomedical Imaging; Child Study Center; Statistics & Data Science*), Hyojung Seo (*Psychiatry*), 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 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 least three 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: three courses are required (INP 701; Structural and Functional Organization of the Human Nervous System [INP 510]; and one elective graduate-level

course). 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 530b / PSYC 530b, Foundations of Neuroscience: Biological Bases of Human Behavior Molly Crockett

The purpose of this course is to provide students with an understanding of the biological factors underlying human cognition and behavior. Particular emphasis is placed on the mechanisms associated with individual differences in healthy functions (including emotion regulation, stress sensitivity, higher cognition, reward sensitivity, impulsivity, and social functions) and their relations with psychiatric and neurological disorders. Biological factors to be covered include genetic, neuroanatomical, neurophysiological, neurochemical, hormonal, and neuropsychological influences. Several of the initial sessions are devoted to basic topics (e.g., neurons, neuronal signaling, brain systems), before we begin our discussion of the neural basis of behavior and cognition. We also cover seminal work on animal models for mechanistic insights into the neurobiology of human behavior. Graduate students with any neuroscience research interest are encouraged to take this course. Required of Psychology Ph.D. students in the neuroscience area.

INP 558b / PSYC 558b, Computational Methods in Human Neuroscience Nick Turk-Browne

This course provides training on how to use computational science for the advanced analysis of brain imaging data, primarily from functional magnetic resonance imaging (fMRI). Topics include scientific programming, high-performance computing, machine learning, network/graph analysis, real-time neurofeedback, nonparametric statistics, and functional alignment. Prerequisite: some prior experience with programming, data preprocessing, and basic fMRI analysis.

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

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 585b / ENAS 585b, Fundamentals of Neuroimaging Douglas Rothman and Fahmeed Hyder
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 638a / PSYC 638a, Computational Models of Human Behavior Robb Rutledge
Why do we do the things we do? How do we adapt to changes in the environment? And how does our happiness depend on our choices and what happens to us? How can computational models help us to gain new insights into psychological processes? The goal of this course is to use computational models to understand human behavior and its relationship to our emotions. Data is collected in a variety of tasks, including new experiments designed by students, and is analyzed using computational models.

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 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 Scott Runner, 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 112, 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 research 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 Responsible Conduct of Research. Format consists of lecture presentation followed by discussion. Permission of instructor required.

IMED 635a or b, Directed Reading in Investigative Medicine Staff
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 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 (Humanities Quadrangle, 5th floor, 203.432.0599)

Professors Millicent Marcus, Jane Tylus

Assistant Professor Christiana Purdy Moudarres

Senior Lectors I Michael Farina, Anna Iacovella

Lectors Simona Lorenzini, Deborah Pellegrino

Affiliated faculty Paola Bertucci (*History of Science & Medicine*), Howard Bloch (*French*), Jessica Brantley (*English*), Francesco Casetti (*Film & Media Studies*), Joanna Fiduccia (*History of Art*), Virginia Jewiss (*Humanities*), Jacqueline Jung (*History of Art*), Laurence Kanter (*Yale Art Gallery*), Gundula Kreuzer (*Music*), Morgan Ng (*History of Art*), Jessica Peritz (*Music*), David Quint (*English; Comparative Literature*), Ayesha Ramachandran (*Comparative Literature*), Pierre Saint-Amand (*French*), Christophe Schuwey (*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 a reading knowledge of a second Romance language, Latin, and a non-Romance language. (German is recommended). Students are reminded that it is difficult to schedule beginning language courses in addition to a normal graduate program and are therefore advised to acquire proficiency in the languages required for the doctoral

program before matriculation. Reading knowledge of Latin may be acquired during the course of the first year. The Latin examination must be passed, usually before the beginning of the third term of study, and all language requirements must be fulfilled before the Ph.D. qualifying examination.

Students are required to take two years of course work (as a rule 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 four 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 members of the department. In the term following the qualifying examination, the student will discuss, in a session with the departmental faculty, 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 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.

Italian and Renaissance Studies

The Department of Italian Studies also offers, in conjunction with the Renaissance Studies Program, a combined Ph.D. in Italian and Renaissance Studies. For further details, see Renaissance Studies.

MASTER'S DEGREES

Only candidates for the Ph.D. degree will be admitted to the program, but the department will, upon request, offer the M.A. and the M.Phil. degrees to students who have completed the general Graduate School requirements for those degrees (see Degree Requirements under Policies and Regulations).

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 668a / CPLT 809a / ENGL 668a / RNST 668a, Translating the Renaissance
Jane Tylus
Would there have been a Renaissance without translation? We approach this question by beginning with the first modern treatise on translation, by the Florentine chancellor Leonardo Bruni, and moving on to consider the role of translation in Florence's and Tuscany's growing cultural and political mastery over the peninsula—and in Italy's cultural domination of Europe. We go on to explore the translation of "medieval" into "early modern" Europe, the translation of visual into verbal material, and the role of gender in the practice of translation. Students engage in their own translation projects as we dedicate the last part of the seminar to the diffusion of the Petrarchan sonnet tradition in early modern Europe.

ITAL 691a or b, Directed Reading Staff

ITAL 720a / CPLT 684a / ENGL 574a / RNST 684a, Renaissance Epic David Quint
This course looks at Renaissance epic poetry in relationship to classical models and as a continuing generic tradition. It examines epic type scenes, formal strategies, and poetic architecture. It looks at themes of exile and imperial foundations, aristocratic ideology, and the role of gender. The main readings are drawn from Vergil's *Aeneid,* Lucan's *Bellum civile,* Tasso's *Gerusalemme liberata,* Camões's *Os Lusíadas,* and Spenser's *Faerie Queene*.

ITAL 780a, Il romanzo del Novecento Millicent Marcus
No literary form is better suited to gauging the convulsive changes wrought by Italy's entrance into modernity than the novel. Infinitely permeable to the forces of historical circumstance, the novel counters these external forces with its own version of the evolving Italian subject in all its personal richness and complexity. We study the evolution of this literary genre throughout the course of the twentieth century and, in the process, adopt a variety of approaches, including, but not limited to, semiotics, psychoanalysis, narratology, gender, ideological criticism, and "la questione della lingua." In Italian.

ITAL 781b / CPLT 705b, *The Decameron* Millicent Marcus
An in-depth study of Boccaccio's text as a journey in genre in which the writer surveys all the storytelling possibilities available to him in the current repertory of short narrative fiction—ranging from ennobling example to flamboyant *fabliaux,* including hagiography, aphorisms, romances, anecdotes, tragedies, and practical jokes—and self-consciously manipulates those forms to create a new literary space of astonishing variety, vitality, and subversive power. In the relationship between the elaborate frame-story and the embedded tales, theoretical issues of considerable contemporary interest emerge—questions of gendered discourse, narratology, structural pastiche, and reader response among them. *The Decameron* is read in Italian or in English. Close attention is paid to linguistic usage and rhetorical techniques in this foundational text of the vernacular prose tradition.

ITAL 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. 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 Ph.D. Policy Committee.

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. Students who do not successfully complete all program requirements before the conclusion of their third year in the program may petition the Ph.D. Policy Committee to enroll in a seventh or eighth term on "Dissertation Completion" status.

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 Bowern, 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 five terms, students must complete a minimum of twelve 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.

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. Students in the doctoral program who complete all requirements for the Ph.D. apart from the submission of a completed dissertation (but including the presentation and successful defense of a dissertation prospectus) may petition for the M.Phil. degree.

M.A. (en route to the Ph.D.) Students in the doctoral program who successfully complete the course work, examinations, and work samples required by the end of the second year of graduate study (see above) may petition for the M.A. degree.

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 Claire Bowern
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 512a, Historical Linguistics Chelsea Sanker
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, 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 LING 525/SKRT 520.

LING 519a, Perspectives in 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 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: 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 564a, Principles of Language Teaching and Learning Nelleke Van Deusen-Scholl
Introduction to the basic principles of second-language acquisition theory, focusing on current perspectives from applied linguistics, sociolinguistics, and psycholinguistics. Topics include language teaching methodology, communicative and task-based approaches, learner variables, intercultural competence, and models of assessment.

LING 611b, Grammatical Diversity in U.S. English Raffaella Zanuttini
Language as a system of mental rules, governing the sound, form, and meaning system. The (impossible) distinction between language and dialect. The scientific study of standard and nonstandard varieties. Social attitudes toward prestige and other varieties; linguistic prejudice. Focus on morpho-syntactic variation in North American English: alternative passives ("The car needs washed"), personal datives ("I need me a new printer"), negative inversion ("Don't nobody want to ride the bus"), "drama SO" ("I am SO not going to study tonight").

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 619a, The Evolution of Language and Culture Claire Bowern
Introduction to cultural and linguistic evolution. How diversity evolves; how innovations proceed through a community; who within a community drives change; how changes can be "undone" to reconstruct the past. Methods originally developed for studying evolutionary biology are applied to language and culture.

LING 620a, General Phonetics Jason Shaw
Investigation of possible ways of describing the speech sounds of human languages. Tools to be developed: acoustics and physiology of speech; computer synthesis of speech; practical exercises in producing and transcribing sounds.

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 631b, Neurolinguistics Maria Pinango
The study of language as a cognitive neuroscience. The interaction between linguistic theory and neurological evidence from brain damage, degenerative diseases (e.g., Alzheimer's disease), mental illness (e.g., schizophrenia), neuroimaging, and neurophysiology. The connection of language as a neurocognitive system to other systems such as memory and music.

LING 632b, Phonology I Natalie Weber
The structure of sound systems in particular languages. Phonemic and morphophonemic analysis, distinctive-feature theory, formulation of rules, and problems of rule interpretation. Emphasis on data description and problem solving.

LING 633a, The Literate Brain and Mind Kenneth Pugh
The neurobiological and cognitive foundations of reading and writing. Emerging research on gene-brain-behavior analyses of typically and atypically developing readers. The relationship between speech perception/production and individual differences in literacy learning; distributed brain circuits that support word reading, text comprehension, and second-language learning; the neurobiology of acquired and developmental reading and writing disorders.

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 636b, 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 638b, Encoding Speech in Minds and Machines Jason Shaw
This class introduces analytical tools that support quantitative reasoning about speech. Methods for encoding speech in computer applications are considered alongside theories of how speech is represented in human minds. The purpose in examining these two areas together is to explore the degree to which theories of the mental representation of speech can inform smart computer applications and the degree to which machine-learning techniques can advance the study of the human mind. Topics include computational modeling of speech movements, the resulting speech signal, human speech perception behavior, as well as relevant computational tools for signal processing, feature extraction, and machine learning. No prior experience with MATLAB or R is necessary, but some general familiarity with programming is required.

LING 641a, Field Methods Chelsea Sanker
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 Veneeta Dayal
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 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 677a, Topics in Semantics: Time and Possibility Joshua Phillips
What are the mechanisms by which natural languages "displace" discourse in terms of time and possibility space? An introduction to a range of temporal and modal phenomena as exhibited in natural language. We develop formal/model-theoretic tools based on intensional logics in view of better understanding the meaning of tense, aspectual and modal operators, the structure of these semantic domains, and their relation to other linguistic categories (including negation and evidentiality). Pre- or

corequisite: LING 663 (or other introduction to formal semantics) or permission of the instructor.

LING 732a, Linguistic Structure in Speech Planning and Production Jason Shaw
How do the cognitive processes involved in speech production relate to linguistic structure, including the morphological and phonological structure of words? This seminar engages with this question by bringing together primary readings on (1) neurocognitive models of speech motor control and (2) language-specific phonetic patterns, as they relate to morphological and phonological structure. Prerequisite: LING 620, LING 635, LING 636, LING 638, or permission of the instructor.

LING 744a, Topics in Phonology: Prosody, Syntax, Structure Natalie Weber
Introduction to the analysis of prosodic structure, with a focus on the relation of prosodic structure to syntax. Survey of current theories of the correspondence between syntactic and prosodic structure. Particular emphasis on comparing theories and their predictions for language typology. Some empirical analysis of prosodic structure in individual languages. Prerequisites: LING 632 and LING 653, or permission of the instructor. LING 635 is recommended but not required.

LING 765a, Semantic Change Joshua Phillips
Investigation of systematic change in the domain of semantics and pragmatics. Empirical phenomena include grammaticalization in the domain of tense, aspect, and modality markers, markers of location and possession, and negation, as well as intensifiers. Focus on reconciling grammaticalization and typological research with formal semantic studies. Prerequisite: LING 663 or permission of the instructor.

LING 772a, Meaning, Concepts, and Words Maria Pinango
The only way a finite brain can produce an unlimited number of novel thoughts is by storing a finite system. It is proposed that part of this system is a large collection of stored parts, which we call "concepts" and which are further combined and recombined via predetermined principles. In order to allow us to express our thoughts, our finite brain must also include a system of associating combinations of concepts with combinations of words and sentences. In this seminar we investigate proposals and empirical evidence from cognitive psychology, linguistics, and cognitive neuroscience, seeking to explain this connection between the ways we combine our concepts and the ways we combine our words and phrases.

LING 779a, Morphology-Syntax Interface Jim Wood
A research seminar in which original research is surveyed and discussed critically. The course is appropriate for advanced undergraduates with some training in linguistics (and/or who are conducting research for senior theses), and graduate students who are conducting original research.

LING 780a, Topics in Computational Linguistics: Neural Network Models of Linguistic Structure Robert Frank
An introduction to the computational methods associated with "deep learning" (neural network architectures, learning algorithms, network analysis). The application of such methods to the learning of linguistic patterns in the domains of syntax, phonology, and semantics. Exploration of hybrid architectures that incorporate linguistic representation into neural network learning. Prerequisites: Python programming, basic calculus and linear algebra, introduction to linguistic theory (LING 106, 110, 116, 217 or equivalent).

Management

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

Dean
Kerwin Charles

Director of Graduate Studies
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Professors Rick Antle, David Bach, Nicholas Barberis, James Baron, Paul Bracken, Lorenzo Caliendo, Judith Chevalier, James Choi, Ravi Dhar, Jonathan Feinstein, Shane Frederick, Stefano Giglio, William Goetzmann, Gary Gorton, Edward Kaplan, Bryan Kelly, Sang-Hyun Kim, Marissa King, Andrew Metrick, A. Mushfiq Mobarak, Tobias Moskowitz, Barry Nalebuff, Nathan Novemsky, Edieal Pinker, K. Geert Rouwenhorst, Nils Rudi, Peter Schott, Fiona Scott-Morton, Jiwoong Shin, Kelly Shue, Edward Snyder, Olav Sorenson, Matthew Spiegel, K. Sudhir, Shyam Sunder, Jacob Thomas, Heather Tookes, Amy Wrzesniewski, Gal Zauberman, X. Frank Zhang

Associate Professors Saed Alizamir, Tristan Botelho, Victoria Brescoll, Rodrigo Canales, Jason Dana, Joyee Deb, Florian Ederer, Donald Lee, Vahideh Manshadi, Justin Murfin, George Newman, Amandine Ody-Brasier, Kosuke Uetake

Participating faculty from the School of Management Julia DeBenigno, Cydney Dupree, Soheil Ghili, Paul Goldsmith-Pinkham, Zeqiong Huang, Ivana Katic, Balázs Kovács, Michael Kraus, Song Ma, Aniko #ry, Taly Reich, Thomas Steffen, Alexander Zentefis, Jidong Zhou

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 specialization in Accounting prepares students to become accounting scholars engaged in research and teaching at the highest levels in the general areas of financial information and contracting within and across organizations. It is designed to develop strong theoretical and empirical skills. There is heavy emphasis on students' original research, which is supported through courses, presentations, feedback, joint work,

and informal interactions with the faculty and fellow students in accounting and other disciplines.

During the first two years of the program, students are required to take the following courses: General Economic Theory: Microeconomics (ECON 500 and ECON 501), Econometrics I (ECON 550), Econometrics II (ECON 551), Seminar in Accounting Research I (MGMT 700), Seminar in Accounting Research II (MGMT 701), Seminar in Accounting Research III (MGMT 702), and Seminar in Accounting Research IV (MGMT 704). Students typically take the four Economics courses and two of the Accounting Research seminars during their first year, and the two remaining Accounting Research seminars and four other courses during their second year. Students may substitute graduate-level courses in statistics for ECON 550 and ECON 551 with permission from their faculty adviser. The summer months at the end of years one and two are devoted to completing original research papers (due by September 1 and October 1, respectively).

In addition, students should fulfill the following requirements: audit the Accounting Research seminars (MGMT 700, MGMT 701, MGMT 702, and MGMT 704) in years three and four; pass all other Ph.D.-level seminars taught by Accounting faculty in years one to four; register for the Accounting seminar (MGMT 781-02) and the Accounting pre-seminar (MGMT 782-02) in years one to four; and register for the Finance pre-seminar (MGMT 782-01) in years one to four.

After four terms in the program (typically by mid-June), students take a faculty-written, three-day qualifying exam aimed at assessing their intellectual readiness to start dissertation research. They remain in residence for five years while they receive a stipend. During this period each student is assigned to a member of the faculty as a research assistant. Students in their third term will also have the option of accepting teaching assistantships. To register for their seventh term of study, students submit an approved dissertation prospectus. Students are expected to complete their dissertations by the end of the sixth year but may petition for a seventh year of study if academically necessary.

SPECIAL REQUIREMENTS IN FINANCIAL ECONOMICS

The specialization in Financial Economics prepares students to launch a career in academic finance. Students should seek out faculty with whom they may wish to work early in the process to ensure a smooth transition from one stage of the program to the next.

Students are required to take twelve courses. In the first year of study, students are expected to take Financial Economics I (MGMT 740), Financial Economics II (MGMT 741), General Economic Theory: Microeconomics (ECON 500 and ECON 501), Econometrics I (ECON 550), and Econometrics II (ECON 551). Some students with limited math or economics backgrounds may be advised to postpone taking some of these courses until their second year of study. In addition, students are expected to take the Ph.D.-level courses offered by the Finance faculty. Availability and topics vary by year. Students must receive a grade of Honors in at least one full-year or two term-long graduate courses. Furthermore, students must have no more than one grade of Pass in these courses. To be admitted to candidacy, a student must pass both

Financial Economics I and II as well as the topic courses offered in the year the student takes the qualifying exam and maintain an HP average in their courses.

Research papers Students are expected to write original research papers during the summers after their first and second years of study. Both papers must be solo authored. The topic of the first-year paper requires written approval from the student's faculty adviser; the deadline to submit that approval to the DGS is May 15. The paper itself is due to the director of the program by the second Monday in August. The second-year paper proposal must be approved by May 15 by a member of the Finance faculty who has agreed to supervise the project. The paper itself is due to the student's adviser by the second Monday in August.

Students whose papers receive a failing grade may be dismissed from the program.

Qualifying exam The two-part qualifying exam covers the Ph.D.-level Finance courses taken in the first two years of study. Unless given a waiver by the director of the Finance Ph.D. program, students must take the relevant section of the qualifying exam before the last business day before June 15 of their first and second years of study. A student who fails either section of the exam may retake it once, by the final business day before August 1. A student who fails either section of the exam a second time will be dismissed from the program.

Dissertation Students must write a dissertation prospectus and assemble a dissertation committee in order to register for a sixth term of study. The committee must have at least three members, at least two of whom must be from the Finance faculty unless a waiver is given by the program director. If a student cannot form a committee prior to the start of the sixth term of study, the student will be withdrawn from the program.

Prior to submission 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 when they believe there are only minor problems with the dissertation and delegate the final decision regarding corrections of those problems to the committee.

Special Requirements in Marketing (Behavioral)

Students are required to take twelve Ph.D.-level courses in their first two years of study: three behavioral marketing core courses (MGMT 753, MGMT 754, MGMT 758; two empirical methods courses that cover the topics of experimental design and statistics; two breadth courses that cover the topics of quantitative marketing and microeconomics; and five 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). Students may take other courses as electives if the faculty adviser permits. Students are expected to obtain at least two Honors grades and a High Pass average in the twelve courses.

Research papers Students are expected to write original research papers during the summers after their first and second years of study. Either paper may be coauthored

with other students or faculty. Students select a faculty adviser for each paper and work with the adviser during the summer to develop the paper. The paper is due by the start of the fall term following that summer (i.e., the start of the fall term of the second year for the first-year paper and the start of the fall term of the third year for the second-year paper). The paper must be presented in the Behavioral Marketing Research Workshop during the fall term of the academic year in which the paper was due. These two research papers are considered to be the student's qualifying exam.

Dissertation The dissertation typically consists of two or three essays which are completed in the student's third through fifth years of study. Prior to starting work on the dissertation, the student must write a dissertation prospectus and finalize the 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 of study.

Prior to submission of the dissertation to the Graduate School, the student must defend it before the student's committee, other faculty members, and interested doctoral students. The faculty could accept the dissertation as is, require minor changes, or reject the dissertation and ask the student to redo one or more essays.

SPECIAL REQUIREMENTS IN MARKETING (QUANTITATIVE)

Students are required to take 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 (MGMT 750, MGMT 755; MGMT 753, MGMT 754, or MGMT 758); 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). Students may take some other courses as electives if the faculty adviser permits. Students are expected to obtain at least two Honors grades and a High Pass average in the remaining twelve courses.

If a student has requested and received a waiver for any of the above courses, the total number of required courses drops by the number of waivers received.

Research papers Students are expected to write original research papers during the summers after their first and second years of study. Either paper may be coauthored with other students or faculty. Students select a faculty adviser for each paper and work with the adviser during the summer to develop the paper. The first paper must be presented in the Ph.D. Student Research Workshop during the fall term of the student's second year of study. The second paper must be presented in the Ph.D. Student Research Workshop in the student's third year of study.

Qualifying exam Students must successfully complete the qualifying exam in Marketing at the end of their second year of study. The exam is administered no later than June 15. A student who fails to successfully complete the exam may retake it once; retakes are generally scheduled during August of the year in which the student first took the exam. A second failure results in dismissal from the program.

Dissertation The dissertation typically consists of three essays which are completed in the student's third through fifth years of study. Prior to starting work on the dissertation, the student must write a dissertation prospectus and finalize the

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 of study.

Prior to submission of the dissertation to the Graduate School, the student must defend it before the student's committee, other faculty members, and interested doctoral students. The faculty could accept the dissertation as is, require minor changes, or reject the dissertation and ask the student to redo one or more essays.

SPECIAL REQUIREMENTS IN OPERATIONS

Students are required to take at least twelve courses: two core courses (ECON 500 and ENAS 649), typically completed in the first year of study; five methods courses (ECON 501; ENAS 530; S&DS 541, S&DS 542, S&DS 551); two operations modeling courses (MGMT 720, MGMT 721), completed in the second year of study; and at least three elective courses scheduled in consultation with the student's course adviser. Under unusual circumstances and with the approval of both the adviser and the DGS, students may fulfill some of the methods course requirements with alternative offerings.

Research paper During the summer after the first year of study, each student works with an Operations faculty member on an ongoing research project. By September 30 the student must write a paper and prepare a presentation on the project for the Operations group internal seminar. Continuation in the program is contingent upon faculty approval of the paper.

General exam The general exam has two components, an exam based upon the course work of the first two years, and a research paper. The course-work exam is scheduled by faculty sometime after the last day of spring-term, second-year exams and prior to June 1. Students then spend the summer writing an original research paper on a topic chosen from a list provided by the Operations faculty (or, with the approval of the faculty, on a topic of the student's own choosing); the paper must be submitted by September 30. Faculty will evaluate the student's continued enrollment in the program based upon the course-work exam and the research paper. Students who do not pass the exam will be offered a chance for remediation prior to the end of the fall term of their third year of study.

Dissertation Prior to the start of the seventh term of study, the student must submit a proposal for the dissertation as an application to doctoral candidacy. Based upon this proposal and the student's previous performance, the faculty will decide whether to admit the student to candidacy.

SPECIAL REQUIREMENTS IN ORGANIZATIONS AND MANAGEMENT

Upon admission, each student is assigned a faculty adviser who helps the student design an individualized program that prepares the student to do research in the student's area of interest. All students must complete 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); 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 625); one breadth course

outside the student's area of study, chosen in consultation with the student's adviser; and one additional elective chosen in consultation with the adviser. Beginning in their third year, students are also expected to present in the Organizations and Management Workshop once per year.

Research papers and qualifying exam During the summer after the first year of study, each student collaborates on a research paper with a faculty member. An initial draft of the paper should be completed by September 30, and the completed paper should be approved by two faculty members and submitted by 5 p.m. of the last day of classes of the fall term. Students will present these coauthored papers in the Ph.D. Student Research Workshop in the fall of the second year.

During the summer after the second year of study, each student works on a research paper under the guidance of a faculty member. An initial draft of the paper should be submitted by 5 p.m. of the last business day in October of the student's third year of study. Students will present these papers in the Ph.D. Student Research Workshop in their third year of study. The second summer paper is considered the qualifying exam and will be vetted by both the Organizations and Management faculty and the DGS.

Dissertation Once students have completed their course work, first-year paper, and qualifying exam, they may apply for admission to candidacy. As part of this application, students must submit a proposal for their planned dissertation and form a four-person dissertation committee to advise this research. Admission to candidacy depends on approval of the proposed plan of study and 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 of study.

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 seven required courses: ECON 500; ECON 501, which covers an introduction to game theory; ECON 550 and ECON 551; MGMT 740; MGMT 742; and MGT 545. Note: Students may substitute MGMT 741 for MGT 545. If MGMT 742 is not offered in the student's second year in the program, the student may choose in its place one of the following graduate finance courses: MGMT 745, MGMT 747, or MGMT 748. *J.D.:* 71 credit units at Yale Law School, including the required first-term courses taken in one term (Contracts, Torts, Civil Procedure, and Constitutional Law); Criminal Law; a course satisfying the legal ethics requirement; and Business Organizations.

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 section of the qualifying exam pertaining to MGMT 740 and MGMT 742 (or the doctoral finance course taken in place of

MGMT 742 when it is not offered in the student's second year in the program). The qualifying exam is taken after the student has completed all required graduate finance courses.

Dissertation and oral defense

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. (en route to the Ph.D.) A student who completes the required courses with a High Pass average and the first-year paper will be eligible for the M.A. degree upon the recommendation of the program's faculty and the approval of the Graduate School.

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 702a, Seminar in Accounting Research III Anya Nakhmurina, Frank Zhang, Jake Thomas, Raphael Duguay, Edward Watts, and Thomas Steffen
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 704b, Seminar in Accounting Research IV Jake Thomas and Frank Zhang
Study of empirical accounting research that covers topics such as relation between accounting information and stock prices, analyst forecasts, taxes, and incentives to manage accounting information.

MGMT 720a / ECON 675a, Models of Operations Research and Management Vahideh Hosseinikhah Manshadi
The course exposes students to main stochastic modeling methods and solution concepts used to study problems in operations research and management. The first half of the class covers analysis of queuing models such as Markovian queues, networks of queues, and queues with general arrival or service distributions, as well as approximation techniques such as heavy traffic approximation. The second half focuses on control of stochastic processes; it covers finite and infinite-horizon dynamic programming problems, and special classes such as linear quadratic problems, optimal stopping, and multi-armed bandit problems. ½ Course cr

MGMT 721a, Modeling Operational Processes Nils Rudi

MGMT 737b, Applied Empirical Methods Paul Goldsmith-Pinkham

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 743b, Continuous Time Finance Staff
This is a doctoral-level course in the empirical analysis of financial data. The course covers some of the more important works in empirical asset pricing, beginning with the early development and tests of the efficient market paradigm, but focuses on modern evidence and research on market efficiency, trading profits, and information-based arbitrage. The course also covers common empirical methods and databases used in asset pricing. The course requires the reading of three to five research papers per week, presentations and class participation in discussions, referee reports, and a final empirical paper.

MGMT 744b, Household Finance James Choi
This course introduces students to the field of household finance, the study of how households interact with financial instruments and markets. The course covers theory and evidence in topics such as lifecycle portfolio allocation and saving, household debt, financial product and institutional design, and financial advice. An important secondary objective of the course is to teach students the art of empirical research: (1) identifying important and interesting questions, (2) identifying the challenges to answering those questions convincingly, (3) understanding common empirical methodologies to overcome those challenges, along with each method's strengths and weaknesses, and (4) learning about settings and data sources that allow the application of these methodologies.

MGMT 745b / ECON 672b, Behavioral Finance Nicholas Barberis
Much of modern financial economics works with models in which agents are rational, in that they maximize expected utility and use Bayes's law to update their beliefs. Behavioral finance is a large and active field that studies models in which some agents are less than fully rational. Such models have two building blocks: limits to arbitrage, which make it difficult for rational traders to undo the dislocations caused by less rational traders; and psychology, which catalogues the kinds of deviations from full rationality we might expect to see. We discuss these two topics and then consider a number of applications: asset pricing (the aggregate stock market and the cross-section of average returns); individual trading behavior; and corporate finance (security issuance, corporate investment, and mergers).

MGMT 746b, 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 749a, Financial Econometrics Bryan Kelly

MGMT 751b, Seminar in Marketing II Aniko Oery
Current issues in marketing related to product planning, pricing, advertising, promotion, sales force management, channels of distribution, and marketing strategy are addressed through the study of state-of-the-art papers.

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 758b / PSYC 602b, Foundations of Behavioral Economics Shane Frederick
The course explores foundational topics in behavioral economics and discusses the dominant prescriptive models (which propose what decision makers should do) and descriptive models (which aim to describe what decision makers actually do). The course incorporates perspectives from economics, psychology, philosophy, decision theory, and finance, and engages long-standing debates about rational choice.

MGMT 781a or b, Workshop Staff
781-01, Accounting/Finance Workshop; 781-03, Marketing Workshop; 781-04, Organizations and Management Workshop; 781-05, Operations Workshop.

MGMT 782a or b, Doctoral Student Pre-Workshop Seminar Staff
782-01, 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 or b, 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*), Daniel Spielman (*Computer Science*), Van Vu, John Wettlaufer (*Earth & Planetary Sciences; Physics*), Gregg Zuckerman (*Emeritus*)

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.

MASTER'S DEGREES

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

M.S. (en route to the Ph.D.) A student must 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. The M.S. degree is conferred only en route to the Ph.D.; there is no terminal master's degree program in Mathematics.

COURSES

MATH 500a, Modern Algebra I 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, projective modules. Other topics may be discussed at the instructor's discretion. After MATH 350 and MATH 370.

MATH 515b, Intermediate Complex Analysis Alexander Goncharov
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 Lu Wang
Construction and limit theorems for measures and integrals on general spaces; product measures; Lp spaces; integral representation of linear functionals.

MATH 525b, Introduction to Functional Analysis 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 Yair Minsky
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 544a, Introduction to Algebraic Topology I Franco Vargas Pallete
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 573a, Algebraic Number Theory Congling Qiu
Structure of fields of algebraic numbers (solutions of polynomial equations with integer coefficients) and their rings of integers; prime decomposition of ideals and finiteness of the ideal class group; completions and ramification; adeles and ideles; zeta functions.

MATH 600a, Topics in Homogeneous Dynamics and Geometry Hee Oh
After studying some basic properties of linear groups, we discuss how to generalize the Patterson-Sullivan theory for Kleinian groups to discrete subgroups of higher rank semisimple Lie groups. This course should be accessible to beginning graduate students.

MATH 617b / AMTH 617b, Partial Differential Equations John Schotland
Classical theory of Laplace, heat and wave equations including energy methods and maximum principles; distribution theory and the Fourier transform; Sobolev spaces; elliptic boundary value problems. The latter part of the course emphasizes functional analytic techniques and estimates rather than explicit solutions.

MATH 671a, Lie Groups and Representation Theory Alexander Goncharov
Lie groups, examples, Poisson-Lie groups, quantum groups, cluster Poisson approach to Poisson-Lie and quantum groups.

MATH 675a / AMTH 675a, Numerical Methods for Partial Differential Equations Vladimir Rokhlin
(1) Review of the classical qualitative theory of ODEs; (2) Cauchy problem. Elementary numerical methods: Euler, Runge-Kutta, predictor-corrector. Stiff systems of ODEs: definition and associated difficulties, implicit Euler, Crank-Nicolson, barrier theorems. Richardson extrapolation and deferred corrections; (3) Boundary value problems. Elementary theory: finite differences, finite elements, abstract formulation and related spaces, integral formulations and associated numerical tools, nonlinear problems; (4) Partial differential equations (PDEs). Introduction: counterexamples, Cauchy–Kowalevski theorem, classification of second-order PDEs, separation of variables; (5) Numerical methods for elliptic PDEs. Finite differences, finite elements, Richardson and deferred corrections, Lippmann–Schwinger equation and associated numerical tools, classical potential theory, "fast" algorithms; (6) Numerical methods for parabolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, integral formulations and related numerical tools; (7) Numerical methods for hyperbolic PDEs. Finite differences, finite elements, Richardson and deferred corrections, time-invariant problems and Fourier transform.

MATH 701b / AMTH 701b, Topics in Analysis Peter Jones
This course provides an introduction to some topics in harmonic analysis and probability. Starting with basic dyadic analysis, we use this to give a short introduction to stochastic processes. We then give an introduction to quasiconformal mappings and results concerning random Jordan curves in R2. The main theorem discussed at the end of the course is contained in K. Astala, P. Jones, A. Kupiainen, E. Saksman, "Random Conformal Weldings," *Acta Mathematica* 207 (2011): 203–254. Some of the topics to be covered are: dyadic grids, maximal functions, and domain decomposition; Haar wavelet analysis, square functions, and Lp estimates; positive measures and product formulas, dyadic earth mover distances; wavelets and applications to function spaces; probability theory in the dyadic setting and the martingale convergence theorem; random walk, Brownian motion (via Haar functions) and introduction to stochastic processes, Feynman-Kac formalism; Brownian motion and relations to L2. Other topics covered depend on students' interests and could include: the Johnson-Lindenstrauss theorem and relations to random Gaussian vectors; the Gaussian Free Field and Kahane's theorem on exponentiation of the GFF; multiscale estimates for Kahane's theorem; degenerate QC mappings and applications related to Kahane's theorem on the GFF. A background in basic graduate-level analysis (e.g., MATH 320 and MATH 325) is assumed, though most of the material can be understood by anyone with an understanding of Lebesgue measure.

MATH 703b, Topics in Representation Theory Ivan Loseu
The course discusses classical and modern aspects of the infinite dimensional representation theory of semisimple Lie algebras over the complex numbers. Topics covered include the category O, Harish-Chandra bimodules, the Soergel theory. Additional topics may include finite W-algebras.

MATH 704b, Fractal Geometry Or Landesberg
An introduction to fractal geometry, the study of geometric properties of general sets and measure in Euclidean spaces. Throughout the course we develop the tools required to study such objects including Hausdorff dimension and relevant measure differentiation theorems. We study several constructions of fractals, such as attractors of

iterated function systems and self-similar sets. As time permits we discuss applications of this theory to a few problems in number theory and dynamics. Prerequisites: measure theory and metric spaces/point-set topology.

MATH 705b, Smooth Extension and Interpolation of Data Kevin O'Neill
This course focuses on the problem of fitting a function through a set of data while optimizing its smoothness. We begin by discussing Whitney's extension problem, using the ideas from its recent solution and related research to discuss the Fefferman-Klartag algorithms for interpolation, the Callahan-Kosaraju decomposition, analysis of outliers, computation of trace norms, and vector-valued problems. Topics toward the end of the course may include Sobolev interpolation/extension, convex interpolation, interpolation with constraints, or manifold fitting, according to demand.

MATH 706b, Geometry of Stokes Phenomena Andrew Neitzke
The Stokes phenomenon is a fundamental feature of the theory of irregular singularities, broadly understood. One manifestation of this phenomenon is the fact that the asymptotic behavior of a holomorphic (in particular smooth) function can exhibit discontinuous jumps. This happens already for many classical special functions, e.g., the gamma function, Bessel functions, Airy function. The Stokes phenomenon has a surprisingly rich geometry in it, and conversely it is an important ingredient in understanding some geometric problems—in particular, in some approaches to mirror symmetry and in the geometry of moduli spaces of Higgs bundles. In this course we begin with relatively "classical" examples of Stokes phenomena, such as the Airy function and solutions of linear ODEs, and then move to the geometric applications.

MATH 707b, Convergence Theory of Manifolds Jiewon Park
This course covers a range of topics in comparison and convergence theory of Riemannian manifolds, including comparison theorems for sectional curvature and Ricci curvature, Gromov-Hausdorff convergence, estimates for some fundamental elliptic and parabolic equations on manifolds, and Cheeger-Colding-Naber theory. Prerequisite: basic knowledge of Riemannian geometry. Some basic knowledge of elliptic PDEs is helpful but not strictly required.

MATH 708a, Quantum Geometry and Topology Staff
Jones polynomial/Kauffman bracket, quantum groups and Reshetikhin-Turaev invariant, Teichmüller space/decorated Teichmüller space and their shear/length coordinates, character varieties and skein algebras, quantum Teichmüller space and Muller algebra, Baseilhac-Benedetti invariant, stated skein algebras; higher rank versions of these, in particular interactions among Fock-Goncharov theory/quantum group theory/skein theory; volume conjecture.

MATH 709b, Topics in Algebraic Geometry Staff
This topic course in algebraic geometry focuses on the study of the topology of algebraic maps. We start with an introduction to perverse sheaves. These are certain "nice" objects in the derived category of constructible sheaves on algebraic varieties that play crucial roles in topology, geometry, and representation theory. Then we introduce the Decomposition Theorem of Beilinson, Bernstein, Deligne, and Gabber. This provides a powerful tool in the study of algebraic maps between varieties where perverse sheaves appear naturally. Further applications, connections, and open questions are discussed. These include Ngô's

support theorem, topology of Hitchin systems, enumerative geometry of Calabi-Yau 3-folds, etc.

MATH 710a / AMTH 710a, Harmonic Analysis on Graphs and Applications Ronald Coifman
This class covers basic methods of classical harmonic analysis that can be carried over to graphs and data analysis. We cover the fundamentals of nonlinear Fourier analysis, including functional approximations in high dimensions. We intend to cover foundational material useful for data organization and geometries.

MATH 711b, Riemannian Geometry Lu Wang
The course covers basic Riemannian geometry: geometry of Riemannian manifolds, connections, curvature, Bianchi identities, completeness, geodesics, exponential map, Gauss's lemma, Jacobi fields, comparison theorems, relation between curvature and topology.

MATH 717a, Arithmetic of Cyclotomic Fields Congling Qiu
This course is an introduction to the arithmetic of cyclotomic fields. An important part is p-adic L-functions. We try to cover the first half of L.C. Washington, *Introduction to Cyclotomic Fields* (GTM 83). Prerequisites: algebraic number theory (need to know local fields; class field theory is not required), Galois theory, abstract algebra, and basic complex analysis.

MATH 827b, Lang Teaching Seminar Miki Havlickova and Brett Smith
This course prepares graduate students for teaching calculus classes. It is a mix of theory and practice, with topics such as preparing classes, presenting new concepts, choosing examples, encouraging student participation, grading fairly and effectively, implementing active learning strategies, and giving and receiving feedback. Open only to mathematics graduate students in their second year.

MATH 991a / CPSC 991a, Ethical Conduct of Research Holly Rushmeier
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, Corey O'Hern, Vidvuds Ozolins,* Brian Scassellati,* Jan Schroers, Udo Schwarz, Mitchell Smooke

Associate Professors Judy Cha, Madhusudhan Venkadesan

Assistant Professors Rebecca Kramer-Bottiglio, Amir Pahlavan, Diana Qiu, Daniel Wiznia*

Lecturers Beth Anne Bennett, Joran Booth, 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; laser diagnostics of reacting and nonreacting 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 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; amorphous metals and nanomaterials including nanocomposites; characterization of crystallization and other phase transformations; nanoimprinting; atomic-scale investigations of surface interactions and properties; classical and quantum nanomechanics; nanostructured energy applications; nanoparticle synthesis for energy applications; combinatorial materials science; in situ transmission electron and 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; 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 R. Howard Bloch, Jessica Brantley, Ardis Butterfield, Raymond Clemens, Stephen Davis, Maria Doerfler, Marcel Elias, Paul Freedman, Valerie Hansen, Felicity Harley, Samuel Hodgkin, Jacqueline Jung, Ivan Marcus, Vasileios Marinis, Emily Thornbury, Shawkat Toorawa, Kevin van Bladel, Jesús Velasco, Mimi Hall Yiengpruksawan, Anna Zayaruznaya

Additional affiliated faculty Adel Allouche (*Emeritus*), Felisa Baynes-Ross, Lucas Bender, Gerhard Bowering (*Emeritus*), Marcia Colish (*Emerita*), John Dillon, Carlos Eire, Roberta Frank (*Emerita*), Walter Goffart (*Emeritus*), Harvey Goldblatt (*Emeritus*), Eric Greene, Frank Griffel, Dimitri Gutas (*Emeritus*), Peter Hawkins (*Emeritus*), Subhashini Kaligotla, Christina Kraus, Traugott Lawler (*Emeritus*), Noel Lenski, Giuseppe Mazzotta (*Emeritus*), Alastair Minnis (*Emeritus*), Robert Nelson (*Emeritus*), Christiana Purdy Moudarres, Barbara Shailor (*Emerita*), Gabrielle Thomas, Jane Tylus, Travis Zadeh

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, 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. (en route to the Ph.D.) Students enrolled in the Ph.D. program may qualify for the M.A. degree upon satisfactory completion of three terms of course work. Minimum requirements include a High Pass average in courses and passing the examination in Arabic, Greek, Hebrew, or Latin.

Terminal Master's Degree Program Students enrolled in the terminal master's degree program must 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, Greek, Hebrew, or Latin. For more information, please visit the program website: http://medieval.yale.edu.

COURSES

MDVL 502a / CPLT 582a / ENGL 545a / FREN 802a, Chaucer and Translation Ardis Butterfield

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

MDVL 533b / ENGL 533b, Medieval Drama Jessica Brantley

This seminar explores the dramatic traditions of late-medieval England from many angles in order to construct a rich, contextual reading of theatrical culture in the period. The biblical cycle drama—sometimes known as Corpus Christi or mystery plays—forms the center of the course, and we consider evidence from all four extant cycles, while concentrating primarily on the N-Town plays. We read the cycle drama in the context of other important genres including liturgical drama, morality plays, saints' plays, mummings and disguisings, and royal entries. Recent critical interest in the histories of performance leads us consider the difference enactment makes to the literary objects we study. But we also think about what it means to read a medieval play, particularly how the visual imagination works for a solitary reader. To this end, we investigate medieval artistic forms that touch the drama without (perhaps) being properly theatrical: liturgy, pageantry, song, spectacle, recitation, book illumination, sculpture, and stained glass. We also attend to the physical forms in which

medieval drama is preserved—i.e., the manuscripts in which we find the texts and performance records. Finally, we consider the legacies of medieval drama as engaged by contemporary playwrights, including Sarah Ruhl (*Passion Play*) and Branden Jacobs-Jenkins (*Everybody*).

MDVL 545a / HIST 545a, Medieval Towns Paul Freedman
European towns from their transformations of the late Roman Empire to 1500. The political, religious, and commercial functions of towns, their government, and the degree of autonomy they possessed are the main topics covered. Comparisons among geographic regions with special attention to regions of precocious developmental and political autonomy such as northern Italy and Flanders.

MDVL 565a / ENGL 503a / HIST 800a, Circa 1000 Valerie Hansen and Emily Thornbury
The world in the year 1000, when the different regions of the world participated in complex networks. Archaeological excavations reveal that the Vikings reached L'Anse aux Meadows, Canada, at roughly the same time that the Kitan people defeated China's Song dynasty and established a powerful empire stretching across the grasslands of Eurasia. Europeans tried to figure out whether the Vikings were a sign of Doomsday, and if so, whether a series of cultural experiments might stave off the end-time, even as the Icelanders tried to decide whether they wanted to be European. In this seminar, students read interpretative texts based on archaeology and primary sources, prepare projects in teams, work with material culture, and develop skills of cross-cultural analysis. Mandatory field trip to the Metropolitan Museum of Art in New York on the second Saturday of the fall term.

MDVL 571a / CLSS 601a, Introduction to Latin Paleography N. Raymond Clemens
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 593a / HSAR 593a, The Body as Medium in Medieval Art and Culture Jacqueline Jung
Since the publication of pioneering studies by Caroline Walker Bynum in the late 1980s, the European Middle Ages has come to be recognized not as an "age of spirituality" but as an emphatically body-oriented culture. The paradoxical bodies of Christ (at once wholly divine and wholly human) and his Virgin Mother were the subject of extensive speculation, scrutiny, and loving devotion in literature, theology, and art; the fragmented remains of the saints were housed in glittering containers for the faithful to venerate; and the living bodies of charismatic men and women became both the vehicles for their own communion with the divine and objects themselves for the devotional (or skeptical) gazes of others. It is the latter facet of medieval visual culture to which this seminar is dedicated. Although we look closely at works of art in various media (especially manuscript painting and sculpture), in which bodies function as representational signs, our main objective is to understand the variety of ways in which active, living bodies could serve as communicative media in spheres both public and private, religious and secular. Topics include the physical and sensory apparatus

of the body in medieval science and medicine; the body as vehicle for the individual's communication with God; the stigmatic body; the rapturous or possessed body as site of discernment; the tortured body as teaching tool; the self-punished body as mimetic spectacle; the courtly body as aesthetic object; and the dissected body as revelation of both personal virtues and cosmic forces. Reading knowledge of French and German is highly recommended but not required.

MDVL 596a / HIST 596a / JDST 761a / RLST 773a, Jewish History and Thought to 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 603a / HIST 603a / JDST 806a / RLST 616a, Jews and Christians in the Formation of Europe, 500–1500 Ivan Marcus
This seminar explores how medieval Jews and Christians interacted as religious societies between 500 and 1500.

MDVL 613a, Medieval Latin: Medieval Mystics from Bernard of Clairvaux to Thomas à Kempis John Dillon
This reading course in Medieval Latin is intended to help students improve their command of Latin through working directly with medieval texts. We read selections from major mystics of the Middle Ages, including works by Bernard of Clairvaux (1090–1153), Hildegard of Bingen's *Scivias* (ca. 1151/1152), the thirteenth-century Latin translation of Mechthild of Magdeburg's *Das fließende Licht der Gottheit* (*Lux divinitatis fluens,* ca. 1250–80), and Thomas à Kempis's *Imitatio Christi* (Imitation of Christ, ca. 1418–27). Prerequisite: one year of formal study of Latin, equivalent to LATN 110 and LATN 120 or LATN 125.

MDVL 621b / CLSS 624b / ENGL 521b / HIST 532b, Advanced Manuscript Studies N. Raymond Clemens
This course builds on the foundation provided by MDVL 620 by focusing on both regional Latin hands and the vernacular hands that grew from the Latin tradition. The backbone of the course is Middle English paleography (no prior experience needed), but the course surveys French, Italian, Hebrew, and German hands as well. Prerequisite: MDVL 620 or MDVL 571 or equivalent study of Latin paleography strongly suggested.

MDVL 660a / HIST 540a, Introduction to Research in Medieval History Paul Freedman
The seminar provides an introduction to research in medieval European history: often-used source genres, methods, and research tools. We focus on working with primary sources in original languages, occasionally in their original manuscript and early printed form. A working knowledge of a medieval language is, therefore, desirable. Yale is particularly fortunate in that the Beinecke Rare Book and Manuscript Library possesses much relevant material, including medieval manuscripts and early printed bibles.

MDVL 663a, From House Churches to Medieval Cathedrals: Christian Art and Architecture to the End of Gothic Vasileios Marinis
This course examines the art associated with, or related to, Christianity from its origins to the end of Gothic. It analyzes major artistic monuments and movements in a variety

of regions, paying particular attention to how art shapes and is shaped by the social and historical circumstances of the period and culture. The class considers art in diverse media, focusing on painting, sculpture, architecture, and decorative arts. Trips to the Yale Art Gallery and the Beinecke Rare Book and Manuscript Library are included. The course aims to familiarize students with key monuments of Christian architecture, sculpture, painting, and related arts, analyzing each within its particular sociocultural and theological perspective. The course stresses the importance of looking at works of art closely and in context and encourages students to develop skills of close observation and critical visual analysis. Additionally, students are encouraged to examine the ways parallel developments in Christian theology, dogma, and liturgy are influenced by art. Prerequisites: basic knowledge of Christian history and familiarity with the Bible.

MDVL 665a / ENGL 500a / LING 500a, Old English I Emily Thornbury
The essentials of the language, some prose readings, and close study of several celebrated Old English poems.

MDVL 666b / ENGL 502b, Old English II Emily Thornbury
Readings in a variety of pre-Conquest vernacular genres, varying regularly, with supplementary reading in current scholarship. Current topic: the Exeter anthology of Old English poetry, comprising saints' lives, lyrics, elegies, wisdom poetry, riddles, and more.

MDVL 679b / NELC 669b, Near Eastern Manuscript Research Kevin van Bladel
Introduction to research using manuscripts in Near Eastern languages. Topics include codicology, palaeography, manuscript history, textual criticism and edition, and a variety of other matters specific to Near Eastern manuscripts. Prerequisites: reading ability in one premodern Near Eastern language and permission of the instructor.

MDVL 731a, Origins of Christian Art in Late Antiquity Felicity Harley
This course examines the origins and development of Christian art in the visual culture of Roman late antiquity, ca. 200–ca. 500 CE. Its aim is to introduce students to key developments in the history of Christian art through the close study of images preserved on a range of objects in different media (including frescoes, glassware, sculpture, coins, textiles, mosaic) made for a variety of purposes. The course involves visits to the Yale Art Gallery and focuses on the importance of situating objects within their larger social and cultural context through the analysis of primary source evidence, which may include archaeological, iconographic, epigraphic, and textual sources (Jewish, early Christian, and other contemporary Roman texts). Topics include the literary and archaeological evidence for early Christian attitudes to visual representation; contexts of manufacture; the social and economic basis of patronage; Roman political influence on Christian iconography; development of new genres of imagery; and the role of imperial patronage in the transformation of civic spaces.

MDVL 771b, Francis and Clare of Assisi Staff
In the early thirteenth century, the question of poverty came to the fore in medieval Christianity. Many people rebelled against the structures of the vastly profitable world of trade and asked if it could still be reconciled with Christian values. The most influential figures of this movement were two young people from Assisi in central Italy: Francis and Clare, both later canonized by the Catholic Church. In them we find sincere efforts to live true Christian discipleship according to the rules of the Sermon on the Mount. In this course we explore their biographies and thought. The sources we read

were written both by themselves and by their hagiographers. We seek to determine the extent to which this material is reliable or not and, in addition, aim to construct a historical and theological image of Francis and Clare as we examine enduring and unresolved questions about them. Prerequisites: one of REL 712, REL 713, REL 714, or REL 715, and a course in theology; or sufficient background from previous studies; or permission of the instructor.

MDVL 773a, Core Texts of Thomas Aquinas and William of Ockham Staff
Scholasticism is somewhat like hard-core training for the brain: scholars of the High Middle Ages used Aristotelian philosophy to express Christian belief. Despite later generations mocking the allegedly widespread inflexibility of scholasticism, a closer examination of the doctrines reveals the diversity of theological approaches. In this course, we follow the works of two extraordinary thinkers: Thomas Aquinas, a Dominican in the thirteenth century, and William of Ockham, a Franciscan of the fourteenth century. While Aquinas trusted in the possibilities of reason to resolve most theological problems, the latter questioned whether reason was able to grasp faith. Together, we closely read texts from both authors, seeking to explore their presuppositions, arguments, and conflicts. This approach both helps us to understand a foreign world and presents challenges for our contemporary thought. Prerequisites: one of REL 712, REL 713, REL 714, or REL 715, and a course in theology; or sufficient background from previous studies; or permission of the instructor.

MDVL 776a, Mysticism in the West 1100–1700 Bruce Gordon
As in Judaism, Islam, Hinduism, and Buddhism, mystical experiences—intellective and bodily—are integral to Christianity, beginning with accounts of divine encounters and visions in the Bible. Mysticism, however, is by no means a uniform set of beliefs or practices. It has always occupied a contested place in the western churches, ranging from sanctity worthy of canonization to heresy, censure, and persecution. Indeed, the nature of mysticism within the realm of religious experiences remains hotly debated, especially in the recent work of historians, theologians, anthropologists, and scholars of gender and sexualities. Mystical experiences knew no institutional, doctrinal, societal, or gender boundaries. Those who have left accounts of their experiences—textual, visual, or musical—include theologians and laity, women and men, elites and common folk. We examine a broad range of textual sources, including tracts, devotional works, sermons, and vernacular literature, as well as art and music. Authors and movements are studied in their historical and social contexts, focusing on themes such as sacraments, hierarchies of knowing and sensing, the role of the symbolic, gender, and narratives of the body. The course draws on a wide range of disciplinary perspectives to broaden the range of questions investigated. Prerequisites: REL 712, REL 713, REL 714, or REL 715, and an introductory course in theology; or permission of the instructors.

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 & Biochemistry; Genetics; Therapeutic Radiology*), Choukri Ben Mamoun (*Internal Medicine; Microbial Pathogenesis*), Ronald Breaker (*Molecular, Cellular, & Developmental Biology; Molecular Biophysics & Biochemistry*), Richard Bucala (*Internal Medicine; Epidemiology; Pathology*), Michael Cappello (*Pediatrics; Epidemiology; Microbial Pathogenesis*), Yung-Chi Cheng (*Pharmacology*), Peter Cresswell (*Immunobiology; Cell Biology*), Daniel DiMaio (*Genetics; Molecular Biophysics & 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*), Akiko Iwasaki (*Immunobiology; Molecular, Cellular, & 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 & Biochemistry*), Walther Mothes (*Microbial Pathogenesis*), Melinda Pettigrew (*Epidemiology*), Carla Rothlin (*Immunobiology; Pharmacology*), Craig Roy (*Microbial Pathogenesis; Immunobiology*), Dieter Söll (*Molecular Biophysics & Biochemistry; Chemistry*), Richard Sutton (*Internal Medicine; Microbial Pathogenesis*), Jeffrey Townsend (*Biostatistics; Ecology & Evolutionary Biology*), Christian Tschudi (*Epidemiology*), Paul Turner (*Ecology & Evolutionary Biology*), Yong Xiong (*Molecular Biophysics & Biochemistry*)

Associate Professors Jason Crawford (*Chemistry; Microbial Pathogenesis*), Charles Dela Cruz (*Internal Medicine; Microbial Pathogenesis*), Farren Isaacs (*Molecular, Cellular, & Developmental Biology*), Priti Kumar (*Internal Medicine/Infectious Diseases*), Brett Lindenbach (*Microbial Pathogenesis*), John MacMicking (*Microbial Pathogenesis; Immunobiology*), Kathryn Miller-Jensen (*Biomedical Engineering; Molecular, Cellular, & Developmental Biology*), Christian Schlieker (*Molecular Biophysics & Biochemistry; Cell Biology*)

Assistant Professors Amy Bei (*Epidemiology of Microbial Diseases*), Ellen Foxman (*Laboratory Medicine; Immunobiology*), Nathan Grubaugh (*Epidemiology of Microbial Diseases*), Stavroula Hatzios (*Molecular, Cellular, & Developmental Biology*), Ya-Chi Ho (*Microbial Pathogenesis; Internal Medicine/Infectious Diseases*), Noah Palm (*Immunobiology*), E. Hesper Rego (*Microbial Pathogenesis*), Craig Wilen (*Laboratory Medicine; Immunobiology*), Jing Yan (*Molecular, Cellular, & 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 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 Eric Meffre
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 670a and MBIO 671a or b and MBIO 672b, Laboratory Rotations Walther Mothes
Rotation in three laboratories. Required of all first-year graduate students.

MBIO 685b, The Biology of Bacterial Pathogens II Andrew Goodman
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 Walther Mothes
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 Walther Mothes
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.

Molecular Biophysics and Biochemistry

336 Bass Center, 203.432.5662
https://mbb.yale.edu
M.S., M.Phil., Ph.D.

Chair
Enrique De La Cruz

Director of Graduate Studies
Karla Neugebauer (SHM C123, 203.785.3322, karla.neugebauer@yale.edu

Graduate Registrar
Meghan Killoran (Bass 336, 203.432.5662, mbb.gradregistrar@yale.edu)

Professors Karen Anderson (*Pharmacology*), Susan Baserga, Ronald Breaker (*Molecular, Cellular, & Developmental Biology*), Gary Brudvig (*Chemistry*), Sandy Chang (*Laboratory Medicine*), Enrique De La Cruz, Daniel DiMaio (*Genetics; Therapeutic Radiology*), Donald Engelman, Alan Garen (*Emeritus*), 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, Karin Reinisch (*Cell Biology*), David Schatz (*Immunobiology*), Robert Shulman (*Emeritus*), Fred Sigworth (*Cellular & 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 & Molecular Physiology*), Christian Schlieker, Matthew Simon, Seyedtaghi Takyar (*Internal Medicine/Pulmonary*), Yongli Zhang (*Cell Biology*)

Assistant Professors Franziska Bleichert, 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, seven one-term science courses. To obtain the desired breadth and depth of education, students coming from the BQBS track are required to take two courses in molecular biophysics (one of which must be MB&B 720), one course in critical thinking (MB&B 730), one course in quantitative biology (MB&B 562 and MB&B 635 are recommended but not required), and one course in molecular biology (MB&B 743 is recommended but not required). The second credit in molecular biophysics and the molecular biology credit may be satisfied by taking appropriate courses from an approved list available each fall. Students originating from other BBS tracks (not BQBS) will discuss their curriculum with the MB&B DGS to ensure equivalent foundational course work in MB&B topic areas and may be permitted to reduce the number of required, graded courses by one (for a total of six required courses). 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 successfully 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 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 523b / CB&B 523b / ENAS 541b / PHYS 523b, Biological Physics Corey O'Hern
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 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MCDB 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet, Joe Howard, and Damon Clark
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 570a, Intensive Research for B.S./M.S. Candidates Andrew Miranker
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 602a / CBIO 602a / MCDB 602a, Molecular Cell Biology Thomas Melia
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 630b / MCDB 630b, Biochemical and Biophysical Approaches in Molecular and Cellular Biology Staff
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 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, Karen Anderson, and Thierry Emonet
Required of all first-year BQBS graduate students.

MB&B 676b, Responsible Conduct of Research Susan Baserga, William Konigsberg, Alan Garen, Titus Boggon, Julien Berro, Sarah Slavoff, Sharon Hammes-Schiffer, Zachary Levine, and Luisa Escobar-Hoyos
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 all first-year BQBS graduate students.

MB&B 711b / C&MP 711b, Practical cryo-EM Workshop Franziska Bleichert, Yong Xiong, Sigrid Nachtergaele, and Jack Zhang
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 730a, Methods and Logic in Molecular Biology Mark Solomon, Anthony Koleske, and Christian Schlieker

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 752b and MB&B 753b and MB&B 754b / CB&B 752b / CPSC 752b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon

Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

MB&B 800a, Advanced Topics in Molecular Medicine Susan Baserga and 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).

Molecular, Cellular, and Developmental Biology

Yale Science Building, 203.432.3538
http://mcdb.yale.edu
M.S., Ph.D.

Chair
Vivian Irish

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, Valerie Horsley, Vivian Irish, Akiko Iwasaki,* Douglas Kankel, Paula Kavathas,* Haig Keshishian, Mark Mooseker, Anna Pyle, Hugh Taylor*

Associate Professors Damon Clark, Joshua Gendron, Megan King,* Farren Isaacs, Kathryn Miller-Jensen,* Weimin Zhong

Assistant Professors Shirin Bahmanyar, David Breslow, Nadya Dimitrova, Stavroula Hatzios, Yannick Jacob, Sigrid Nachtergaele, Michael O'Donnell, Josien van Wolfswinkel, Jing Yan

Lecturers Megan Bathgate,* Alexia Belperron,* Francine Carland, Surjit Chandhoke,* Iain Dawson, Seth Guller,* Amaleah Hartman, Ronit Kaufman, Rebecca LaCroix, 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 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 Eric Meffre
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, Physiological Systems 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 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / PHYS 562b, Modeling Biological Systems II Thierry Emonet, Damon Clark, and 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 Ronald Breaker, Craig Crews, Joseph Wolenski, F Kenneth Nelson, Farren Isaacs, and Yannick Jacob
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 585b, Research in MCDB for B.S./M.S. Candidates Valerie Horsley
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 and MCDB 596b, Intensive Research in MCDB for B.S./M.S. Candidates Valerie Horsley
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
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 630b / MB&B 630b, Biochemical and Biophysical Approaches in Molecular and Cellular Biology Staff
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, Nadya Dimitrova, 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. 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. Prerequisite: permission of the instructor.

MCDB 670b, Advanced Seminar in Biochemistry and Genetics Ronald Breaker, Anna Marie Pyle, and Josien van Wolfswinkel
This seminar is designed to expand students' abilities to critically read and evaluate the primary scientific literature relevant to some of the most active areas of biochemical and genetic research. Special emphasis is placed on topics that deal with recent discoveries in nucleic acids, such as catalytic RNA and DNA, functions of noncoding RNA, gene regulation by RNA, and genomic processing and instability. Students read assigned papers in advance. Discussion focuses on experimental design used by the authors, results of the experiments, and conclusions drawn by the authors.

MCDB 680a, Advances in Plant Molecular Biology Yannick Jacob, Vivian Irish, and Josh Gendron
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 752b / CB&B 752b / CPSC 752b / MB&B 752b and MB&B 753b and MB&B 754b / MB&B 753b and MB&B 754b / MB&B 754b, Biomedical Data Science: Mining and Modeling Mark Gerstein and Matthew Simon
Biomedical data science encompasses the analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. It represents a major practical application for modern techniques in data mining and simulation. Specific topics to be covered include sequence alignment, large-scale processing, next-generation sequencing data, comparative genomics, phylogenetics, biological database design, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, normalization of microarray data, mining of functional genomics data sets, and machine-learning approaches to data integration. Prerequisites: biochemistry and calculus, or permission of the instructor.

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

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

MCDB 902a and MCDB 903b, Advanced Graduate Seminar John Carlson and Josien van Wolfswinkel
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 Shirin Bahmanyar
First laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

MCDB 912a / CBIO 912a / GENE 912a, Second Laboratory Rotation Shirin Bahmanyar
Second laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

MCDB 913b / CBIO 913b / GENE 913b, Third Laboratory Rotation Shirin Bahmanyar
Third laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

MCDB 950a and MCDB 951b, 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
Daniel Harrison (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, Anna Zayaruznaya

Assistant Professor Jessica Peritz

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 Renaissance Studies

The Department of Music offers, in conjunction with the Renaissance Studies Program, a combined Ph.D. in Music and Renaissance Studies. For further details, see Renaissance Studies.

MASTER'S DEGREES

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

M.A. (en route to the Ph.D.) Students enrolled in the Ph.D. program qualify for the M.A. degree upon the successful completion of 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.

Terminal Master's Degree Program The department offers admission to a small number of students in a terminal M.A. program. Applicants must submit scores from the GRE General Test. Candidates must pass seven term courses achieving an average of High Pass and at least one Honors, complete a special project, and pass an examination in one foreign language.

COURSES

MUSI 559b, Opera and Representation Gundula Kreuzer
Throughout the long nineteenth century, opera was the most expensive, lavish, and politically implicated multimedia spectacle, with both its production and the act of opera-going offering prime opportunities to negotiate personal and collective identities. By looking at all of opera's complex media—libretti, music, voice types, design, stage technology, architecture, etc.—this seminar addresses various operatic forms and techniques of representation related to such issues as gender, sexuality, class, race, nationalism, (dis)ability, the rise of the masses as a political agent, and the operatic genre itself as a vehicle of colonialism. Following some introductory readings, the course focuses each week on one topic and opera (or select scenes), including works by Rossini, Weber, Meyerbeer, Verdi, Wagner, Puccini, Smyth, and Gershwin, as well as their representation on today's stages. We may contrast these modes of representation with a few contemporary works. A visit to the Metropolitan Opera or other performance is anticipated (if possible). Knowledge of Western musical notation is suggested.

MUSI 699a, Proseminar: Musicology Gary Tomlinson
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 812a or b, Directed Studies: Ethnomusicology Staff

MUSI 814a or b, Directed Studies: History of Music Staff
By arrangement with faculty.

MUSI 901a, 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 914a or b, Directed Studies: Theory of Music Staff
By arrangement with faculty.

MUSI 998a, Prospectus Workshop Anna Zayaruznaya

MUSI 999b, Dissertation Colloquium Anna Zayaruznaya

Near Eastern Languages and Civilizations

Humanities Quadrangle, 203.432.2944
http://nelc.yale.edu
M.A., M.Phil., Ph.D.

Chair
Shawkat Toorawa

Director of Graduate Studies
Kevin van Bladel

Professors John Darnell, Benjamin Foster, Eckart Frahm, Dimitri Gutas (*Emeritus*), Bentley Layton (*Emeritus*), Nadine Moeller, Shawkat Toorawa, Kevin van Bladel, Harvey Weiss

Senior Lecturer Kathryn Slanski

Lecturers and Lectors Sarab al-Ani, Muhammad Aziz, Jonas Elbousty, Ozgen Felek, Shiri Goren, Agnete Lassen, Gregory Marouard, Dina Roginsky, Farkhondeh Shayesteh, Klaus Wagensonner, M. Ezgi Yalcin, Orit Yeret

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 and must submit scores from the General Test of the GRE. 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

Course Work

The department normally requires that students take twenty-three courses distributed over three full years of course work: four yearlong courses or eight term courses per year (seven in the last year) are considered a full load. 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 twenty-three required courses for graduate study, at least eighteen 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 with only twenty courses (see above) 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 Staff
Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 501b, Elementary Akkadian II Staff
Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 510b, Akkadian Dialects Benjamin Foster

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 Muhammad Aziz
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 Muhammad Aziz
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 Jonas Elbousty
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 Jonas Elbousty
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, Intermediate 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, Intermediate 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 527b / NELC 598b, Hunger in Eden: Mohamed Choukri's Narratives Jonas Elbousty
A survey of the work of Mohamed Choukri, one of the most prominent Moroccan, if not Arab, writers to have shaped the modern Arabic literary canon. His influence has been instrumental in forming a generation of writers and enthusiastic readers, who cherish his narratives. Students dive deeply into Choukri's narratives, analyzing them with an eye toward their cultural and political importance. The class looks to Choukri's life story to reveal the roots of his passion for writing and explores the culture of the time and places about which he writes. Through his narratives, students better understand the political environment within which they were composed and the importance of Choukri's work to today's reader regarding current debates over Arab identity. This class surveys the entirety of his work, contextualizing within the sphere of Arabic novelistic tradition. Prerequisite: ARBC 505 or permission of the instructor.

ARBC 560a or b, Graduate Arabic Seminar: al-Suyuti Shawkat Toorawa
Study and interpretation of classical Arabic texts for advanced students. The focus this term is on Arabic scholarly texts.

ARBC 578a, Yemeni Literature and Culture Muhammad Aziz
This course introduces students to a variety of Yemeni novels, short stories, poetry, history, movies, songs, and culture. We delve deeply into the major Arabic literary styles, in their forms of poetry, prose, movies, and series, and gain a general sense of the transitional period between past and present in the modern era. Students are expected to read the material at home and prepare for class discussions. Students grasp some sense of Yemeni history as well as literature in general. Yemeni series and films are an essential part of the course. Evaluation is based on participation, a midterm paper, and a final project. Prerequisite: ARBC 503.

ARBC 849a or b, Directed Readings: Arabic. Shawkat Toorawa

EGYP 500a, Introduction to Classical Hieroglyphic Egyptian I Staff
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 Staff
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 Camille Angelo
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 Ramona Teepe
Continuation of EGYP 510. Prerequisite: EGYP 510.

EGYP 531b, Historical Texts of Egypt and Nubia John Darnell
This course examines textual evidence regarding Egypt's relationship with Nubia from the Old Kingdom through the Ramesside Period, focusing on close reading of the texts of royal monuments, private autobiographical inscriptions, military dispatches, and graffiti from the Nubian deserts. Background reading about the history and archaeology of ancient Nubia supplements the interpretation of the texts. Some texts are read in the original hieratic script. Prerequisite: EGYP 501 or permission of the instructor.

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 Staff
Close reading of Middle Egyptian historical texts in original hieroglyphic and hieratic script. Initial survey of ancient Egyptian historiography and grammatical forms peculiar to this genre of text. Prerequisite: EGYP 501.

EGYP 550a, Introduction to Demotic Staff
Introduction to the script and grammar of demotic, including readings of the *Instruction of Onkhsheshonqy* and excerpts from the bilingual decrees.

EGYP 551b, Demotic Texts Staff
Close reading of Demotic texts of various genres, including wisdom texts, literary compositions, historical inscriptions, documentary texts, and graffiti.

EGYP 567a, Medinet Habu Texts John Darnell
Overview of a complete temple from the New Kingdom, the "Temple of Millions of Years" of Ramesses III located on the west bank at Thebes. Readings of historical and religious texts that discuss the temple's historical significance. Ramesside religious texts with discussion of their transmission, "grammar of the temple," etc. Additional readings cover supporting materials, such as passages from the Great Papyrus Harris, other monuments of Ramesses III, and late variants of the Book of the Dead.

EGYP 599b, 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 510b, Conversational Hebrew: Israeli Media Shiri Goren
An advanced Hebrew course for students interested in practicing and enhancing conversational skills. The course aims to improve the four language skills while stressing listening comprehension and various forms of discussions including practical situations, online interactions, and content analysis. Prerequisite: HEBR 502 or permission of the instructor.

HEBR 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 517b, Hebrew in a Changing World Dina Roginsky
An advanced Hebrew class that focuses on the ways the Hebrew language is used in Israel for constructing social norms, expectations, and day-to-day experiences. Topics include gendered language, political and PC language, military language, slang, humor, dialects, accents, name-giving practices, and Americanization of the Hebrew language. Materials include advertisements, Internet forums, movie clips, skits, maps, political stickers, and newspapers. Prerequisite: HEBR 502 or equivalent.

HEBR 519a / JDST 835a, Israel in Ideology and Practice Dina Roginsky
An advanced Hebrew class that focuses on changing ideology and politics in Israel. Topics include right- and left-wing political discourse, elections, state-religion dynamics, the Jewish-Arab divide, and demographic changes. Materials include newspapers, publications, online resources, speeches of different political and religious groups, and contemporary and archival footage. Also, this course draws comparisons to American political and ideological discourse. Prerequisite: HEBR 502 or equivalent.

HEBR 563b / JDST 695b, From Biblical to Modern Hebrew Dina Roginsky
This course aims to support students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. The course concentrates on reading and aims at enabling students to use Modern Hebrew for research purposes. The texts chosen are tailored to students' particular areas of interest. Prerequisite: two years of Biblical or Modern Hebrew studies, or permission of the instructor. Conducted in English.

HEBR 570a, Contemporary Israeli Art (1948 until Today) Orit Yeret
An advanced Modern Hebrew course that focuses on contemporary Israeli art, from 1948 until today. The course aims to expand students' knowledge of the Hebrew language and refine their writing, reading, speaking, and listening skills through exposure to authentic materials in the field of the visual arts. Students engage with diverse Israeli visual art productions—such as paintings, drawings, sculpture, photography, new media, etc.—and employ critical thinking to discuss and analyze a variety of art pieces. Prerequisite: completion of L4 (Modern Hebrew) or a placement exam.

MESO 506b, Selected Mesopotamian Texts: Sumerian Benjamin Foster
Survey of selected Mesopotamian texts in Sumerian.

MESO 530a, Beginning Sumerian I Staff
A two-term introduction to the Sumerian language.

MESO 531b, Beginning Sumerian II Staff
A two-term introduction to the Sumerian language.

MESO 532a, Intermediate Sumerian Klaus Wagensonner

MESO 544b, Mesopotamian Scholarly Texts Eckart Frahm
Study and interpretation of Mesopotamian scholarly texts, which could include omen treatises, medical texts, and commentaries from Babylonia and Assyria. Prerequisite: knowledge of Akkadian.

MESO 574a, Reading, Editing, and Copying Cuneiform Tablets Benjamin Foster
Students work with previously unpublished Akkadian texts and learn how to copy tablets both manually and in digital form. They are also introduced to new electronic aids in Assyriology. Prerequisite: knowledge of Akkadian.

NELC 500b / ARCG 500b / CLSS 808b, Environmental History of West Asia, Egypt, and the Mediterranean Harvey Weiss
The new linkages of high-resolution paleoclimate and archaeological and epigraphic records revise earlier historiography for the major disjunctions, including societal genesis, collapse, habitat tracking, and technological and ideological innovations, from 4000 to 40 BCE across west Asia, Egypt, and the Aegean. The seminar synthesizes speleothem and lake, marine, and glacial core records for abrupt climate changes and coincident societal adaptations previously unexplained.

NELC 512b, Egyptian Religion through the Ages John Darnell
Diachronic approach to topics in Egyptian religion. Religious architecture, evidence for protodynastic cults, foreigners in Egyptian religious celebrations, music and vocal expression in Egyptian religion, Re and Osiris, the Amarna interlude and the Ramesside solar religion, and the goddess of the eye of the sun. Readings in translation.

NELC 515b, The Bible in Its Ancient Near Eastern Setting (Seminar) Eckart Frahm
History of the Assyrian, Babylonian, and Persian empires of the first millennium BCE, and how their rise and fall influenced the politics, religion, and literary traditions of biblical Israel. Topics include the role of prophecy and (divine) law, political and religious justifications of violence, the birth of monotheism, and the historical reliability of the Hebrew Bible.

NELC 520a, Mesopotamian History of the Third Millennium Benjamin Foster
Readings and discussion of issues and evidence for a selected 500-year period of Mesopotamian history.

NELC 539a / ARCG 539a, Era of the Pyramids: Archaeology and Material Culture of the Old Kingdom, Egypt Gregory Marouard
This seminar examines in detail the Old Kingdom period, covering about eight hundred years of this crucial phase of the Egyptian civilization, from the late phase of the Early Dynastic state formation period (ca. 2850 BCE) to the First Intermediate period (ca. 2050 BCE), encompassing the Third to the Sixth Dynasty. The course is based on an archaeological approach and is not a language or history course. All major archaeological sites of this period are investigated through the scope of material culture, art, and architecture, using as much as possible information from recent excavations and discoveries. The approach includes the study of the large mortuary complexes, from Saqqara to Dahshur, Giza, Abu Rawash, and Abusir, as well as several settlement sites from the central state capital in the Memphite region, the lower and upper provinces to the Egyptian borders. Several aspects of the connections established by Egypt with its neighboring areas such as Nubia and the Levant and desert areas at the periphery of the Nile Valley are included to illustrate the extensive exchange

network and the complex economy and administrative system established to support the major construction projects of the period. Material culture, artistic aspects, and typologies (within an overview of reliefs and statuary), craft productions, everyday life activities, and burial practices are addressed. This course constitutes the first in a series of chronological survey courses in Egyptian archaeology.

NELC 557b, Israeli Narratives Shiri Goren
Close reading of major Israeli novels in translation with attention to how their themes and forms relate to the Israeli condition. Focus on topics and theories of war and peace, migration, nationalism, and gender. Authors include Oz, Yehoshua, Grossman, Matalon, Castel-Bloom, Shalev, and Kashua.

NELC 588a / ANTH 773a / ARCG 773a, Climate Change, Societal Collapse, and Resilience Harvey Weiss
Collapse documented in the archaeological and early historical records of the Old and New Worlds, including Mesopotamia, Mesoamerica, the Andes, and Europe. Analysis of politicoeconomic vulnerabilities, resiliencies, and adaptations in the face of abrupt climate change, anthropogenic environmental degradation, resource depletion, "barbarian" incursions, or class conflict.

NELC 598b / ARBC 527b, Hunger in Eden: Mohamed Choukri's Narratives Jonas Elbousty
A survey of the work of Mohamed Choukri, one of the most prominent Moroccan, if not Arab, writers to have shaped the modern Arabic literary canon. His influence has been instrumental in forming a generation of writers and enthusiastic readers, who cherish his narratives. Students dive deeply into Choukri's narratives, analyzing them with an eye toward their cultural and political importance. The class looks to Choukri's life story to reveal the roots of his passion for writing and explores the culture of the time and places about which he writes. Through his narratives, students better understand the political environment within which they were composed and the importance of Choukri's work to today's reader regarding current debates over Arab identity. This class surveys the entirety of his work, contextualizing within the sphere of Arabic novelistic tradition. Prerequisite: ARBC 505 or permission of the instructor.

NELC 610a / PERS 563a, Reading Persian Texts Farkhondeh Shayesteh
Students enhance their knowledge of Persian, with primary focus on reading skills. The course involves reading, analyzing, and in-class discussion of assigned materials. Excerpts from history, art, philosophy, and literature, as well as art history materials from medieval to modern times, are used. Conducted in Persian. Prerequisite: permission of the instructor.

NELC 627a / ARCG 645a, Archaeology of Ancient Egypt: An Introduction Gregory Marouard
This seminar examines in detail the archaeology of ancient Egypt following the chronological order of Egyptian history and covering almost 4,000 years, from the late Neolithic period to the end of the Greco-Roman period. The aim is not only to give a comprehensive overview of major sites and discoveries but also to use as much as possible information from recent excavations, discuss problems and priorities concerning this field, and offer an introduction to new fieldwork methods and approaches used in Egypt as well as a short history of this discipline.

NELC 662b, Death, Memorial, and Immortality in the Hebrew Bible and Its World Jacqueline Vayntrub
What does the Hebrew Bible have to say about human mortality, divine immortality, and the afterlife? Are these ideas more consistent with later Jewish and Christian notions of death and the afterlife, or are they closer to the views of their ancient Near Eastern neighbors? In this course we examine the development of biblical and ancient Near Eastern concepts of death and life-after-death. We look at a variety of different types of texts that touch upon these themes, such as narrative, poetry, ritual, and law in biblical and other ancient Near Eastern texts. Topics include the depiction of human mortality and divine immortality in literature; dying as a social process; the development of the notion of an afterlife and the concept of the "soul"; communication with the dead; how these texts have been received in the West; and how they have shaped inherited ideas of the immortality of the soul, human suffering, and divine justice. The aim of the course is to develop an awareness of the ancient historical and cultural context in which these texts were authored, and to deepen our understanding of modern views of mortality. Prerequisite: an introductory course in the Bible at some level is preferred.

NELC 669b / MDVL 679b, Near Eastern Manuscript Research Kevin van Bladel
Introduction to research using manuscripts in Near Eastern languages. Topics include codicology, palaeography, manuscript history, textual criticism and edition, and a variety of other matters specific to Near Eastern manuscripts. Prerequisites: reading ability in one premodern Near Eastern language and permission of the instructor.

NELC 768a, Sasanian Seminar Kevin van Bladel
This is an intensive introduction to the primary sources for the study of the Sasanian Persian kingdom (third–seventh century CE) and the state of research on the topic.

NELC 802b, The Islamic Near East from Muhammad to the Mongol Invasion Kevin van Bladel
The shaping of society and polity from the rise of Islam to the Mongol conquest of Baghdad in 1258. The origins of Islamic society; conquests and social and political assimilation under the Umayyads and Abbasids; the changing nature of political legitimacy and sovereignty under the caliphate; provincial decentralization and new sources of social and religious power.

NELC 829a, History of the Arabic Language Kevin van Bladel
The course covers the development of the Arabic language from the earliest epigraphic evidence through the formation of the Classical 'Arabiyya and further, to Middle Arabic and Neo-Arabic. Readings of textual specimens and survey of secondary literature.

NELC 850a, Introduction to Arabic and Islamic Studies Frank Griffel
Comprehensive survey of the various subjects treated in Arabic and Islamic studies, with representative readings from each. Detailed investigation into the methods and techniques of scholarship in the field, with emphasis on acquiring familiarity with the bibliographical and other research tools.

OTTM 630a, Intermediate Ottoman I Ozgen Felek
This course is focused on developing skills that will enable students to read intermediate-level texts in Ottoman Turkish and pursue independent work in Ottoman studies. Original Ottoman texts and excerpts are read and analyzed. These texts could include chronicles, heroic narratives, advice books, physiognomy texts, travel

accounts, and hagiographical stories. In addition, using Korkut Bu#day's *The Routledge Introduction to Literary Ottoman* for grammar and reading passages, the course covers the principles of Turkish grammar, syntax, and textual criticism. Prerequisite: OTTM 620 or permission of the instructor.

OTTM 640b, Intermediate Ottoman II Ozgen Felek
A continuation of OTTM 630 focused on developing skills that will enable students to read intermediate texts in Ottoman Turkish and pursue independent work in Ottoman studies. Original Ottoman texts and excerpts are read and analyzed. These texts could include chronicles, heroic narratives, advice books, physiognomy texts, travel accounts, and hagiographical stories. The principles of Turkish grammar, syntax, and textual criticism are covered as well. Prerequisite: OTTM 620 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 502a, Intermediate Persian I Farkhondeh Shayesteh
This two-term course is a continuation of PERS 501 with emphasis on expanding vocabulary and understanding of more complex grammatical forms and syntax. Designed for nonnative speakers. Prerequisite: PERS 501 or permission of the instructor.

PERS 503b, Intermediate Persian II Farkhondeh Shayesteh
This two-term course is a continuation of PERS 501 with emphasis on expanding vocabulary and understanding of more complex grammatical forms and syntax. Designed for nonnative speakers. Prerequisite: PERS 501 or permission of the instructor.

PERS 563a / NELC 610a, Reading Persian Texts Farkhondeh Shayesteh
Students enhance their knowledge of Persian, with primary focus on reading skills. The course involves reading, analyzing, and in-class discussion of assigned materials. Excerpts from history, art, philosophy, and literature, as well as art history materials from medieval to modern times, are used. Conducted in Persian. Prerequisite: permission of the instructor.

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 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, designed for graduate students who are proficient in Syriac, is organized topically. This term's topics: language (the language of Adam, the language of Paradise); hagiography (Persian martyr acts); scientific texts (pandemic of bubonic plague, medicine); and philosophy.

SMTC 554b / RLST 875b, Advanced Syriac II Jimmy Daccache

This course, designed for graduate students who are proficient in Syriac, is organized topically. This term's topics: language (the language of Adam, the language of Paradise); hagiography (Persian martyr acts); scientific texts (pandemic of bubonic plague, Medicine); and philosophy.

Nursing

400 West Campus Drive, 203.785.2389
https://nursing.yale.edu/academics/phd-program-nursing
M.Phil., Ph.D.

Dean
Ann Kurth

Directors of Graduate Studies
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Lois Sadler (203.737.2561, lois.sadler@yale.edu)

Professors Margaret Grey, Holly Kennedy, M. Tish Knobf, Ann Kurth, Carmen Portillo, Nancy Redeker, Lois Sadler, David Vlahov, Robin Whittemore

Associate Professors Soohyun Nam, LaRon Nelson, Monica Ordway, Julie Womack

Assistant Professors Samantha Conley, Shelli Feder

FIELDS OF STUDY

Fields include chronic conditions (diabetes, cardiovascular disease, cancer, HIV/AIDS); self- and family management; maternal and child health; sleep and sleep disorders; global health; health equity and care of marginalized populations; end-of-life and palliative care; environmental influences on health; and community-based interventions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Course Work

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, Multi-Method Measurement of Biobehavioral Phenomena; NURS 904, Mixed Methods Research; NURS 905, Intervention Development, Testing, and Introduction to Implementation Science; NURS 908, Synthesis of Knowledge and Skills for Nursing Science; NURS 909, Nursing Science 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 nursing, or in any area related to the student's dissertation research, including appropriate methodology and statistics courses. One of the four cognates must be an advanced analysis course appropriate to the dissertation. 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. High Pass is required in all core courses in the first year for a student to be eligible to take the Preliminary Examination. 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, including the required advanced analysis course.

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 course work has been completed. A grade of High Pass or better in each core course is required. The Preliminary Examination is intended to allow the student to demonstrate mastery of doctoral course work. 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 course work 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 1 to 1.5 hours. The student gives a 15-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 1.5 to 2 hours. The student gives a 15- to 20-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 course work, 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 Nursing courses. Not all required courses are offered every year; only courses offered in 2021–2022 are listed below. 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 Samantha Conley
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 902b, Qualitative Methods for Health Research Staff
This course introduces students to major approaches to qualitative research, including newer and innovative methods. Selected topics are presented linking qualitative approaches with stage of knowledge development and steps in the research process, including use of theory, design, conduct, analyses, rigor, reporting, and evaluation of qualitative research. Emphasis is placed on the appropriate use of qualitative methods and differences across qualitative approaches depending on the nature of the research question. The course includes practice with key elements of data collection, analysis, reporting, and critiquing. Required of all Ph.D. students in nursing. Three hours per week.

NURS 906a, Dissertation Seminar I Nancy Redeker
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 per month.

NURS 907b, Dissertation Seminar II Nancy Redeker
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. 1.5 hours every other week for fourteen weeks.

NURS 908a, Synthesis of Knowledge and Skills for Nursing Science Staff
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 909b, Nursing Science and Grant Writing Staff
This course is designed to provide the foundation for students to develop knowledge and skills for becoming a nurse scientist, including beginning competencies in the principles and processes of grant writing.

NURS 912a, Knowledge Development for Nursing Science Staff
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.

NURS 913b, Chronic Conditions: Risk Factors, Prevention, and Management of Adverse Outcomes Samantha Conley
In this course, students examine the concepts of health and illness over the lifespan, in the context of chronic conditions. We focus on relationships among predisposing or contextual factors, processes, and outcomes, considering individual, family, and caregivers, community, and larger societal (social determinants of health) perspectives. We consider early adversity, marginalized populations, and adaptation to chronic conditions over time. Three hours per week for fourteen weeks.

NURS 929b, Responsible Conduct of Research Monica Ordway
These class sessions introduce major concepts in the ethical conduct of clinical research from the perspective of the advanced practice nurse and the nurse-researcher. National and international ethical codes for research and regulatory requirements are reviewed. Emphasis is placed on the protection of vulnerable populations and community-based research, including international research. Required of all first-year Ph.D. students in nursing. Open to others with permission of the instructor.

Pharmacology

Sterling Hall of Medicine B316, 203.785.7469
http://medicine.yale.edu/pharm
M.S., M.Phil., Ph.D.

Chair
Joseph Schlessinger

Director of Graduate Studies
Elias Lolis (SHM B345, 203.785.6233, elias.lolis@yale.edu)

Director of Medical Studies
Benjamin Turk (SHM B395, 203.737.2494, ben.turk@yale.edu)

Professors Karen Anderson, Anton Bennett, Yung-Chi Cheng, Priscilla Dannies (*Emerita*), Barbara Ehrlich, Jonathan Ellman, Leonard Kaczmarek, Irit Lax, Mark Lemmon, Elias Lolis, Gary Rudnick, Joseph Schlessinger, William Sessa, Dianqing (Dan) Wu

Associate Professors Titus Boggon, David Calderwood, Kathryn Ferguson, Ya Ha, Benjamin Turk

Assistant Professors Claudio Alarcón, 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 Molecular Medicine, Pharmacology, and Physiology (MMPP) 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. Students are required to do three laboratory rotations. 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. (en route to the Ph.D.) Students are eligible for the M.S. degree upon successful completion of 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 550a / C&MP 550a / ENAS 550a / MCDB 550a, Physiological Systems 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.

Philosophy

Connecticut Hall, 203.432.1665
http://philosophy.yale.edu
M.A., M.Phil., Ph.D.

Acting Chair
Kenneth Winkler

Director of Graduate Studies
Stephen Darwall (stephen.darwall@yale.edu)

Professors David Charles, Stephen Darwall, Michael Della Rocca, Keith DeRose, Paul Franks, Tamar Gendler, John Hare, 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, Manon Garcia

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 competed some course work within the home department. In either case, students must be accepted into the combined program by each department.

Students in the combined program complete two-thirds of the course requirements of each of the two disciplines, then write a qualifying paper and a dissertation that are fully interdisciplinary. For more details about the program requirements, see http://philosophy.yale.edu/graduate-program/philosophy-and-psychology-combined-phd-program.

MASTER'S DEGREES

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

M.A. (en route to the Ph.D.) An M.A. degree is awarded to students after completion of seven term courses with an average grade of High Pass.

Please see the Philosophy website for information on the program: http://philosophy.yale.edu.

COURSES

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 601a, Skepticism: Historical and Recent Michael Della Rocca
An examination of the various styles of skeptical arguments and of responses to skepticism in the early modern period (seventeenth and eighteenth centuries). Some attention also to comparisons between skepticism in this period and skepticism in contemporary philosophy, in ancient philosophy, and in non-Western thought. Figures to be discussed include Descartes, Spinoza, Leibniz, Astell, Hume, Sextus Empiricus, Zhuangzi, and Nagarjuna.

PHIL 624a, Hegel's *Phenomenology of Spirit* Paul Franks and Hugo Havranek
A close reading of sections of one of the major works in post-Kantian philosophy, currently receiving renewed attention within analytic philosophy. Themes discussed include varieties of skepticism and responses to skepticism; the relationship of epistemology to questions concerning the structures of social practices of reasoning; the historical character of reason; the relationship between natural processes and social developments; the intersubjectivity of consciousness; and the possibility of a philosophical critique of culture. Attention is paid both to commentaries that focus on historical development and to approaches that view historical narratives as allegories whose deeper meaning may be formulated as a logical or semantic theory.

PHIL 625b, Topics in Epistemology Keith DeRose
A survey of some recent work in epistemology, with an emphasis on connections between formal approaches to epistemology and traditional epistemological questions. We explore the power and limitations of Bayesian approaches to epistemology; the relationship between credence on the one hand, and belief and knowledge on the other; higher-order knowledge and probability; and other topics.

PHIL 627b, Computability and Logic Sun-Joo Shin
A technical exposition of Gödel's first and second incompleteness theorems and of some of their main consequences in proof theory and model theory, such as Löb's theorem, Tarski's undefinability of truth, provability logic, and nonstandard models of arithmetic.

PHIL 628b, Ancient Moral Psychology David Charles
The aim of the seminar is to examine Aristotle's discussion of the psychology of ethical virtue and of ethical failing, as exemplified by *akrasia* and various forms of vice, and to compare it with later discussions of similar topics, some ancient and some contemporary. The goal of the seminar is to answer two questions: Did Aristotle develop a distinctive account of ethical motivation that resists analysis into two distinct, independently defined, components (such as reason or intellect and desire)? If so, does it withstand criticism from writers who analyze ethical motivation in terms of reason and/or desire (as two independently defined components)? In addressing the second question we consider criticisms of, and alternatives to, Aristotle's account as developed in some Stoic sources, by David Hume and by some contemporary writers (such as John McDowell and Christine Korsgaard). No knowledge of Greek is required.

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 639b, Modal Logic Sun-Joo Shin
Basic philosophical concepts and logical tools underlying different modal systems, mainly focusing on necessity and possibility. Topics include propositional logic and its natural deductive system; modal operators and development of the simplest natural deductive system; extensions of the basic propositional modal system; intensional semantics; a diagrammatic method to check validity or invalidity; and quantified modal logic (QML). These topics lead to interesting philosophical issues and several nonstandard logical assumptions.

PHIL 641b, Philosophy of Simone de Beauvoir Manon Garcia
Simone de Beauvoir's *The Second Sex* is a benchmark feminist text. But its philosophical claims—and her other philosophical works—were overshadowed for much of her life for personal and professional reasons. For much of the twentieth century she was seen as derivative of her companion, Jean-Paul Sartre, and her work was given partial and problematic English translations that obscured their original richness. The recent publication in English of Beauvoir's student diaries and philosophical works has shown her work in new light. Through a thorough reading of her philosophical works and a selection of her feminist and literary works, this seminar is an in-depth, systematic study of de Beauvoir's philosophy, establishing her contributions to post-Kantian continental philosophy as well as to feminist philosophy.

PHIL 650a, The Problem of Evil Keith DeRose and Miroslav Volf
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 653b, Good and Will Michael Della Rocca
An exploration of the nature of moral reasons, the sources of normativity, the nature of good, and related topics in philosophy of action. Focus on the (alleged) distinction between theoretical and practical reason, the (again alleged) distinction between world-mind and mind-world directions of fit, the (again alleged) distinction between internal and external reasons, and theories of good. Authors to be covered include

Anscombe, Murdoch, Foot, Adams, Nagel, Michael Thompson, Strawson, Korsgaard, and Williams.

PHIL 655b, Normative Ethics Shelly Kagan
A systematic examination of normative ethics, the part of moral philosophy that attempts to articulate and defend the basic principles of morality. The bulk of the course surveys and explores some of the main normative factors relevant in determining the moral status of a given act or policy (features that help make a given act right or wrong). Brief consideration of some of the main views about the foundations of normative ethics (the ultimate basis or ground for the various moral principles).

PHIL 659a, Philosophy of Citizenship Jeremy Lent
For many of us, citizenship seems to amount to little more than voting and paying taxes. Our identities as family members, friends, classmates, colleagues, and so on are often far more salient than our identities as members of political units. But citizenship presents many significant philosophical questions and problems. In this course, we read and assess some of the most interesting arguments about what morality requires, permits, and forbids us to do as citizens. The questions we explore include whether there is a moral duty to obey the law; how morality bears on voting, paying taxes, and philanthropy; whether patriotism is a virtue; and whether it is morally permissible or perhaps even obligatory to ignore politics. Overall, we seek to decide if citizenship is a more consequential component of our identities than we often imagine. Prerequisite: a course in political philosophy or ethics.

PHIL 665b, Recent Work in Ethical Theory Stephen Darwall
A study of recently published works on ethics and its foundations. Issues include the grounds of normativity and rightness, and the role of the virtues.

PHIL 668a, Metaethics Stephen Darwall
A study of moral theorizing and moral discourse. The linguistic role of words like good, bad, right, and wrong; whether propositions that use these terms can be true or false. What ethical claims mean, if anything, and what kinds of reasoning or evidence might justify such claims.

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 677b / WGSS 677b, 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 692b, Metaphysics Meets Cognitive Science: Objects, Causation, Time, and Self Laurie Paul and Brian Scholl
The premise (and promise) of cognitive science is that we will come to understand ourselves better by integrating the insights and contributions from multiple fields of inquiry. This interdisciplinary project has been especially vibrant when it has explored the intersection of philosophy and psychology (for example, when work in ethics integrates empirical work from moral psychology, or when work in the philosophy of mind integrates neuroscientific studies of consciousness). But cognitive science has interacted far less with the study of metaphysics—the philosophical exploration of topics such as time, causation, and possibility. This may seem surprising, since there has been a great deal of fascinating empirical research on the mental representations and cognitive processes involved in such topics. This seminar attempts to bridge this gap, exploring potential interactions between these fields. In particular, we explore the possibility of a "cognitive metaphysics," in which each field is enriched by consideration of the other. How might metaphysical theories raise questions or identify concepts of interest to working cognitive scientists? How might empirical studies from cognitive science on the nature of seeing and thinking contribute to the study of metaphysics? Topics likely include the ways in which we understand the nature (in both the mind and the world) of space, time, objects, events, causality, persistence, and possibility. We also consider some more particular topics, such as the asymmetry between past and future experience, the apparent backwards causation in the context of Newcomb's puzzle, and why the present seems special. A previous course in philosophy or psychology is presumed.

PHIL 705a, First-Year Seminar Shelly Kagan and Daniel Greco
Required of and limited to first-year students in the Philosophy Ph.D. program. Topic varies from year to year. Preparation for graduate work. Reading, writing, and presentation skills.

PHIL 706b, Work in Progress I Laurie Paul
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 715b, Philosophy of Law: Normative Jurisprudence Gideon Yaffe
This course concerns philosophical topics that arise in connection with particular areas of law. Such topics include the justification of criminal punishment; discrepancy in punishment of attempted and completed crimes; the relevance of ignorance of the law to criminal responsibility; self-defense and other forms of preventive violence; the rationale for double-jeopardy restrictions; the conception of justice of import to tort law; the concepts of causation and intention in tort law; the relationship between promises and contracts; the fundamental rationale for property rights; the grounds for and nature of the individualization of the reasonable person standard; the rationale for variations in standards of proof across areas of law. A selection of such topics are examined through consideration of both philosophical essays written about them and legal materials that bear on them. PHIL 703 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 723b, Metaphysics and Epistemic Self-Trust John Pittard
A consideration of arguments that purport to show that some worldview or metaphysical outlook is rationally incompatible with epistemic self-trust (either in general, or in some important domain like morality). Possible topics include skeptical worries posed by contemporary cosmological theories, by causal determinism, by atheistic and theistic multiverse theories, by materialist accounts of mind, by Darwinian evolution, and by theistic responses to the problem of evil. We also consider whether God might face irresolvable skeptical worries.

PHIL 731b, Theological Predication and Divine Attributes John Pittard
An exploration of philosophical debates concerning the nature of theological language and the nature of God. Topics include theories of analogical predication, divine simplicity, God's relation to time, divine impassibility, the nature of God's love, divine freedom, the compatibility of foreknowledge and human freedom, and theories of providence.

PHIL 750a or b, Tutorial Stephen Darwall
By arrangement with faculty.

PHIL 758a, The First Person Laurie Paul
This seminar is on the topic of the first person, with a view to considering the relation of this topic to spatial perception, agency, the sense of presence, bodily and mental properties, modal reasoning about the self, imagination, perspectival thought, perceptual content, and related topics. We discuss both philosophical writing and empirical and/or computational work relevant to the philosophical issues. Open to graduate students in the Department of Philosophy and to others with permission of the instructor.

PHIL 760a, Language and Convention Zoltan Szabo
It is nonnegotiable that language is conventional, but it is up for grabs what language and convention are supposed to be. So, despite consensus that in some sense and to some extent language is a convention, it is far from clear what this apparent agreement amounts to. We try to get clearer about that during this seminar. The seminar has four main parts. We begin with a conception of convention and language advocated by David Lewis, which provides the background for further discussion. The second part explores the influential idea of the logical positivists that some truths are true by convention: we discuss the early debate between Carnap and Quine on analyticity and subsequent attempts to defend and clarify the notion of analyticity. The third part is about the conventionality of linguistic meaning. We focus on three issues: whether reference is constrained by naturalness in a way that makes word meaning not entirely conventional, whether conventional meaning outstrips what is relevant to truth-conditional content, and whether assertion and other speech acts are conventional. In our final two meetings we explore two debates between conventionalists and their opponents—one about color and the other about modality. Open to all philosophy graduate students. Undergraduates and graduate students from other fields may join with explicit permission from the instructor, which will be granted only to those with sufficient background.

PHIL 763a / CLSS 834a, Friendship and Egoism: *Nicomachean Ethics* 9 Brad Inwood and David Charles

The class reads, analyzes, and discusses book 9 of Aristotle's Nicomachean Ethics, dealing with the nature of the self, the place of friendship in the good life, and the balance between one's commitments to social and intellectual activities. This is a core course for the combined Ph.D. program in Classics and Philosophy. Open to all graduate students in Philosophy or Classics who have suitable preparation in Attic 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 780a, Methods in Metaphysics Robin Dembroff

Metaphysicians want to describe the catalog of what exists and how those things relate to each other. But how should we go about doing that? Historically, metaphysics has heavily relied on a priori methods, such as conceptual analysis and thought experiments. In this course, we examine these a priori methods, as well as more recent "modeling" approaches to metaphysics. We also discuss the place of normativity and human interests in metaphysical methodology, critique notions of metaphysical objectivity, and examine new methodological frameworks, such as dynamic systems modeling, genealogical analysis, and conceptual engineering.

Physics

35 Sloane Physics Laboratory, 203.432.3605
http://physics.yale.edu
M.S., M.Phil., Ph.D.

Chair
Karsten Heeger

Director of Graduate Studies
Bonnie Fleming (bonnie.fleming@yale.edu)

Professors Charles Ahn (*Applied Physics*), Yoram Alhassid, Thomas Appelquist, Charles Bailyn (*Astronomy*), O. Keith Baker, Charles Baltay, Sean Barrett, Helen Caines, Hui Cao (*Applied Physics*), Richard Casten (*Emeritus*), Flavio Cavanna (*Adjunct*), Paolo Coppi (*Astronomy*), Michel Devoret (*Applied Physics*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology*), Frank Firk (*Emeritus*), Bonnie Fleming, Paul Fleury (*Emeritus*), Marla Geha (*Astronomy*), Steven Girvin, Larry Gladney, Leonid Glazman, Jack Harris, John Harris (*Emeritus*), Karsten Heeger, Victor Henrich (*Emeritus*), Jonathon Howard (*Molecular Biophysics & Biochemistry*), Francesco Iachello (*Emeritus*), Sohrab Ismaill-Beigi (*Applied Physics*), Steve Lamoreaux, Simon Mochrie, Vincent Moncrief, Priyamvada Natarajan (*Astronomy*), Corey O'Hern (*Mechanical Engineering & Materials Science*), Ornella Palamara (*Adjunct*), Peter Parker (*Emeritus*), Daniel Prober (*Applied Physics*), Nicholas Read, Peter Schiffer (*Applied Physics*), Robert Schoelkopf (*Applied Physics*), Jurgen Schukraft (*Adjunct*), Ramamurti Shankar, Witold Skiba, Charles Sommerfield (*Emeritus*), A. Douglas Stone (*Applied Physics*), Hong Tang (*Electrical Engineering*), Paul Tipton, Thomas Ullrich (*Adjunct*), C. Megan Urry, Frank van den Bosch (*Astronomy*), Pieter van Dokkum (*Astronomy*), John Wettlaufer (*Earth & Planetary Sciences*), Robert Wheeler (*Emeritus*), Werner Wolf (*Emeritus*)

Associate Professors Damon Clark (*Molecular, Cellular, & Developmental Biology*), Sarah Demers, Walter Goldberger, Reina Maruyama, Michael Murrell (*Biomedical Engineering*), Daisuke Nagai, Nikhil Padmanabhan, David Poland, Peter Rakich (*Applied Physics*), Alison Sweeney

Assistant Professors Meng Cheng, Eduardo da Silva Neto, Benjamin Machta, David Moore, Ian Moult, John Murray (*Psychiatry*), Nir Navon, Laura Newburgh, Diana Qiu (*Mechanical Engineering & Materials Science*)

Lecturers Mehdi Ghiassi-Nejad, Stephen Irons, 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 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 substitution of core courses for individual students.

A written qualifying event, taken by all students at the beginning of the third term, consists 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 will also complete a qualifying event in research in conjunction with PHYS 990.

Students who have completed their course requirements with satisfactory grades (two Honors and an overall High Pass average), completed the qualifying events, and submitted an acceptable thesis prospectus to their core committee are recommended for admission to candidacy. Students must submit the thesis prospectus before the end of their third year of study.

There is no foreign language requirement, 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 asked 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. (en route to the Ph.D.) Students who complete all courses numbered one through five above, plus one of the following: PHYS 510, Quantum Mechanics II; PHYS 990, Special Investigations; or an advanced elective (all with a satisfactory record) qualify for the M.S. degree. 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); website, http://physics.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 A Douglas Stone
Classical electromagnetic theory including boundary-value problems and applications of Maxwell equations. Macroscopic description of electric and magnetic materials. Wave propagation.

PHYS 504a or b, Modern Physics Measurements Staff
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 Nicholas Read
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 515a, Topics in Modern Physics Research Simon Mochrie
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 or b, Introduction to Atomic Physics Staff
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 523b / CB&B 523b / ENAS 541b / MB&B 523b, Biological Physics Corey O'Hern
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 David Moore
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 Keith Baker
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 530a / B&BS 879a, Theory and Practice of Scientific Teaching Rona Ramos
The course discusses the fundamentals of learning theory and practical strategies for teaching in the physical and life sciences. Students learn evidence-based teaching strategies, including engaging students through active learning, incorporating inclusive teaching practices, and developing effective assessments, while building a community of scientific educators. In the second half of the course, students (1) apply these principles as they develop and evaluate instructional materials for a college-level science course and (2) develop peer-reviewed teaching and diversity statements. Prerequisite: completion of one term of required teaching at Yale (n/a for postdocs).

PHYS 538b, Introduction to Relativistic Astrophysics and General Relativity Walter Goldberger
Basic concepts of differential geometry (manifolds, metrics, connections, geodesics, curvature); Einstein's equations and their application to such areas as cosmology, gravitational waves, black holes.

PHYS 548a, Solid State Physics I Yu He
A two-term sequence (with PHYS 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, Solid State Physics II Vidvuds Ozolins
A two-term sequence (with PHYS 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 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b, Modeling Biological Systems II Thierry Emonet, Joe Howard, and Damon Clark
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 Priyamvada Natarajan
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 609a, Relativistic Field Theory I David Poland
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 Leonid Glazman
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 David Poland
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 669a, Relativistic Field Theory III Walter Goldberger
This course covers various advanced topics in quantum field theory. The focus is on symmetries, modern techniques for conformal field theories, and the AdS/CFT correspondence.

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 / ASTR 535b, Computing for Scientific Research David Moore
This hands-on lab course introduces students to essential computational and data analysis methods, tools, and techniques and their applications to solve problems in physics. The course introduces some of the most important and useful skills, concepts, methods, tools, and relevant knowledge to get started in scientific research broadly defined, including theoretical, computational, and experimental research. Students learn basic programming in Python, data analysis, statistical tools, modeling,

simulations, machine learning, high-performance computing, and their applications to problems in physics and beyond.

PHYS 681a, Advanced Instrumentation Bonnie Fleming and Antonio Ereditato
An advanced course on the development and use of advanced instrumentation in physics. Through lectures and projects, the course provides an introduction to the design, development, and performance of scientific instrumentation in modern experiments.

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, Isabela Mares, Gerard Padró i Miquel, John Roemer, Frances Rosenbluth, 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 Peter Aronow, Katharine Baldwin, Sarah Bush, Ana De La O Torres, Alexandre Debs, Hélène Landemore, Kelly Rader

Assistant Professors Alexander Coppock, Allison Harris, John Henderson, Joshua Kalla, Sarah Khan, Christina Kinane, Egor Lazarev, Daniel Mattingly, Salma Mousa, Elizabeth Nugent, 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. 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. (en route to the Ph.D.) The M.A. degree is awarded upon completion of a full year of course work in the program (i.e., at least eight term courses) with an average of High Pass or better. 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. 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.

COURSES

PLSC 500a, Foundations of Statistical Inference Fredrik Sävje
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 Peter 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 506b, Machine-Learning Tools for Political Analysis John Henderson
This course covers a wide array of machine-learning techniques that aim to improve our understanding of political phenomena through better measurement, estimation, and inference. Topics include measurement, reliability and error concepts, text and web scraping, supervised and unsupervised learning, Bayesian inference, cluster and topic modeling, ideal point scaling, and some advanced topics in statistical inference. The aim of the course is to provide students with a host of practical tools that can be used to evaluate and replicate other research, as well as to help students address methodological issues arising in their own work. Two terms of probability, statistics, or data science courses (e.g., S&DS 500, 510, 520, 523, 530; PLSC 454, 500, 503, 504; ECON 136; EP&E 203, 209; or equivalents) are strongly recommended. Working knowledge of a statistical programming language (e.g., R, Python, Stata) is required.

PLSC 508a, Causal Inference and Research Design Fredrik Sävje
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 509a / GLBL 509a, Philosophy of Science for the Study of Politics Ian Shapiro
An examination of the philosophy of science from the perspective of the study of politics. Particular attention to the ways in which assumptions about science influence models of political behavior, the methods adopted to study that behavior, and the relations between science and democracy. Readings include works by both classic and contemporary authors.

PLSC 510a, Introduction to the Study of Politics Gregory Huber
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 511a / S&DS 617a, Applied Machine Learning and Causal Inference Research Seminar Jas Sekhon

In this seminar we discuss recent advances in machine learning and causal inference. Emphasis is placed on research designs and methods that have succeeded. We carefully examine successful examples to see why they work. The seminar is also a forum for students to discuss the research designs and methods needed in their own work. It should be particularly helpful for students writing their prospectus or designing a major research project. Applications are drawn from a variety of substantive domains including political science, economics, medicine, and public health. It is assumed that students come with diverse backgrounds. A good background would be provided by S&DS 542, ECON 551, or equivalent, plus some experience with applications and statistical computing. More important than the precise course background are research maturity and familiarity with modern statistical and machine-learning methods.

PLSC 518b, Introduction to Game Theory Milan Svolik

This course offers a rigorous introduction to noncooperative game theory. The goal is to help students understand the key concepts and ideas in game theory and to provide students with a road map for applying game theoretic tools to their own research. Topics include strategic form games, extensive form games, and Bayesian games, among others. Students are assumed to have mathematical knowledge at the level of the Political Science Math Camp.

PLSC 519a, Formal Models of Domestic Politics Emily Sellars

This course surveys key applications of game theory and related methods to the study of politics and political economy. Topics include electoral competition, political accountability, special interest politics, delegation, political agency, legislative bargaining, collective action, and regime chance. Prerequisite: PLSC 518 or an introductory course in game theory.

PLSC 523b, Mixed Methods Research Salma Mousa

This course trains students to design and critique a range of quantitative, qualitative, and experimental research methods. The course begins with a discussion of concept formation, defining quantities of interest, and the advantages and disadvantages of bringing descriptive vs. causal evidence to bear. We then analyze the strengths and weaknesses of quantitative tests, experimental designs, case-based approaches (case studies, case selections, and cross-case comparisons), and interpretive methods such as process tracing. Next, the course discusses the research design choices of two award-winning books using mixed methods research; it then evaluates the qualitative and quantitative data in isolation and in combination. The final assignment builds on the course material to produce a mixed method research design proposal.

PLSC 529a, Mathematics for Political Science Andrew Bridy

This course builds on the material seen in math camp. It covers foundational concepts and techniques in mathematics that are relevant to quantitative and formal research. Students learn to read and write rigorous mathematical proofs. Topics include real analysis, optimization, and probability theory.

PLSC 530a or b / S&DS 530a or b, Data Exploration and Analysis Staff
Survey of statistical methods: plots, transformations, regression, analysis of variance, clustering, principal components, contingency tables, and time series analysis. The R computing language and web data sources are used.

PLSC 534a / ECON 791a, Theories of Distributive Justice: Formal Models of Political Theory John Roemer
We survey the main theories of distributive justice proposed by political philosophers since John Rawls, including A. Sen, R. Dworkin, G.A. Cohen, and R. Arneson. We use economic models to study these theories, and we critique them from the economic and philosophical viewpoints. We then read Thomas Piketty's book *Capital in the Twenty-First Century.* If time permits, we introduce a microeconomic theory modeling how people cooperate in economic settings, to be contrasted with Nash equilibrium, a model of how people compete. Prerequisite: microeconomics, at least at the intermediate level, or permission of the instructor.

PLSC 536a, Applied Quantitative Research Design Alexander Coppock
This course focuses on applications of observational and experimental quantitative research designs to answer both descriptive and causal questions. We characterize designs using the Model, Inquiry, Data strategy, Answer strategy (MIDA) framework and learn about them through simulation. The work is heavily application-driven: each week's problem set involves describing the ex ante properties of a design and reproducing empirical findings using modern data analysis procedures, i.e., the Tidyverse philosophy and set of packages for R. This skills course is designed for students who intend to conduct quantitative empirical research in the future, either inside or outside the academy. Prerequisite: any statistics or data science course that teaches ordinary least squares regression at any level. Prior experience with R is helpful but not required.

PLSC 537b, The Logic of Randomized Experiments in Political Science Alexander Coppock
Instruction in the design, execution, and analyzation of randomized experiments for businesses, nonprofits, political organizations, and social scientists. Students learn to evaluate the impact of real-world interventions on well-defined political, economic, and social outcomes. Specific focus on randomized experimentation through field and survey experiments, with design and analysis principles extending to lab and so-called natural experiments. Prerequisite: any introductory probability or statistics course.

PLSC 540a, Research and Writing Helene Landemore-Jelaca and Ana De La O
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 545a and PLSC 546b, Prospectus Writing Workshop Alex Debs
A non-credit workshop for third-year Ph.D. students in the Political Science department, in which they develop, revise, and present their prospectus. o Course cr per term

PLSC 581a, Socialism and Democracy, 1820–1940 Staff
This course explores the history of socialist political thought by focusing on how socialist thinkers addressed the problem of political organization and how they viewed democracy and its institutions. The course looks at Utopian socialism, the problem of political organization in Marx and Engels, Proudhon's arguments for anarchism, the Paris Commune and its afterlife in socialist theorizing, debates about direct democracy in the Second International, controversies over the role of parliaments, political parties and the masses in the first decades of the twentieth century, the soviet as a novel political form, the question of feminism, Lenin and Luxemburg's debate about imperialism, and socialist theories of the postcolonial state. The course is structured around key primary texts, which are accompanied by secondary readings and suggestions for books and movies.

PLSC 627a, Aristotle's Political Thought Bryan Garsten
A careful reading of Aristotle's *Nichomachean Ethics* and *Politics,* along with selected debates in the secondary literature and consideration of Aristotle's place in recent political theory.

PLSC 644b, The Idea of Statesmanship Steven Smith
Who is a statesman and what are the ideal qualities required for the office? This remains one of the enduring questions of political philosophy. This course examines the art of statesmanship in ancient and modern political thought. We consider examples of statecraft in both ancient Greece and Rome and the Hebrew Bible before viewing examples of modern statesmanship using Machiavelli, Hume, Burke, the *Federalist Papers,* and Abraham Lincoln. We consider the statesman's role in different contexts, as political founder, preserver, and reformer. We also consider what kind of education is necessary to best carry out the work of statecraft.

PLSC 645a, Machiavelli and His Readers Steven Smith
Machiavelli remains one of the most widely discussed and debated figures in the Western political canon. This course offers a close reading of his two major treatises, *The Prince* and *The Discourses on Livy,* as well as important sections from Livy's history of Rome. We then consider influential nineteenth- and twentieth-century interpreters of Machiavelli, from Hegel to Gramsci to Leo Strauss.

PLSC 678a / GLBL 678a, Japan and the World Frances McCall Rosenbluth
The historical development of Japan's international relations since the late Tokugawa period; World War II and its legacy; domestic institutions and foreign policy; implications for the United States; and interactions between nationalism and regionalism.

PLSC 680b, Non-State Actors in World Politics Sarah Bush
Non-state actors are increasingly important to world politics. This course introduces the variety of non-state actors that are currently influencing our world, with a special emphasis on nongovernmental organizations and transnational networks (of advocates, criminals, government officials, and terrorists). We explore how these actors interact with states, intergovernmental organizations, and each other. The course covers issues

relating to war, peace, human rights, democracy, the global economy, the environment, and international law.

PLSC 695a / GLBL 905a, International Security Alex Debs
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 Tyler Pratt
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 705a, Introduction to Political Economy John Roemer
The course is an introduction to important economic ideas: preferences and rationality, Pareto efficiency, economic equilibrium in a capitalist economy, externalities, the role of the state, uncertainty and von Neumann-Morgenstern utility, the principle of insurance, elementary game theory (Nash equilibrium), the median voter theorem, political equilibrium with party competition, distributive justice, equality of opportunity, and Arrow's impossibility theorem. These topics are essential tools for political economists. Prerequisite: differential calculus and/or the Political Science Math Camp. Microeconomics at the intermediate level is helpful but not mandatory.

PLSC 709b, Comparative Constitutional Law Bruce Ackerman
An effort to define the key concepts adequate for an evaluation of the worldwide development of modern constitutionalism since the Second World War. Enrollment limited. Follows Law School academic calendar.

PLSC 721a / ECON 548a, 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 722b, Comparative Political Parties and Electoral Systems Andrea Aldrich
This course explores democratic representation through political parties around the world and the effects of electoral systems on party system development. We critically examine the role of political parties in the representation of societal interests, party system evolution, the consequences of electoral law, and challenges facing modern political parties today with a particular focus on the growth of authoritarian and far-right parties around the world. Prerequisite: introductory course in American politics or comparative politics. It is helpful, although not mandatory, to have taken a course on research design in the social sciences.

PLSC 731a, Nelson and Winnie Mandela Staff
A study of Nelson and Winnie Mandela's marriage and public careers and the political and philosophical questions the marriage raises. Students examine the Mandelas' conflicting ideas on race and on the colonial experience and compare them to those of Mohandas Gandhi and Frantz Fanon. Students also read recent philosophical work on forgiveness and on violence in order critically to assess the politics of reconciliation that so divided the Mandelas. The course examines the politics of global celebrity and the portrayal of men and women in public media.

PLSC 734a or b / SOCY 560a or b, Comparative Research Workshop Staff
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 746a, 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 748a, Nationalism in the World Maria Jose Hierro
Nationalism is the most powerful political force in the world. It can explain why countries come together and why countries come apart. It can also explain why people praise and trust those who belong to the nation and despise and distrust those who do not. This course introduces students to the study of nationalist thought and practice. The course first examines the concept of nationalism and other adjacent concepts, and reviews different theoretical approaches to the study of nationalism. From here, the course moves to examine nationalist practices: the origin of the nation, the crafting of a national identity, the practice of inclusion and exclusion, the relationship between nationalism and democracy and nationalism and conflict, nationalism in the postcolonial world, and nationalism in the world today. The course examines nationalist thought and practice in different geographic areas and relies on both theoretical and empirical literature from several disciplines (history, economics, sociology, psychology, and political science) to understand the power of nationalism in the world today.

PLSC 756a / GLBL 756a, The European Union David Cameron
Origins and development of the European Community and Union over the past fifty years; ways in which the often conflicting ambitions of its member states have shaped the EU; relations between member states and the EU's supranational institutions and politics; and economic, political, and geopolitical challenges.

PLSC 760b, India and Pakistan: Democracy, Conflict, and Development Steven Wilkinson
The variation in democracy, conflict, and development between India and Pakistan since 1947, as well as variation within each country. Management of ethnic and religious conflicts, secularism, secessionist movements in Kashmir and elsewhere, the tension between economic growth and equity, and problems of governance.

PLSC 763a, State Formation Didac Queralt
Study of the domestic and international determinants of functional states from antiquity to the present. Analysis of state formation in Europe from premodern times and outside Europe from colonial times. Topics include centralization of power, capacity to tax, and contract enforcement.

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 Didac Queralt
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, Agrarian Societies: Culture, Society, History, and Development Kalyanakrishnan Sivaramakrishnan 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 800a, Introduction to American Politics Jacob Hacker
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. Gerring, 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 810a, Political Preferences and American Political Behavior Peter Aronow
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 820a, 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 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 859b, Reconstructing the American Constitution Bruce Ackerman
An examination of the statutory and constitutional reforms required to reinvigorate democratic accountability and individual liberty in the United States. Enrollment limited to fifteen. Permission of the instructor required. Meets on the Law School calendar. Also LAW 21390.

PLSC 865b, Policy Making under Separation of Powers Christina Kinane
This seminar provides an overview of the literature on the politics of separation of powers, with an eye toward understanding how the various interbranch constraints on American political institutions impact the development and implementation of public policy.

PLSC 868a / AMST 724a / WGSS 724a, 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 873a, The U.S. Constitution and Comparative Constitutional Law Akhil Reed Amar and Steven Calabresi

This seminar provides a comparative perspective on American constitutional law by looking at analogous case law and institutions from fifteen of the G-20 nations that are constitutional democracies: the United Kingdom; France; Germany; Italy; Japan; India; Canada; Australia; South Korea; Brazil; South Africa; Mexico; Indonesia; and the European Union. Topics include: (1) why have a written constitution and comparative amendment and secession rules? (2) the origins of judicial review in each country and its foundational case; (3) a comparison of the separation of powers; (4) comparative federal regimes; (5) comparative bills of rights or unenumerated rights; (6) comparative protections of equality; (7) comparative freedom of expression cases; (8) comparative freedom of religion cases; (9) comparative civil, criminal, and appellate procedure; (10) comparative protection of property rights and of economic liberties; (11) comparative judicial protection of social welfare entitlements; and (12) comparative guaranties of democracy in each country's constitution. The required text is Calabresi, *The U.S. Constitution and Comparative Constitutional Law* (Foundation Press, 2016). Paper required. *Also LAW 20121.*

PLSC 874a, The Anti-Tax Movement and the Transformation of U.S. Politics and Policy Michael Graetz

This seminar examines the legal and political evolution of U.S. tax law and policy through the lens of the anti-tax movement. *Also LAW 20049.*

PLSC 878b, Election Law Staff

This course introduces some of the central issues in the law governing the democratic process in the United States. Topics include: (1) the development and nature of the right to vote under the U.S. Constitution including limits on the franchise, (2) the relationship between majority rule and minority representation as reflected in the 15th Amendment and the federal Voting Rights Act, (3) thorny questions about equality in the administration of elections, and (4) the constitutional fault lines of campaign finance regulation. *Also LAW 21567.*

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 Staff
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 Staff
This seminar series engages research on the interaction between economics and politics as well as research that employs the methods of political economists to study a wide range of social phenomena. The workshop serves as a forum for graduate students and faculty to present their own work and to discuss current research in the field as presented by outside speakers, faculty, and students. Detailed information can be found at http://leitner.yale.edu/seminars. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 940a and PLSC 941b, International Relations Workshop Staff
This workshop engages work in the fields of international security, international political economy, and international institutions. The forum attracts outside speakers, Yale faculty, and graduate students. It provides a venue to develop ideas, polish work in progress, or showcase completed projects. Typically, the speaker would prepare a 35- to 40-minute presentation, followed by a question-and-answer session. More information can be found at http://irworkshop.yale.edu. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 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
Tyrone Cannon (203.432.4545, tyrone.cannon@yale.edu)

Director of Graduate Studies
Gregory McCarthy (203.432.4518, gregory.mccarthy@yale.edu)

Professors Woo-kyoung Ahn, John Bargh, Paul Bloom (*Emeritus*), Thomas Brown (*Emeritus*), Tyrone Cannon, B.J. Casey, Marvin Chun, Margaret Clark, John Dovidio (*Emeritus*), Melissa Ferguson, 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, Molly Crockett, 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 (*Senior Lecturer*), Mary O'Brien

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*), Jeannette Ickovics (*Public Health*), Dan Kahan (*Law School*), 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*), Linda Mayes (*Child Study Center*), Carolyn Mazure (*Psychiatry*), James McPartland (*Child Study Center*), George Newman (*School of Management*), Nathan Novemsky (*School of Management*), Laurie Paul (*Philosophy*), Al Powers (*Psychiatry*), Helena Rutherford (*Child Study Center*), Wendy Silverman (*Child Study Center*), Dana Small (*Psychiatry*), Jane Taylor (*Psychiatry*), 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) Course work selected to meet the individual's objectives with a minimum of three basic-level core courses and one course in data analysis.

Two of the three required basic-level core courses must be in two different areas of psychology outside the student's main area of concentration. 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 due by May 10 of the second term. (4) Completion of a predissertation research project, to be initiated not later than the second term and completed not later than May 1 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 a minimum of eight courses.

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 terminal master's degree upon completion of the academic requirements as stated above.

Program materials are available online at http://psychology.yale.edu.

COURSES

PSYC 509a, Social Cognition John Bargh
A course in contemporary social cognition theory and research, in which students fully participate in each week's class discussion of the assigned readings. The goal of the course is to bring students up to speed, not only on the major themes and programs of research today, but also on the historical roots and context of that research—in other words, why that research is being done in the first place.

PSYC 518a, Multivariate Statistics Julian Jara-Ettinger
This is a practical course in statistics that covers classical null-hypothesis significance testing (e.g., binomial and chi-squared tests), regression analyses (multiple regressions, generalized linear models, and mixed-effects models), modern statistical methods (bootstraps and cross-validation), basics of Bayesian data analysis (hierarchical Bayesian models, Bayes factors), and basics of machine learning for data analysis (principal component analysis and classifiers). This course focuses on how to intuitively understand what different tests do, how to run them using R, and how to interpret the results. The course favors intuitions over mathematical rigor, but it's impossible to teach statistics without some math.

PSYC 523b, Cognitive Psychology Yarrow Dunham
A comprehensive introduction to graduate-level cognitive psychology for first-year graduate students in psychology, with topics including learning, memory, perception, and attention. This course serves as the foundation for further study in more advanced graduate courses on specific topics within cognitive psychology.

PSYC 530b / INP 530b, Foundations of Neuroscience: Biological Bases of Human Behavior Molly Crockett

The purpose of this course is to provide students with an understanding of the biological factors underlying human cognition and behavior. Particular emphasis is placed on the mechanisms associated with individual differences in healthy functions (including emotion regulation, stress sensitivity, higher cognition, reward sensitivity, impulsivity, and social functions) and their relations with psychiatric and neurological disorders. Biological factors to be covered include genetic, neuroanatomical, neurophysiological, neurochemical, hormonal, and neuropsychological influences. Several of the initial sessions are devoted to basic topics (e.g., neurons, neuronal signaling, brain systems), before we begin our discussion of the neural basis of behavior and cognition. We also cover seminal work on animal models for mechanistic insights into the neurobiology of human behavior. Graduate students with any neuroscience research interest are encouraged to take this course. Required of Psychology Ph.D. students in the neuroscience area.

PSYC 536a / AFAM 518a / SOCY 539a, Is That Racist? Theory and Methods for Diagnosing and Demonstrating Racism Phillip Atiba Goff

How do we know when something is racist? And how do we prove it to those who are skeptical? This course is designed to allow students to go beyond armchair pontificating about racism by exploring a broad range of ways social theorists have defined the term and methods they have used to demonstrate it. Together, we read, critique, and synthesize scholarship from across disciplines, with the goal of refining our own definition of the term. To accomplish this, we examine the stakes of calling something racist, who benefits and who suffers from a given definition, and how racism functions across contexts (mostly) within the United States. We also learn about popular methods for demonstrating that an idea, feeling, behavior, person, or institution is racist and evaluate how evidence about racism (or lack thereof) can obscure a diagnosis of racism—or lead to an erroneous one. Throughout the course, we take opportunities to translate the theoretical and methodological lessons we learn to the world we live in today, from popular culture to dinner table conversations. This course is designed to be mostly *synchronous,* with synchronous sections accompanying lectures. Videos are made available for students who are not able to attend lectures or sections, but taking the course asynchronously is discouraged. Prerequisite: students should be comfortable reading journal articles and thinking critically about contentious social/political topics. Readings and other course materials span a wide range of disciplines. While there are no statistical prerequisites, students are asked to think about the logic of statistical analysis and should be comfortable reasoning about numbers.

PSYC 554a / MGMT 754a, Behavioral Decision-Making II: Judgment Ravi Dhar and Nathan Novemsky

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 558b / INP 558b, Computational Methods in Human Neuroscience Nick Turk-Browne
This course provides training on how to use computational science for the advanced analysis of brain imaging data, primarily from functional magnetic resonance imaging (fMRI). Topics include scientific programming, high-performance computing, machine learning, network/graph analysis, real-time neurofeedback, nonparametric statistics, and functional alignment. Prerequisite: some prior experience with programming, data preprocessing, and basic fMRI analysis.

PSYC 602b / MGMT 758b, Foundations of Behavioral Economics Shane Frederick
The course explores foundational topics in behavioral economics and discusses the dominant prescriptive models (which propose what decision makers should do) and descriptive models (which aim to describe what decision makers actually do). The course incorporates perspectives from economics, psychology, philosophy, decision theory, and finance, and engages long-standing debates about rational choice.

PSYC 626b, Topics in Law and Psychology Arielle Baskin-Sommers and Tom Tyler
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 627b, The Rise and Fall of Wonder: When Early Passions for Exploration and Discovery Decay with Age Frank Keil
Research on children's minds reveals early emerging abilities that help explain the developmental origins and early growth of wonder. We consider wonder as the joy of exploration and discovery. Preschoolers and even infants are driven to learn not just facts and statistics, but also underlying causal patterns that are at the heart of many sciences. They learn not just as individuals but also as members of knowledge communities and, early on, they sense how to "harvest" knowledge from these communities. Yet, those joyous moments of discovery and exploration often fade as children grow older and cease to wonder. We explore how this decline occurs and its consequences. When people stop wondering, they fail to expand their grasps of the world and become ever more vulnerable to misunderstanding and manipulation by others. We examine possible ways to reverse the decline.

PSYC 628a, Neuroscience of Decision-Making Molly Crockett
An overview and examination of the neuroscience of decision-making. Interdisciplinary course highlighting research from cognitive neuroscience, psychology, behavioral economics, finance, marketing, computer science, and public health. Topics include utility and value, reinforcement learning, risky decision-making, impulsivity and self-control, social decision-making, psychopathology, and commercial applications (e.g., neuromarketing and neurofinance).

PSYC 631a, Human Skill Learning Samuel McDougle
Humans possess a remarkable ability to learn new skills and retain memories for those skills throughout their life span (e.g., learning to ride a bicycle). The ease with

which humans acquire and sharpen skills belies the complexity involved in selecting and executing the correct actions in a given situation. This course considers both foundational and contemporary psychology and neuroscience research regarding skill learning, with an emphasis on motor and reinforcement learning. The overall goal is to gain an understanding of the different cognitive processes and algorithms that underlie skill acquisition. Prerequisite: PSYC 110. Recommended: PSYC 130, PSYC 160, PSYC 335, PSYC 376.

PSYC 634b, The Psychology of Changing One's Mind Melissa Ferguson
When and how do we change our minds about other people? We are constantly learning information about others, but this new information does not always influence what we think and feel about them and how we act toward them. What determines when we update our beliefs and feelings about others? This course reviews cutting-edge psychological science to answer this question, with special attention to social and cognitive research.

PSYC 637b, Minds, Brains, and Machines Julian Jara-Ettinger
Exploration of the implications that the brain is a kind of computer that gives rise to the mind. Readings combine classical and cutting-edge research in psychology, philosophy, and artificial intelligence.

PSYC 638a / INP 638a, Computational Models of Human Behavior Robb Rutledge
Why do we do the things we do? How do we adapt to changes in the environment? And how does our happiness depend on our choices and what happens to us? How can computational models help us to gain new insights into psychological processes? The goal of this course is to use computational models to understand human behavior and its relationship to our emotions. Data is collected in a variety of tasks, including new experiments designed by students, and is analyzed using computational models.

PSYC 643b, Psychological Measurement of Individual Differences in Cognitive Functioning, Achievement, and Perso Mary O'Brien
This course focuses on theoretical, methodological, and practical issues in psychological assessment. The processes that underlie evidence-based assessment are explored: how constructs are conceptualized and operationalized, how measures are developed and evaluated, how assessment tools are selected to answer specific questions, how findings are analyzed and synthesized, and how psychological reports are written to meet the expectations of professional and layperson audiences. Over the course of the term, students gain experience with administering, scoring, and interpreting a variety of commonly used assessment instruments (such as the WAIS-IV, WMS-IV, and MMPI-2). The importance of critical evaluation of the assessment process is emphasized throughout.

PSYC 649a, Neuroscience of Social Interaction Steve Chang
This advanced seminar discusses influential studies that have informed how the brain enables complex social interaction. Students thoroughly read selected original research papers in the field of social neuroscience across several animal species and using multiple modern neuroscience methodologies. In class, the instructor and students work together to discuss these studies in depth. Focused topics include neural mechanisms behind brain-to-brain coupling, empathy, prosocial decision-making, oxytocin's prosocial effects, and social dysfunction.

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 679a, Computational Basis of Seeing and Thinking Ilker Yildirim
The goal of this seminar is to discuss the computational basis of seeing and thinking in the mind and brain. We are especially concerned with the question of how perception gets us to cognition: How is it that perception transforms raw, unprocessed, unorganized, incoming sensory signals arising from our physical environments—for example, the light that bounces off surfaces and arrives at your retina, raw audio waves hitting your ears, or the vibro-tactile sensations you feel at your fingertips when you touch a surface—into things like objects and people, into things that we can think about? We somewhat prioritize the field of scene perception, where many fundamental questions about the nature of seeing and aspects of cognition arise prominently, and much of those questions remain open to this date. We draw upon readings and classroom discussions to find out where the literature stands, including behavioral, neural, and computational studies, all in the context of searching for a mechanistic, functional account of how the brain produces percepts and thoughts about objects, scenes, and people.

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 694b, Tools for Academic Success (and Beyond) Julia Leonard
"The academic environment can feel as harsh and unforgiving as the South Pole in winter." —Barbara W. Sarnecka, *The Writing Workshop* (2019). The goal of this course is to give you the tools to survive and thrive in this "academic winter" and to build a community around this shared endeavor. The course focuses on the tools needed for academic success that often are not formally taught in graduate course work: writing, best practices for open science, data management, time management, and building a positive lab culture. The course is centered around building a community of practice as we learn and build these skills together. Topics and materials are geared toward psychology Ph.D. students but may be relevant to master's and Ph.D. students in related fields. Permission of the instructor required.

PSYC 699a, Teaching in Psychology Dylan Gee
This course will teach students how to teach courses in psychology.

PSYC 702a or b, Current Work in Cognition Samuel McDougle
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 Staff
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 Samuel McDougle
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 Staff
Faculty and students in personality/social psychology meet during lunchtime to hear about and discuss the work of a local or visiting speaker.

PSYC 720a or b, Current Work in Clinical Psychology Dylan Gee
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 or b, 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 729a or b, Research Topics in Language and Cognition Paul Bloom
Seminar focusing on ongoing research projects in language, cognition, and development. Prerequisite: permission of the instructor.

PSYC 731a or b, 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 researched 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, 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 Neuroscience of Social Behavior Steve Chang
A weekly seminar discussing 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 756a or b, Research Topics in the Fundamentals of Adolescent Brain and Behavior BJ Casey
We examine and discuss how the brain is sculpted by biological and experiential factors to adapt to the unique challenges of adolescence using behavioral, psychophysiological, genetic, and brain-imaging methods. Emphasis is on how the capacity for self-control changes with age and across different social and emotional situations.

PSYC 757a or b, Research Topics in Social Neuroscience and Behavior Molly Crockett
Seminar-style discussion of recent research in social neuroscience and behavior, covering both recent studies from the literature and ongoing research at Yale.

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 McDougle
This weekly seminar covers various themes in human learning, with an emphasis on motor learning, motor memory, reinforcement learning, and decision-making. We discuss recently published and ongoing research on these topics, with special attention to behavioral studies, computational models of learning, and neural correlates.

PSYC 763a 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 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, 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 777a or b / WGSS 767a or b, Research Topics in Gender and Psychology Marianne LaFrance
The "Gender Lab" meets weekly to consider research being done in the Psychology department that bears on some gender-related issue.

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 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 803a or b, Cognitive and Social Bases of Behavior Arielle Baskin-Sommers
The course is designed to provide students an overview of key topics in cognitive and social psychology. Readings include reviews and empirical articles that highlight core issues relevant to the topic and new advancements in the fields of cognitive and social psychology. Topics broadly fall into several domains, including perception, attention, decision-making, self and other processing, moral reasoning, and biases.

PSYC 805a or b, Affective and Developmental Bases of Behavior Dylan Gee
This course aims to provide a broad survey of the affective and developmental bases of behavior, drawing on key topics in affective science and developmental psychology. Readings include reviews and empirical articles that highlight core issues relevant to the topics, from early theoretical perspectives to recent advances in the field. Topics broadly fall into several domains, including evolutionary, cultural, and developmental perspectives on emotion; neurocognitive and affective development; early experiences, attachment, and sensitive periods; emotional reactivity and regulation; and the role of emotion in illness and well-being.

PSYC 811a 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 920a or b, First-Year Research Staff
By arrangement with faculty.

PSYC 923a or b, Individual Study: Theme Essay Staff
By arrangement with faculty.

PSYC 925a or b, Individual Tutorial Staff
By arrangement with faculty and approval of DGS.

PSYC 930a or b, Predissertation Research Staff
By arrangement with faculty.

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Associate Professors Rene Almeling (*Sociology*), Sandy Bogucki (*Emergency Medicine*), Xi Chen, Maria Ciarleglio, Zack Cooper, Forrest Crawford, J. Lucian Davis, Mayur Desai, Andrew Dewan, Nicole Deziel, Michaela Dinan, Abigail Friedman, Gregg Gonsalves, Nathan Grubaugh, Nicola Hawley, Josephine Hoh, Manisha Juthanki-Mehta (*Infectious Diseases*), Danya Keene, Kaveh Khoshnood, Joan Monin, Chima Ndumele, Marcellal Nunez-Smith (*Internal Medicine*), John Pachankis, Sunil Parikh, Robert Pietrzak (*Psychiatry*), Virginia Pitzer, Jason Schwartz, Jodi Sherman (*Anesthesiology*), Andre Sofair (*Internal Medicine*), Shiyi Wang, Zuoheng (Anita) Wang, Joshua Warren, Daniel Weinberger, Yong Zhu

Assistant Professors Peter Aronow (*Political Science*), Amy Bei, Drew Cameron, Kai Chen, Jen-hua Chu (*Internal Medicine*), Jennifer Edelman (*Internal Medicine*), Leah Ferrucci, Laura Forastiere, Leying Guan, Ashley Hagaman, Evelyn Hsieh (*Internal Medicine*), Yuan Huang, Caroline Johnson, Michael Kane, Morgan Levine (*Pathology*), Fan (Frank) Li, Zeyan Liew, Sarah Lowe, Robert McDougal, Terrance Murphy (*Internal Medicine*), Ijeoma Opara, Victoria Perez, Krystal Pollitt, Yusof Ransome, Tormod Rogne, Yasmmyn Salinas, Veronika Shabanova (*General Pediatrics*), Jamie Tam, Jacob Wallace, Joshua Wallach, Katie Wang, Wei Wei, Shannon Whirledge (*Obstetrics, Gynecology, & Reproductive Sciences*), Xiting Yan (*Internal Medicine*), Reza Yaesoubi, Yize Zhao, 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 students must enroll in and complete training in Research Ethics and Responsibility (EPH 600). This course will introduce and prepare 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 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. This document is to be distributed to each committee member for comments, and the student and the DGS are to 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.* In each pathway students must complete a minimum of sixteen courses (not including BIS 525, BIS 526, BIS 695, and EPH 600). Course substitutions must be identified and approved by the student's adviser and the DGS.

Required courses (or their equivalents) for both pathways are: BIS 525 and BIS 526, Seminar in Biostatistics and Journal Club; BIS 610, Applied Area Readings for Qualifying Exams; BIS 623, Advanced Regression Models (or S&DS 612, Linear Models); BIS 628, Longitudinal and Multilevel Data Analysis; BIS 643, Theory of Survival Analysis; BIS 678, Statistical Practice I; BIS 691, Theory of Generalized Linear Models; BIS 695, Summer Internship in Biostatistical Research; EPH 508, Foundations

of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; and S&DS 610, Statistical Inference. Students entering the doctoral program with an M.P.H. are exempt from EPH 608. Students with prior graduate-level epidemiology courses may be exempt from EPH 508.

Students in the *Biostatistics Standard Pathway* will be required to complete BIS 681, Statistical Practice II. In consultation with their academic adviser and approved by the DGS, students also choose a minimum of six additional electives that will best prepare them for dissertation work.

Students in the *Biostatistics Implementation and Prevention Science Methods Pathway* will be required to complete BIS 537, Statistical Methods for Causal Inference; BIS 629, Advanced Methods for Implementation and Prevention Science; BIS 631, Advanced Topics in Causal Inference Methods; and EMD 533, Implementation Science. In consultation with their academic adviser and approved by the DGS, students also choose a minimum of three additional electives. Recommended electives are:* BIS 536, Measurement Error and Missing Data; BIS 557, Computational Statistics; BIS 567, Bayesian Statistics; BIS 646, Nonparametric Statistical Methods and Their Applications; CDE 516, Principles of Epidemiology II; CDE 534, Applied Analytic Methods in Epidemiology; EMD 538, Quantitative Methods for Infectious Disease Epidemiology; HPM 570, Cost-Effectiveness Analysis and Decision-Making; HPM 586, Microeconomics for Health Policy and Management; HPM 587, Advanced Health Economics; HPM 611, Policy Modeling; SBS 541, Community Health Program Evaluation; SBS 574, Developing a Health Promotion and Disease Prevention Intervention; SBS 580, Qualitative Research Methods in Public Health; SBS 676, Questionnaire Development; S&DS 541, Probability Theory; and S&DS 600, Advanced Probability.

* Of these recommended electives, the following are *strongly* recommended: HPM 570, HPM 611, SBS 580, and S&DS 541.

Students funded by specific fellowships may be subject to additional requirements and should discuss this with their adviser.

CHRONIC DISEASE EPIDEMIOLOGY

Ph.D. students in Chronic Disease Epidemiology (CDE) must complete a minimum of seventeen courses (not including EPH 600). Course substitutions must be identified and approved by the student's adviser and the DGS.

Required courses (or their equivalents) are: CDE 516, Principles of Epidemiology II; CDE 534, Applied Analytic Methods in Epidemiology; CDE 610, Applied Area Readings for Qualifying Exams; CDE 617, Developing a Research Proposal*; CDE 619, Advanced Epidemiologic Research Methods; CDE 650, Introduction to Evidence-Based Medicine and Health Care; EHS 502/CDE 502, Physiology for Public Health; EPH 508, Foundations of Epidemiology and Public Health; and EPH 600, Research Ethics and Responsibility. Students must also complete course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health). Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. In addition, in consultation with their dissertation adviser, students choose three 600-level course units in Biostatistics† (or equivalent as approved by the adviser and the DGS), as well

as five additional electives that will best prepare them for their dissertation research. All electives must be approved by the adviser and the DGS.

* CDE 617 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.

† CDE 634, Advanced Applied Analytic Methods in Epidemiology and Public Health, and S&DS 563, Multivariate Statistical Methods for the Social Sciences, are also options to fulfill the Biostatistics course requirement.

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 are: EHS 503, Public Health Toxicology; EHS 507, Environmental Epidemiology; EHS 508, Environmental and Occupational Exposure Science; EHS 525 and EHS 526, Seminar and Journal Club in Environmental Health; EPH 505, Biostatistics in Public Health; EPH 508, Foundations of Epidemiology and Public Health; and EPH 600, Research Ethics and Responsibility. Students must also complete course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health). Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. Ph.D. students enrolled in EHS 503, EHS 525, and EHS 526 may be assigned additional readings.

In addition, all students are required to complete two research rotations during the first year: EHS 619 and EHS 620. At the end of the research rotation students give a presentation and are graded based on their rotation work and presentation.

Students must take an additional five electives. Suggested electives (or equivalents approved by the student's adviser and the DGS) are: BIS 505, Biostatistics in Public Health II; BIS 623, Advanced Regression Models; BIS 628, Longitudinal and Multilevel Data Analysis; CDE 516, Principles of Epidemiology II; CDE 520, Case-Based Learning for Genetic and Environmental Diseases; CDE 534, Applied Analytic Methods in Epidemiology; CDE 617, Developing a Research Proposal; EHS 502, Physiology for Public Health; EHS 511, Principles of Risk Assessment; EHS 530, Air Pollution and Public Health; EHS 531/HPM 531, Systematic Reviews, Meta-Analyses, and Meta-Research; EHS 537, Water, Sanitation, and Global Health; EHS 545, Molecular Epidemiology; EHS 547, Climate Change and Public Health; EHS 560/ENV 606, Methods in Climate Change and Health Research; EHS 563, Biomarkers of Exposure, Effect, and Susceptibility in the Epidemiology of Noncommunicable Disease; EHS 566, Causal Inference Methods in Public Health Research; EHS 567, Fundamentals of Green Engineering and Green Chemistry; EHS 568, Introduction to GIS for Public Health; EMD 625, How to Develop, Write, and Evaluate an NIH Proposal; ENV 755, Modeling Geographic Space; and ENV 756, Modeling Geographic Objects.

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. Students will be asked to prepare a brief presentation at the end of each rotation. These research rotations (EMD 670, EMD 671, and EMD 672) are graded and account for three of the required ten courses.

Students are required to complete course work in epidemiology (EPH 508, Foundations of Epidemiology and Public Health; or CDE 516, Principles of Epidemiology II). In addition, students must complete EPH 600, Research Ethics and Responsibility, and course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health). Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. Students with prior graduate-level epidemiology courses may be exempt from course work in epidemiology.

The following courses are suggested as appropriate for Ph.D. students in EMD; however, other courses in Public Health or in other schools or departments may also be appropriate: CDE 617, Developing a Research Proposal; EMD 531, Genomic Epidemiology of Infectious Diseases; EMD 533, Implementation Science; EMD 538, Quantitative Methods for Infectious Disease Epidemiology; EMD 539, Introduction to Public Health Surveillance; EMD 548, Observing Earth from Space; EMD 550, Biology of Insect Disease Vectors; EMD 553, Transmission Dynamic Models for Understanding Infectious Diseases; EMD 567, Tackling the Big Three: Malaria, TB, and HIV in Resource-Limited Settings; EMD 582, Political Epidemiology; EMD 625, How to Develop, Write, and Evaluate an NIH Proposal; HPM 570, Cost-Effectiveness Analysis and Decision-Making; MGT 611, Policy Modeling; and S&DS 538, Probability and Statistics.

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 course work detailed below, or the equivalent of the topic areas covered in these courses. The course listing represents a suggested program of study. The standard number of courses taken is sixteen, with the option of obtaining credits for previous courses. With the approval of the academic adviser and DGS, alternative courses that better suit the needs of the student may satisfy the course work requirement. The departmental representative to the Graduate Studies Executive Committee, in conjunction with the student's adviser and the DGS, is responsible for determining if core course requirements have been satisfied by previous course work

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.

Courses required of all students are: EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; and HPM 617 and HPM 618, Colloquium in Health Services Research. Students entering the program with an M.P.H. degree may be exempt from EPH 608. (EPH 600, HPM 617, and HPM 618 do not count toward the total number of required courses).

HPM 610, Applied Area Readings, is required of all second-year students. Additionally, all HPM students are expected to attend the departmental research seminar for faculty and the doctoral research seminar.

A minimum of four courses in Methods and Statistics are required. Suggested courses are: BIS 623, Advanced Regression Models; BIS 628, Longitudinal and Multilevel Data Analysis; ECON 556, Topics in Empirical Economics and Public Policy; ECON 558, Econometrics; HPM 583, Methods in Health Services Research; MGMT 737, Applied Empirical Methods; PLSC 500, Foundations of Statistical Inference; PLSC 503, Theory and Practice of Quantitative Methods; PLSC 504, Advanced Quantitative Methods; SBS 580, Qualitative Research Methods in Public Health; SOCY 580, Introduction to Methods in Quantitative Sociology; SOCY 581, Intermediate Methods in Quantitative Sociology; SOCY 582, Statistics III: Advanced Quantitative Analysis for Social Scientists; S&DS 563, Multivariate Statistical Methods for the Social Sciences; and S&DS 565, Introductory Machine Learning.

A minimum of four courses in Health Policy and Management, all with Ph.D. readings, are required. Suggested courses are: EPH 510, Health Policy and Health Care Systems; HPM 514, Health Politics, Governance, and Policy; HPM 560, Health Economics and U.S. Health Policy; HPM 570, Cost-Effectiveness Analysis and Decision-Making; HPM 573, Advanced Topics in Modeling Health Care Decisions; HPM 587, Advanced Health Economics; HPM 590, Economics, Addiction, and Policy; HPM 597, Capstone Course in Health Policy; and HPM 688, Managing Health Care in Complex Systems.

Areas of Specialization

Students in HPM must complete a minimum of four courses, all with Ph.D. readings, in their chosen area of specialization.

In *Economics,* required courses (or their equivalents) are: ECON 545, Microeconomics; and ECON 558, Econometrics (which may count as a Methods and Statistics class or as an area of specialization class, but not both). In addition, students are required to take two field courses in a concentration area in which they plan to develop expertise. In *Behavioral Economics,* two courses such as: MGMT 758, Foundations of Behavioral Economics; and PSYC 553, Behavioral Decision-Making I: Choice. In *Industrial Organization:* ECON 600, Industrial Organization I; and ECON 601, Industrial Organization II. In *Labor Economics,* ECON 630, Labor Economics I; and ECON 631, Labor Economics II. In *Public Finance,* two courses from: ECON 556, Topics in Empirical Economics and Public Policy; ECON 680, Public Finance I; and ECON 681, Public Finance II. In consultation with the student's adviser, other courses may be substituted.

In *Organizational Theory and Management,* four courses are required, selected in consultation with the student's adviser.

In *Political and Policy Analysis,* four courses are required, selected in consultation with the student's adviser. Suggested courses are: PLSC 800, Introduction to American Politics; PLSC 801, Political Preferences and American Political Behavior; and PLSC 803, American Politics III: Institutions.

HPM students take qualifying exams in each of three areas: (1) health policy and management; (2) empirical analysis and/or statistics; and (3) the student's area of specialization. Typically these are taken in the summer after two years of course work.

SOCIAL AND BEHAVIORAL SCIENCES

Ph.D. students in Social and Behavioral Sciences (SBS) 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.

Required courses (or their equivalents) are: CDE 534, Applied Analytic Methods in Epidemiology; CDE 617, Developing a Research Proposal*; EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; SBS 580, Qualitative Research Methods in Public Health; SBS 610, Applied Area Readings for Qualifying Exams; and SBS 699, Advanced Topics in Social and Behavioral Sciences. Students must also complete course work that introduces them to the breadth of public health (EPH 608, Frontiers of Public Health). Students entering the doctoral program with an M.P.H. may be exempt from EPH 608. In addition, in consultation with their dissertation adviser, students choose three advanced-level (600 or above) statistics or methods courses (from Biostatistics, Psychology, Political Science, Sociology, Anthropology, or Statistics and Data Science†) as well as five additional electives that will best prepare them for their dissertation research.

Students supported by training grants may be subject to additional requirements and should discuss with the principal investigator of the grant whether there are training-specific requirements.

* CDE 617 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.

† S&DS 563, Multivariate Statistical Methods for the Social Sciences, is an option to fulfill the statistics course requirement.

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 for or receiving the M.Phil. are not eligible for an M.S. degree.

Fields of Study

TERMINAL M.S. WITH CONCENTRATION IN BIOSTATISTICS

This two-year program provides training in clinical trials, epidemiologic methodology, implementation 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 *Data Science Pathway*. Part-time enrollment is permitted.

Course Requirements

The Biostatistics concentration requires the completion of fifteen required courses (not including BIS 525, BIS 526, BIS 695, EPH 100, EPH 101, and EPH 600).

All pathways Required courses (or approved substitutions) for all three pathways are: BIS 525 and BIS 526, Seminar in Biostatistics and Journal Club; BIS 623, Advanced Regression Models (or S&DS 612, Linear Models); BIS 628, Longitudinal and Multilevel Data Analysis; BIS 630, Applied Survival Analysis (or BIS 643, Theory of Survival Analysis); BIS 695, Summer Internship in Biostatistical Research; EPH 508,

Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; S&DS 541, Probability Theory (or S&DS 600, Advanced Probability, or S&DS 551, Stochastic Process); and S&DS 542, Theory of Statistics (or S&DS 610, Statistical Inference). Students entering the program with an M.P.H. may be exempt from EPH 508. Students in all pathways will also be required to attend a Professional Skills Seminar, EPH 100 and EPH 101 (details provided in the first term).

Biostatistics Standard Pathway Students in this pathway are also required to complete BIS 678, Statistical Practice I; BIS 679, Advanced Statistical Programming in SAS and R; and BIS 681, Statistical Practice II. They must also complete three electives in Statistics and Data Science. Suggested electives are: S&DS 563, Multivariate Statistical Methods for the Social Sciences; S&DS 565, Introductory Machine Learning; S&DS 612, Linear Models (cannot fulfill elective requirement if used to substitute for BIS 623); or any other S&DS 600-level course. Students must also select two electives in Biostatistics. Suggested electives are: BIS 557, Computational Statistics; BIS 567, Bayesian Statistics; BIS 643, Theory of Survival Analysis (cannot fulfill elective requirement if used to substitute for BIS 630); BIS 646, Nonparametric Statistical Methods and their Applications; and BIS 691, Theory of Generalized Linear Models. Alternative electives must be approved by the student's adviser and the DGS.

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.

Biostatistics Implementation and Prevention Science Methods Pathway Students in this pathway are also required to complete BIS 629, Advanced Methods for Implementation and Prevention Science; BIS 678, Statistical Practice I; BIS 679, Advanced Statistical Programming in SAS and R; BIS 681, Statistical Practice II; and EMD 533, Implementation Science. They must also complete three electives.* At least one of these electives must be from the following: BIS 536, Measurement Error and Missing Data; BIS 537, Statistical Methods for Causal Inference; and BIS 631, Advanced Topics in Causal Inference Methods. Up to two of these electives must be from the following: CDE 516, Principles in Epidemiology II; CDE 534, Applied Analytic Methods in Epidemiology; EMD 538, Quantitative Methods for Infectious Disease Epidemiology; HPM 570, Cost-Effectiveness Analysis and Decision-Making; HPM 586, Microeconomics for Health Policy and Health Management; HPM 587, Advanced Health Economics; HPM 611, Policy Modeling; SBS 541, Community Health Program Evaluation; SBS 574, Developing a Health Promotion and Disease Prevention Intervention; SBS 580, Qualitative Research Methods in Public Health; SBS 676, Questionnaire Development; and S&DS 565, Introductory Machine Learning. Alternative electives must be approved by the student's adviser and the DGS.

A master's thesis is strongly recommended in place of BIS 681 and one elective.

* Of the electives, the following are *strongly* recommended: HPM 570, HPM 611, SBS 541, and SBS 580.

Data Science Pathway Students in this pathway are also required to complete BIS 620, Data Science Software Systems; BIS 687, Data Science Capstone; and two of the following four courses: BIS 555, Machine Learning with Biomedical Data; BIS 557, Computational Statistics; BIS 634, Computational Methods for Informatics; and BIS 646, Nonparametric Statistical Methods and Their Applications. One course in machine learning is required (if not taken from the list above) from the following: BIS 555, Machine Learning with Biomedical Data; BIS 557, Computational Statistics; BIS 634, Computational Methods for Informatics; BIS 646, Nonparametric Statistical Methods and Their Applications; CB&B 555, Unsupervised Learning for Big Data; CB&B 567, Topics in Deep Learning: Methods and Biomedical Applications; CB&B 663, Deep Learning Theory and Applications; CB&B 745, Advanced Topics in Machine Learning and Data Mining; or S&DS 565, Introductory Machine Learning. Students must also complete one course related to databases from the following: BIS 638, Clinical Database Management Systems and Ontologies; or CPSC 537, Introduction to Database Systems. Two additional electives are required from the machine learning or database list, or from BIS, S&DS, or CB&B. Alternative courses from Public Health, Computer Science, or other departments must be approved by the Data Science Pathway director and the DGS.

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.

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.) who seek the skills necessary to conduct epidemiological research in their professional practice. Part-time enrollment is permitted.

Course Requirements

The Chronic Disease Epidemiology concentration requires the completion of ten courses (not including CDE 525, CDE 526, and EPH 600), including a capstone course.* Required courses (or substitutions approved by the student's adviser and the DGS) are: CDE 516, Principles of Epidemiology II; CDE 525 and CDE 526, Seminar in Chronic Disease Epidemiology; CDE 617, Developing a Research Proposal (or CDE 600, Independent Study or Directed Readings); EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; and EPH 608, Frontiers of Public Health. Students must also complete three quantitative courses from the following list (in consultation with the student's adviser, other courses may be approved): BIS 536, Measurement Error and Missing Data; BIS 537, Statistical Methods for Causal Inference; BIS 575, Introduction to Regulatory Affairs; BIS 621, Regression Models for Public Health; BIS 628, Longitudinal and Multilevel Data Analysis; BIS 630, Applied Survival Analysis; CDE 634, Advanced Applied Analytic Methods in Epidemiology and Public Health; S&DS 530, Data Exploration and Analysis; and S&DS 563, Multivariate Statistical Methods for the Social Sciences.

In addition, students must complete two electives in Chronic Disease Epidemiology and one additional elective chosen in consultation with the student's adviser. Suggested CDE electives are: CDE 502, Physiology for Public Health; CDE 532, Epidemiology of Cancer; CDE 534, Applied Analytic Methods in Epidemiology; CDE 535, Epidemiology of Heart Disease and Stroke; CDE 545, Health Disparities by Race and Social Class: Application to Chronic Disease Epidemiology; CDE 551, Global Noncommunicable Disease; CDE 562, Nutrition and Chronic Disease; CDE 572, Obesity Prevention and Lifestyle Interventions; CDE 597, Genetic Concepts in Public Health; and CDE 650, Introduction to Evidence-Based Medicine and Health Care. Alternative electives must be approved by the student's adviser and the DGS.

* In the capstone course CDE 617, the student is required to develop a grant application that is deemed reasonably competitive by the instructor. An alternative to this capstone course is an individualized tutorial (CDE 600) in which the student completes a manuscript that is suitable for submission for publication in a relevant journal.

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.

Course Requirements

The Epidemiology of Infectious Diseases concentration consists of ten courses (not including EPH 600, Research Ethics and Responsibility, and EMD 525/EMD 526, a yearlong seminar in infectious disease epidemiology). Course substitutions must be identified and approved by the student's adviser and the DGS.

The required courses (or approved substitutions) for the quantitative area of specialization include: BIS 623, Advanced Regression Models; BIS 630, Applied Survival Analysis; EMD 517 and EMD 518, Principles of Infectious Diseases I and II; EMD 525 and EMD 526, Seminar in Epidemiology of Microbial Diseases; EMD 553, Transmission Dynamic Models for Understanding Infectious Diseases (or EMD 539, Introduction to Public Health Surveillance); EMD 538, Quantitative Methods for Infectious Disease Epidemiology; EMD 625, How to Develop, Write, and Evaluate an NIH Proposal (or EMD 563, Laboratory and Field Studies in Infectious Diseases); EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; one elective; and a capstone project.

The required courses for the clinical area of specialization include: EPH 505, Biostatistics in Public Health; BIS 505, Biostatistics in Public Health II (or CDE 534, Applied Analytic Methods in Epidemiology); EMD 517 and EMD 518, Principles of Infectious Diseases I and II; EMD 567, Tackling the Big Three: Malaria, TB, and HIV in Resource-Limited Settings (or EMD 533, Implementation Science); EMD 530, Health Care Epidemiology: Improving Health Care Quality through Infection

Prevention (or EMD 536, Investigation of Disease Outbreaks); EMD 525 and EMD 526, Seminar in Epidemiology of Microbial Diseases; EMD 625, How to Develop, Write, and Evaluate an NIH Proposal (or EMD 563, Laboratory and Field Studies in Infectious Diseases); EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; EPH 608, Frontiers of Public Health; one elective; and a capstone project.

There are two capstone course options: (1) students will develop an NIH-style research proposal focusing on a topic related to infectious disease epidemiology (EMD 625, How to Develop, Write, and Evaluate an NIH Proposal); or (2) students may elect to enroll in EMD 563, Laboratory and Field Studies in Infectious Diseases, which will provide students with hands-on training in laboratory or epidemiological research techniques.

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.

Course Requirements

The Health Informatics concentration consists of a total of fourteen courses (excluding EPH 600, Research Ethics and Responsibility): eight required courses, four electives, and satisfactory completion of a yearlong capstone project (BIS 685 and BIS 686).

The eight required courses are: BIS 562, Clinical Decision Support; BIS 633, Population and Public Health Informatics; BIS 634, Computational Methods for Informatics; BIS 638, Clinical Database Management Systems and Ontologies; CB&B 740, Introduction to Health Informatics; CB&B 750, Core Topics in Biomedical Informatics; EPH 508, Foundations of Epidemiology and Public Health; and EPH 608, Frontiers of Public Health. Students who have demonstrated a mastery of topics covered by the required courses may substitute more advanced courses as approved by the student's adviser and the DGS.

Four electives are required. Suggested electives are: BIS 540, Fundamentals of Clinical Trials; BIS 557, Computational Statistics; BIS 567, Bayesian Statistics; BIS 621, Regression Models for Public Health; BIS 628, Longitudinal and Multilevel Data Analysis; BIS 640, User-Centered Design of Digital Health Tools; BIS 643, Theory of Survival Analysis; BIS 679, Advanced Statistical Programming in SAS and R; BIS 691, Theory of Generalized Linear Models; CB&B 555, Unsupervised Learning for Big Data; CB&B 567, Topics in Deep Learning: Methods and Biomedical Applications; CB&B 645, Statistical Methods in Computational Biology; CB&B 663, Deep Learning Theory and Applications; CB&B 745, Advanced Topics in Machine Learning and Data Mining; CDE 566, Causal Inference Methods in Public Health Research; CPSC 546, Data and Information Visualization; CPSC 564, Topics in Foundations of Machine Learning; CPSC 577, Natural Language Processing; EMD 533, Implementation Science; EPH 510, Health Policy and Health Care Systems; HPM 560, Health Economics and U.S. Health Policy; HPM 570, Cost-Effectiveness Analysis and Decision-Making;

IMED 625, Principles of Clinical Research; MGT 510, Data Analysis and Causal Inference; MGT 534, Personal Leadership; MGT 656, Management of Software Development; NURS 922, Introduction to Clinical Research Informatics; S&DS 517, Applied Machine Learning and Causal Inference; S&DS 530, Data Exploration and Analysis; S&DS 562, Computational Tools for Data Science; S&DS 565, Introductory Machine Learning; S&DS 583, Time Series with R/Python; S&DS 584, Applied Graphical Models; S&DS 610, Statistical Inference; S&DS 663, Computational Mathematics for Data Science; S&DS 664, Information Theory; and S&DS 670, Theory of Deep Learning.

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, melanie.elliot@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

Acting Chair [Sp]
Kathryn Lofton

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*), Christine Hayes, 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*), Kathryn Tanner (*Divinity*), Shawkat Toorawa (*Near Eastern Languages & Civilizations*), Miroslav Volf (*Divinity*)

Associate Professors Zareena Grewal (*American Studies*), Willie Jennings (*Divinity*), Noreen Khawaja, Hwansoo Kim, Elli Stern, Tisa Wenger (*Divinity*), Travis Zadeh

Assistant Professors Maria Doerfler, Supriya Gandhi, Eric Greene, Nicole Turner

Senior Lecturers John Grim (*School of the Environment*), Mary Evelyn Tucker (*School of the Environment*)

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. and M.A. (both en route to the Ph.D.) See Degree Requirements under Policies and Regulations. Students in Religious Studies must take seven courses to be eligible for the M.A. degree.

Program materials are available online at http://religiousstudies.yale.edu.

COURSES

RLST 510a, Method and Theory Kathryn Lofton
Required seminar for doctoral students in Religious Studies. Others admitted with instructor's permission.

RLST 522a / HIST 565a, Early Modern Spain Carlos Eire
Reading and discussion in sixteenth- and seventeenth-century Spanish texts (all available in English translation) and also in recent scholarship on early modern Spain.

RLST 568a / EALL 521a, Introduction to Chinese Buddhist Literature Eric Greene
This class is an introduction to Chinese Buddhist literature. Although written in classical Chinese, Buddhist texts in China were written in a particular idiom that was much influenced by the Indian languages and which can be difficult to understand without special training. This class introduces students who already have some reading ability in literary Chinese to this idiom and the tools and background knowledge needed to read and understand Chinese Buddhist literature. We read a series of selections of some of the most influential Chinese Buddhist texts from various genres including canonical scriptures, apocryphal scriptures, monastic law, doctrinal treatises, and hagiography. Secondary readings introduce the basic ideas of Indian and Chinese Buddhist thought to the extent necessary for understanding our readings. Prerequisite: CHNS 571 or equivalent, or permission of the instructor. Students of Japanese or

Korean literature who can read basic *kanbun* or *gugyeol* are also welcome to enroll; no knowledge of modern, spoken Chinese is required.

RLST 574b, Chinese Buddhist Texts Eric Greene
Close reading of selected Chinese Buddhist texts in the original.

RLST 598b / EAST 511b, 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 606b, Pedagogy Nancy Levene
Seminar for doctoral students on the craft of teaching, with emphasis on the cultivation of a variety of learning environments.

RLST 616a / HIST 603a / JDST 806a / MDVL 603a, Jews and Christians in the Formation of Europe, 500–1500 Ivan Marcus
This seminar explores how medieval Jews and Christians interacted as religious societies between 500 and 1500.

RLST 620a, Origins of Islam Travis Zadeh
This seminar examines the formative stages of Islamic history. The topic of origins offers a broader framework to probe the histories of Orientalism and modern Islamic reform through case studies focusing on law, ritual, gender, race, slavery, and memory. Readings are drawn from epigraphic materials, prosopographical compendiums, exegesis, hadith collections, juridical manuals, and universal and regional histories.

RLST 626a / AFAM 626a / HIST 721a, African American Religious History Nicole Turner
African American religions have been central to the African American experience since Africans arrived in North America. An amalgam of traditional African religions, Christianity, Islam, Judaism, and African American ingenuity, African American religions are dynamic and multifaceted. Although they are often depicted as sources of black resilience and emblems of black resistance, they have also been critiqued for marginalizing and racializing black people, as well as encoding archaic gender paradigms and reinforcing class divisions. This course explores the ways histories of African American religions have produced these various interpretive frames. Questions that animate the course include: What role have African American religions played in African American life? How have scholars studied the history of African American religions and ultimately shaped the discourse about African American religious life, and by extension African American history? The course engages foundational works, such as Albert Raboteau's *Slave Religion* and Evelyn Brooks Higginbotham's *Righteous Discontent,* as well as newer works like Judith Weisenfeld's *New World A-Coming* and Matthew Harper's *The End of Days*.

RLST 628a / EAST 506a, Paradise in Buddhism: Pure Land Traditions James Dobbins

Pure Land Buddhism is a tradition with roots in India that developed most extensively in East Asia. Unlike other forms of Buddhism, it centers on a paradise motif and is largely devotional in character. It arises from scriptural stories about a transcendent Buddha named Amida who vows to bring all living beings to enlightenment via an other-worldly realm known as the Pure Land. The seminar examines this tradition historically against the backdrop of Buddhism in general, focusing on the Pure Land sutras and the unfolding of Pure Land Buddhism in Japan. Among the goals of the course is to develop familiarity with the structure of the sutras and with classical Buddhology, the core concepts and strategies of Buddhist doctrine and story-making. It also explores the teachings of several celebrated Japanese Buddhists, the portrayal of women in texts and religious practices, and the demythologization of Pure Land and Amida in the modern period.

RLST 641a, Death and Afterlife in Eastern Christian Traditions Maria Doerfler and Vasileios Marinis

Death, for ancient Christians as in the present era, sat at the intersection of a wide range of discourses. Doctors and intercessors sought to avert it, jurists to mitigate its impact on families and the flow of capital, philosophers and theologians to prescribe approaches to it, and bishops and other religious professionals to create rituals by which to assist the departed's transition into the afterlife and to channel the grief of surviving loved ones. This seminar introduces students to the pluriformity of material, literary, and liturgical practices surrounding death in early and Byzantine Christianity, from the fourth through the fifteenth century CE. After an initial foray into the sources, both biblical and philosophical, from which Christians constructed ideas about death and the afterlife, the seminar moves to exploring strategies of commemorating the departed; competing notions about the fate of the soul after death; and the anticipated final judgment and the loci—heaven and hell—to which Christians expected it to assign all humanity. Admission is at the instructor's discretion. While there is no formal prerequisite, familiarity with the outlines of early and Byzantine Christian history, and with biblical literature, is an asset to participants.

RLST 646a / SAST 670a, 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 Upani#ads, Mahābhārata, Rāmāya#a, Bhāgavata Purā#a, Bhagavad-gītā, and Yogavāsi##ha; 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 704a / AMST 730a / ANTH 727a, Readings in Critical Muslim Studies Zareena Grewal

This course surveys key texts from a broad range of fields, including transnational American studies, religious studies, history, and anthropology, to explore methodological and theoretical questions that include: What is the "critical" in critical

Muslim studies? What and who is "the Muslim" in these scholarly formations: a religious subject, a racial category, a location of subjection and surveillance, or all of these? What theoretical frameworks have emerged in the past twenty years to analyze the Muslim experience, and what is the impact of these intellectual projects on the academy and Muslim populations themselves? What different methodologies are used and what kinds of knowledge do they yield? How does critical Muslim studies as an emergent field complicate notions of an "American Islam" and "American Islamophobia," terms that are and have been practiced, debated, encoded, and altered both by transnational populations within the United States and by U.S. imperial policies, investments, and interests in Islam. The aim is to combine the resources and insights of various disciplines while identifying theoretical and methodological pitfalls and possibilities for future research. We focus on the relationship of our readings to other interdisciplinary formations that transcend disciplines, such as critical security studies and the anthropology of the secular, and the debates and trends therein. Permission of the instructor required.

RLST 741b, Phenomenology Noreen Khawaja
In-depth introduction to phenomenology as a theory of what is and as a method for studying it. Key figures in the history of phenomenology, emphasizing connections to social theory, aesthetics, and religion. Readings from Merleau-Ponty, Heidegger, Fanon, Husserl, Ahmed, Barad, and others.

RLST 750b, Religion, Ethnicity, and Identity in American Jewish History Elli Stern
An exploration of how Jews in America negotiated, and renegotiated, religion and ethnicity to forge a hyphenated American identity. Topics include the impact of Protestant domination, immigrant experiences and legacies, the role of discrimination, and self-presentation and representation by others.

RLST 771a / HIST 598a / JDST 846a, Jewish Emancipation in the Nineteenth Century David Sorkin
A study of the various forms of emancipation politics in the nineteenth century. Conventional historiography has identified Haskalah (Jewish Enlightenment) and religious reform as the predominant forms of emancipation politics. This course explores neglected forms of emancipation politics including: the citizen intercessor, lawyers using law, organized community politics, cooperation with the state, opposition to the state, horizontal alliances, public protests, private diplomacy, etc.

RLST 773a / HIST 596a / JDST 761a / MDVL 596a, Jewish History and Thought to 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 819a / AMST 630a / HSAR 529a, Religion and Museums 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 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 861b, Archaeology of the Roman Empire for the Study of New Testament and Early Christianity Laura Nasrallah
The first portion of the course introduces students to working with archaeological data from the Greco-Roman world (inscriptions, architecture, sculpture, coins). The second consists of seminars in Greece and Turkey during May, including some meetings with archaeologists and other scholars abroad. The course is designed for EMWAR students with a primary or secondary area of concentration in New Testament, Early Christianity, Late Ancient Christianity, and Christianity and Judaism in the Hellenistic East. The course also provides important historical context for students concentrating in Second Temple and Hellenistic Judaism and in Rabbinic Judaism. The course can also be applied to secondary areas of concentration focused on archaeology and material culture. Prerequisites: some level of reading ability in Greek, Latin, or Arabic; some level of reading ability in German, French, or modern Greek; and previous course work in early Christianity, New Testament, or Classics/Roman history. *EMWAR area of concentration designations: NT, EarXty, LateXty, XtyJudEast.*

RLST 874a / SMTC 553a, Advanced Syriac I Jimmy Daccache
This course, designed for graduate students who are proficient in Syriac, is organized topically. This term's topics: language (the language of Adam, the language of Paradise); hagiography (Persian martyr acts); scientific texts (pandemic of bubonic plague, medicine); and philosophy.

RLST 875b / SMTC 554b, Advanced Syriac II Jimmy Daccache
This course, designed for graduate students who are proficient in Syriac, is organized topically. This term's topics: language (the language of Adam, the language of Paradise); hagiography (Persian martyr acts); scientific texts (pandemic of bubonic plague, Medicine); and philosophy.

RLST 890a, Religion and Modernity Nancy Levene
Seminar for doctoral students working at the intersection of religion, philosophy, and politics in modernity. Readings and topics vary from year to year.

RLST 897a, EMWAR Seminar I Stephen Davis
Required seminar for doctoral students in the EMWAR program, which also welcomes students who are interested in the religions of antiquity (including those students continuing in the tracks of New Testament, Ancient Christianity, Ancient Judaism). This term consists of 3–4 meetings, arranged so that the maximum number of students

and faculty in the program can attend. Events include presentation of written works in progress, delivery of paper drafts for upcoming conferences, and a seminar for professionalization. ½ Course cr

RLST 898b, EMWAR Seminar II Stephen Davis
Part II of the EMWAR seminar consists of every-other-week sessions, which include such events as discussion of works in progress, key professionalization topics, and meetings with invited scholars in the field. ½ Course cr

RLST 905a, Theology Doctoral Seminar Kathryn Tanner
Combining seminar and workshop formats, this course solicits text suggestions from both students and faculty on the topic of Christian theology and anti-black racism in order 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.

Renaissance Studies

Humanities Quadrangle, Rooms 431 & 436, 203.432.0672
http://renaissance.yale.edu
M.A., M.Phil., Ph.D.

Chair and Director of Graduate Studies
Ayesha Ramachandran

Executive Committee Marisa Bass, Paola Bertucci, Christina Kraus, Alan Mikhail, Feisal Mohammed, Ayesha Ramachandran, Christophe Schuwey, Jane Tylus

Faculty associated with the program Rolena Adorno (*Emerita*), Emily Bakemeier, Marisa Bass, Paola Bertucci, R. Howard Bloch, Leslie Brisman, Paul Bushkovitch, Ardis Butterfield, Judith Colton (*Emerita*), Carlos Eire, Paul Freedman, Roberto González Echevarría (*Emeritus*), Bruce Gordon, Emily Greenwood, K. David Jackson, Maija Jansson (*Emerita*), Jacqueline Jung, David Scott Kastan (*Emeritus*), Christina Kraus, Noel Lenski, Lawrence Manley, J.G. Manning, John Matthews (*Emeritus*), Giuseppe Mazzotta (*Emeritus*), Alan Mikhail, Feisal Mohammed, Isaac Nakhimovsky, Robert Nelson (*Emeritus*), Catherine Nicholson, David Quint, Ayesha Ramachandran, Ellen Rosand (*Emerita*), Christophe Schuwey, Christopher Semk, Nicola Suthor, Jane Tylus, Jesús Velasco, Keith Wrightson (*Emeritus*)

FIELDS OF STUDY

Renaissance Studies offers a combined Ph.D. degree that integrates concentration in a departmental field with interdisciplinary study of the broader range of culture in the Renaissance and early modern periods. The program is designed to train Renaissance specialists who are firmly based in a traditional discipline but who can also work across disciplinary boundaries. Departmental areas of concentration available are Classics, Comparative Literature, English, French, History, History of Art, History of Music, Italian, and Spanish and Portuguese.

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

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are subject to the combined Ph.D. supervision of the Renaissance Studies program and the relevant participating department. The student's program will be decided in consultation with an adviser, the director of graduate studies (DGS) in Renaissance Studies, and the DGS in the participating department. As detailed below, requirements for the combined degree vary slightly to accommodate the requirements of the participating departments, but all candidates for the combined degree are expected to meet, at a minimum, the following requirements. (1) Students must demonstrate a reading knowledge of Latin, Italian, and a third language, which will vary according to departmental requirements. At the minimum, an examination in Latin or Italian should normally be passed upon entrance; a second language should be passed before the third term; and a third language by the end of the second year. (2) Each student is required to take sixteen term courses (in History of Art, fifteen). The normal pattern is to have completed fifteen courses during the first two years of

study, no more than two of which may be individual reading and research. (3) A two-term core seminar (RNST 500/RNST 501), designed to present a wide range of topics concerned with Renaissance and early modern culture, is required of all combined degree candidates. This course, offered every other year, is open to students from other departments.

Training in teaching, through teaching fellowships, is considered an important part of every student's program. Most students teach in their third and fourth years.

The scheduling of the oral examination and the dissertation prospectus follows the practice of the primary department, but in every case the two requirements must be completed not later than September of the fourth year. The oral examination, varying in length from two hours to two hours and fifteen minutes, will include questions on Renaissance topics outside the primary discipline. The remainder of the examination will be devoted to the primary discipline, including (except in the case of Classics) some further coverage of the Renaissance period. Students take additional written examinations as required by the primary departments.

Upon completion of all predissertation requirements, including the prospectus, students are admitted to candidacy for the combined Ph.D. degree. Admission to candidacy must be completed by the beginning of the fourth year.

The dissertation will be advised and completed according to departmental guidelines, but one of the readers will normally be a member of the Renaissance Studies Executive Committee.

Classics

Course work Students are required to complete sixteen term courses. Eight of these will be courses in Classics and will include at least four courses in Greek and Latin literature, a course in historical or comparative grammar, and at least three seminars. The eight remaining courses making up the Renaissance Studies portion of the degree will be distributed as follows: two terms of the Renaissance Studies core seminar (RNST 500/RNST 501), six additional term courses to be taken in at least two disciplines (such as literature, history, history of art, music, religious studies, etc.). One of these courses should respect the spirit of the ordinary Classics requirement of a course in classical art or archaeology (a course on the classical origins of Renaissance architecture, for example, will satisfy this requirement).

Languages Students are expected to pass the normal Greek and Latin competency exams upon entrance to the program. Italian, as set by Renaissance Studies—one hour on sixteenth-century Italian prose, and another one-hour exam on modern Italian scholarship—and a second language, normally German or French.

Examinations Students are expected to pass the Greek and Latin translation exams, based on the Classics and Renaissance Studies Ph.D. reading lists, by the beginning of the fifth term in residence; the oral exams in Greek and Latin literature, based on the Classics and Renaissance Studies Ph.D. reading lists, by the end of the fifth term in residence; and the oral exams on special fields appropriate to both disciplines, as described below, by the end of the sixth term in residence.

Orals Classics portion: seventy-five minutes on three or four topics in classical Greek and Latin literature. Renaissance Studies portion: forty-five minutes, three fifteen-minute questions on Renaissance topics to be divided between at least two disciplines, i.e., literature, history, history of art, etc.

Prospectus and dissertation The prospectus must be completed by the end of the seventh term in residence. Procedures regarding the dissertation will follow departmental practice, although the board of readers will normally include at least one member of the Renaissance Studies Executive Committee.

Comparative Literature

Course work Students are required to complete sixteen 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 ten courses in the field of Renaissance Studies (offered in several departments), including two terms of the Renaissance Studies core seminar (RNST 500/RNST 501) and three courses in two disciplines other than literature (such as history, history of art, or religious studies). 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. 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 Latin and Italian, as set by Renaissance Studies—one hour of Renaissance Latin prose; one hour of sixteenth-century Italian prose, one of modern Italian scholarship—and two additional languages, at least one of them European.

Orals The joint oral examination will consist of seven twenty-minute questions (two topics in Renaissance literature from a comparative perspective; three on non-Renaissance literature, including at least one theoretical or critical question; and two questions on Renaissance topics in nonliterary disciplines). Orals should be completed no later than the end of the sixth term.

Prospectus and dissertation The prospectus should be completed in September of the fourth year. Procedures regarding the dissertation will follow departmental practice, although the final readers will normally include at least one member of the Renaissance Studies Executive Committee.

English

Course work Students are required to complete sixteen term courses. Eleven of these will be courses in English, of which five (including those normally cross-listed, such as Comparative Literature courses and the Renaissance Studies core seminar [RNST 500/RNST 501]) will be in Renaissance literature. An additional five courses in Renaissance topics will be non-cross-listed courses from other departments. Course work must be completed by the end of the fifth term.

Languages Latin, Italian, and a second modern language, to be tested by the Renaissance Studies program.

Orals Five twenty-minute questions, including two Renaissance topics. An additional thirty-minute portion, consisting of two fifteen-minute questions in Renaissance Studies, on nonliterary disciplines.

Prospectus and dissertation The prospectus must be completed by the beginning (i.e., September) of the seventh term. Procedures regarding the dissertation will follow departmental practice, with at least one reader from the Renaissance Studies Executive Committee.

French

Course work Sixteen term courses at the graduate level are required. Nine correspond to the requirements of the French department, seven to the requirements of the Renaissance Studies program. Of the nine courses taken in French, one must be FREN 610 (Old French), two others must fall within the medieval and early modern periods (eleventh through seventeenth century). The six remaining courses in French must cover as broad a spectrum as possible of the various periods and subfields of French and francophone literature. Of the seven courses taken in Renaissance Studies, two must be the Renaissance Studies core seminar (RNST 500/RNST 501), two must be in a literature or literatures other than French, and three must be taken in other departments (e.g., History, History of Art, Music, Religious Studies, Philosophy, etc.).

Languages Latin and Italian, as required and examined by Renaissance Studies, and a third language relevant to the student's specialization (Greek, Hebrew, Spanish, Portuguese, German), in addition to French. A written examination in Latin will consist of a passage of humanist Latin prose (one hour). A written examination in Italian will consist of a literary passage from the Italian Renaissance (one hour) and a passage of modern Italian scholarship (one hour). Written examinations in the third language will consist of passages appropriate to the language and the discipline, or may be satisfied by a graduate seminar taken in the language or literature in question.

Orals 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 seven topics: four in French and three in Renaissance Studies. Of the four topics in French, one must center on Renaissance literature, two on other areas of French and francophone literature; the fourth will consist of the textual analysis of a poem or prose passage in French, provided to the candidate twenty-four hours before the examination. Of the three topics in Renaissance Studies, one or two must center on a Renaissance literature other than French, the remainder on an area or areas of Renaissance Studies other than literature. The French part of the examination will be conducted in French; the Renaissance Studies part will be conducted in English.

Prospectus and dissertation A formal prospectus defense must take place no later than two weeks before 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 of the Renaissance Studies Executive Committee. 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 at least one member of the Renaissance Studies Executive Committee.

History

Course work Students are required to complete sixteen term courses. Ten of these will be courses in History; of these, a minimum of four will be in Renaissance/early modern topics from the fourteenth through the seventeenth century. The six remaining courses making up the Renaissance Studies portion of the degree will be distributed as follows: two terms of the Renaissance Studies core seminar (RNST 500/RNST 501), four additional term courses to be taken in at least two disciplines outside of history (such as Classics, modern literatures, history of art, music, etc.). The normal History department requirements of three research seminars and a prospectus tutorial apply to combined-degree students.

Languages Latin, Italian, and another European language. Students whose areas of interest do not include Italy are encouraged to learn Italian, but may request replacing Italian with another modern European language that is more relevant to their research.

Orals History portion: seventy-five minutes in all, including forty-five minutes on the student's major Renaissance/Reformation/early modern field, which may, but need not be, shared with more than one examiner, and thirty minutes on a minor field outside the specialization (and preferably outside of European history). Renaissance Studies portion: forty-five minutes, three fifteen-minute questions to be divided between at least two disciplines outside of history narrowly conceived (i.e., in literature, history of art, etc.). Students are expected to complete the oral examination no later than September of the fourth year.

Prospectus and dissertation Students are expected to complete the prospectus by March of the third year. Procedures regarding the dissertation will follow departmental practice, although the board of readers will normally include at least one member of the Renaissance Studies Executive Committee.

History of Art

Course work Students are required to complete fifteen term courses. Ten of these will be courses in History of Art; of these, a minimum of four will be in Renaissance art from fourteenth-century Italy through the baroque. The five remaining courses making up the Renaissance Studies portion of the degree will be distributed as follows: two terms of the Renaissance Studies core seminar (RNST 500/RNST 501), three additional term courses taken in at least two disciplines outside of history of art (such as literature, history, music, religious studies, etc.). Students will normally take seven courses in the first year, six in the second year (the credit for first-time teaching will be included in this number), and a final course in the fall of the third year.

Qualifying paper Normally during January of the second year, students submit a qualifying paper that should demonstrate the candidate's ability to complete a Ph.D. dissertation successfully.

Languages Latin and Italian, as set by Renaissance Studies—one hour of Renaissance Latin prose; two hours of Italian, one of sixteenth-century Italian prose, one of modern

Italian scholarship. A third language (in most cases German) at the discretion of the History of Art department.

Orals The comprehensive oral examination will normally take place toward the end of the first term of the third year and must be completed no later than September of the fourth year. It will consist of a three-hour written examination based on the candidate's major field and an oral examination as follows: History of Art: seventy-five minutes, including examination on at least one field noncontiguous with the Renaissance; Renaissance Studies: forty-five minutes, three fifteen-minute questions to be divided between at least two disciplines outside the history of art.

Prospectus and dissertation Students are expected to complete the prospectus and colloquium by March of the third year. Procedures for the submission and evaluation of dissertations will be those followed in History of Art, although the board of readers will normally include a member of the Renaissance Studies Executive Committee.

Italian

Course work Of the combined degree program's total of sixteen term courses, seven are in Renaissance Studies and nine are in the Department of Italian Studies. Of the nine courses in Italian, at least three must be devoted to the period from Dante to the earlier seventeenth century. The seven courses making up the Renaissance Studies portion of the degree will be distributed as follows: two terms of the Renaissance Studies core seminar (RNST 500/RNST 501); two courses in Renaissance literatures other than Italian, and three courses divided between at least two nonliterary disciplines (e.g., history, history of art, religious studies, etc.).

Languages Latin, as set by Renaissance Studies (one hour of Renaissance Latin prose), a second romance language, and a non-romance language, tested in a two-hour examination (one hour of Renaissance prose, one hour of modern scholarship). Latin to be passed by the end of the first year (and preferably upon entrance); all languages to be passed before the oral examination.

Orals The qualifying examination, which must be completed by the end of the third year, will include an oral examination in which sixty minutes will be devoted to Italian literature, including the Renaissance, and forty-five minutes will be devoted to three fifteen-minute questions on a topic in Renaissance literature outside of Italy and two topics in nonliterary areas of the Renaissance (such as history or history of art). The portion of the examination devoted to Italian literature will also include a written component following departmental guidelines.

Prospectus and dissertation The dissertation (a prospectus of which must be completed by the beginning of the fourth year) will normally be directed within the Department of Italian Studies, but at least one of the readers will normally be a member of the Renaissance Studies Executive Committee.

Music

Course work Students are required to complete sixteen term courses. Ten of these will be courses in Music, including four in early music, i.e., from the later Middle Ages through the baroque. The six remaining courses making up the Renaissance Studies portion of the degree will be distributed as follows: two terms of the Renaissance

Studies core seminar (RNST 500/RNST 501), four additional term courses taken in at least two disciplines outside of music (such as literature, history, history of art, religious studies, etc.).

Languages Latin and Italian, as set by Renaissance Studies—one hour of Renaissance Latin prose; two hours of Italian, one of sixteenth-century Italian prose, one of modern Italian scholarship. A third language (normally French or German) at the discretion of the Department of Music.

Comprehensive examinations Music: three ninety-minute essays (including one on early music), followed by an oral examination of ninety minutes. Renaissance Studies: one ninety-minute essay on an interdisciplinary Renaissance topic (e.g., art and literature of a particular country, or comparison of the culture of two or three princely courts, or the history of the Reformation or Counter-Reformation), followed by a thirty-minute oral examination on the essay topic. Students take the comprehensive exam in Music at the beginning of the third year and the Renaissance Studies comprehensive exam in the spring of the third year.

Prospectus and dissertation Students enroll in the third-year prospectus/dissertation seminar in Music and must complete the prospectus no later than September of the fourth year. Dissertations will be approved in the Department of Music, with at least one reader to come from the Renaissance Studies Executive Committee.

Spanish and Portuguese

Course work A total of sixteen term courses at the graduate level is required. Nine correspond to the requirements of the Spanish and Portuguese department, seven to the requirements of the Renaissance Studies program. Of the nine courses taken in Spanish and Portuguese, two are required: SPAN 790, Methodologies of Modern Foreign Language Teaching, and SPAN 500, History of the Spanish Language. Of the remaining seven, three or four will be in Spanish and/or Portuguese literature from the medieval period through the seventeenth century, and the balance will be in the literature of Spain's and/or Portugal's ultramarine possessions. Students doing the combined degree program may elect to devote their departmental course work to either Hispanic or Luso-Brazilian literatures or do a combination of both in a distribution to be determined in consultation with their departmental adviser(s). Of the seven courses taken in Renaissance Studies, two must be the Renaissance Studies core seminar (RNST 500/RNST 501), two must be in a literature or literatures other than Spanish and/or Portuguese, and three must be taken in other departments (e.g., History, History of Art, Religious Studies, Philosophy, etc.).

Languages Students are expected to have a strong command of Spanish and/or Portuguese as well as English. In addition, the following requirements must be met: (1) Latin, as set by the Renaissance Studies program (passing a one-hour translation examination in Renaissance Latin prose); (2) Italian, as set by the Renaissance Studies program (successful completion of a one-hour translation exam in sixteenth-century Italian prose and a one-hour translation exam in modern Italian scholarship); (3) demonstration of reading/translation proficiency in one of the following languages: French, German, Greek, Portuguese (available to students doing departmental course work exclusively in Spanish), Spanish (available to students doing departmental course work exclusively in Portuguese), or another language relevant to the student's

specialization. Students doing their departmental course work in a combination of Spanish-language and Portuguese-language courses will be understood to have satisfied this third reading knowledge requirement so long as the courses are taught and the readings done in the relevant Romance language. If the course work in either Hispanic or Luso-Brazilian literatures is done in English, then the student will be expected to demonstrate proficiency by taking a one-hour translation exam in the sixteenth-century prose of the relevant language. One language requirement must be satisfied by the end of the first year of study, if not upon entrance into the program (preferably Latin or Italian); the remaining requirement (for students doing both Spanish- and Portuguese-language literatures) or requirements (for the student working exclusively in either Spanish or Portuguese) must be satisfied by the end of the second year.

Qualifying examination Written component: (1) a two-hour examination in peninsular Spanish and/or Portuguese literatures, and (2) a two-hour exam in the ultramarine literatures of Spain and/or Portugal. Oral component: eight fifteen-minute questions, distributed as follows: four in Spanish/Portuguese peninsular/ultramarine literatures (medieval period through the seventeenth century), and three in Renaissance Studies (one question on a non-Spanish/Portuguese literature, and two questions from extra-literary fields such as history, history of art, religious studies, etc.).

Prospectus The dissertation project should be carefully planned with faculty members from the relevant departments specializing in the respective areas. The prospectus should meet the approval of the student's adviser in the Department of Spanish and Portuguese and the Renaissance Studies program member advising the student. The prospectus must include a presentation of the topic to be investigated, an explanation of the reasons for its significance, and a description of the theoretical and methodological framework to be employed. The prospectus must be submitted to the DGS in the Department of Spanish and Portuguese, who will circulate it to the departmental faculty for their review and approval; the prospectus will likewise be submitted to the Renaissance Studies program for review and approval by the faculty member(s) working with the student. The prospectus must be submitted and approved by the faculty by the beginning of the seventh term of enrollment. Failure to meet this deadline will result in suspension of registration privileges by the Graduate School. The deadline for the submission of the dissertation prospectus in either term is the Monday of the final week of classes.

Dissertation The dissertation is to achieve a strong disciplinary (i.e., Spanish, Portuguese, or Spanish/Portuguese) identity while at the same time projecting a clear Renaissance Studies profile. The dissertation normally will be directed from within the Department of Spanish and Portuguese, and there will be at least one reader from the Renaissance Studies Executive Committee.

MASTER'S DEGREES

M.Phil. The combined M.Phil. degree may be requested after all requirements but the dissertation are met.

M.A. (en route to the Ph.D.) The M.A. degree is awarded upon completion of eight term courses, taken in at least three disciplines, and with at least three grades of Honors. The examination in Latin or Italian must have been passed.

Program materials are available upon request to the Chair, Renaissance Studies Program, Yale University, PO Box 208298, New Haven CT 06520-8298.

COURSES

The two-term Renaissance Studies core seminar (RNST 500/RNST 501) is offered every other year.

RNST 501b / HIST 564b, The Renaissance beyond Italy Carlos Eire
An introduction to the Renaissance beyond Italy, focused on reading and analyzing key texts.

RNST 668a / CPLT 809a / ENGL 668a / ITAL 668a, Translating the Renaissance Jane Tylus
Would there have been a Renaissance without translation? We approach this question by beginning with the first modern treatise on translation, by the Florentine chancellor Leonardo Bruni, and moving on to consider the role of translation in Florence's and Tuscany's growing cultural and political mastery over the peninsula—and in Italy's cultural domination of Europe. We go on to explore the translation of "medieval" into "early modern" Europe, the translation of visual into verbal material, and the role of gender in the practice of translation. Students engage in their own translation projects as we dedicate the last part of the seminar to the diffusion of the Petrarchan sonnet tradition in early modern Europe.

RNST 684a / CPLT 684a / ENGL 574a / ITAL 720a, Renaissance Epic David Quint
This course looks at Renaissance epic poetry in relationship to classical models and as a continuing generic tradition. It examines epic type scenes, formal strategies, and poetic architecture. It looks at themes of exile and imperial foundations, aristocratic ideology, and the role of gender. The main readings are drawn from Vergil's *Aeneid,* Lucan's *Bellum civile,* Tasso's *Gerusalemme liberata,* Camões's *Os Lusíadas,* and Spenser's *Faerie Queene*.

RNST 870a / CPLT 973a / SPAN 870a, Imagining the New World Lisa Voigt
This course focuses on the use of images of and in the "New World" during the first century of European exploration, conquest, and colonization in the Americas. We explore printed illustrations that shaped European perceptions of New World "exoticism" and "barbarism," as well as indigenous pictorial manuscripts that continued and adapted native visual practices and offered alternative views of the conquest. Besides reading texts by European and indigenous authors in which images played an important role (Columbus, Las Casas, Oviedo, Staden, Léry, Raleigh, Sahagún, Guaman Poma), we study nonalphabetic visual sources such as Nahua codices and maps, and portraits and festive performances of Afro-descendants. We also examine how images of the Americas were disseminated in Europe through copied illustrations, generating clichés and stereotypes—terms originally associated with printing techniques—that contributed to the racism and colonialism that have shaped the modern world. We conclude with a discussion of examples of contemporary films that reimagine the colonial Americas.

Slavic Languages and Literatures

Humanities Quadrangle, 203.432.1300, slavic.department@yale.edu
http://slavic.yale.edu
M.A., M.Phil., Ph.D.

Chair
John MacKay

Director of Graduate Studies
Molly Brunson

Professors Edyta Bojanowska, Katerina Clark, John MacKay

Associate Professor Molly Brunson

Assistant Professors Marijeta Bozovic, Jinyi Chu, Claire Roosien

Senior Lectors II Irina Dolgova, Constantine Muravnik

Senior Lectors I Krystyna Illakowicz, Julia Titus, Karen von Kunes

FIELDS OF STUDY

The department offers the Ph.D. in Russian literature and culture and, by special arrangement, in medieval Slavic literature and philology.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

All graduate students are required to take four courses. RUSS 607, Topics in Russian Literature from Its Origins to the Eighteenth Century, is coordinated with the department's graduate reading list of required works in Russian literature of the period. All students will take an examination in RUSS 607 that will also double as the medieval Russian literature examination for the doctorate (for more on examinations, see below). RUSS 608, Eighteenth-Century Russian Literature, follows the same pattern as RUSS 607. Its readings are also coordinated with the department's graduate reading list of required works in Russian literature. All students will take an examination in RUSS 608 that will also double as the eighteenth-century Russian literature examination for the doctorate. The other required courses are SLAV 754, Church Slavonic, and RUSS 834, Aspects of Russian Grammar and Teaching Methodology, which combines pedagogy with the structure of Russian. If possible, SLAV 754 should be taken before RUSS 607. RUSS 834 should be taken concurrently with or before a graduate student's first term of teaching Russian language, typically during the seventh term of study.

The minimum number of graduate courses for the Ph.D. is sixteen, counting the above four required courses. Of the remaining twelve, at least two must be taken in nineteenth-century Russian literature and at least two in twentieth-century Russian literature, including poetry and prose or dramatic works.

Students who have done graduate work elsewhere may petition the department for up to three course credits toward their degree after one year's residence at Yale.

A special curriculum may be arranged for students wishing to specialize in medieval Slavic literature and philology.

Minor field As part of their program of study, students will also be responsible for developing a minor field of specialization in one of the following: (1) a Western or non-Western literature; (2) film studies; (3) a topic in intellectual history; (4) one of the other arts; (5) another Slavic literature; (6) Slavic linguistics; (7) another discipline relevant to their primary interests in Russian literature. The student's minor field of specialization will be determined in consultation with the director of graduate studies (DGS). The minor field can be developed most readily through reading courses in the Slavic department or by taking graduate courses in another department. Up to two graduate courses in other departments will count toward the sixteen for the doctorate if they are relevant to a student's program of study. The successful completion of a course or courses in the student's minor field taken in another department may double as the departmental examination in the minor.

Examinations The Ph.D. qualifying examinations comprise eight parts and will be completed during the third year of study: (1) medieval Russian literature; (2) Russian literature of the eighteenth century; (3) minor field; (4) nineteenth-century Russian prose and drama; (5) nineteenth-century Russian poetry; (6) twentieth-century Russian prose and drama; (7) twentieth-century Russian poetry; (8) pre-prospectus examination.

The first two examinations are taken in conjunction with courses offered during the first two years of course work, RUSS 607 and RUSS 608. Early in the fifth term of study, students will take (3), a forty-minute oral exam in their chosen minor field, administered by the DGS and relevant faculty within and/or outside the department; this examination will be waived if the student has successfully completed one or two relevant graduate courses in another department. In October of the third year of study (typically during the second week), students will take two written examinations, (4) and (5), of two hours each, the first on Monday of the given week, the second on Friday. Each exam will consist of two or three passages drawn from well-known works of literature that will be identified and that are designated as required on the department's reading list (which also includes additional works that are recommended but not required). Students will be expected to choose one passage and write an essay in which they analyze the text from as many of the following points of view as possible: versification (if relevant), style, structure, narrative point of view, themes, genre, period, place in the author's oeuvre and in literary history, comparative context, and critical reception. Two additional written examinations, (6) and (7), which will follow the same format, will be held during one week at the end of the student's fifth term of study (typically the first week of December), again on Monday and Friday. Each of these four written exams will be compiled and graded by two faculty members with expertise in the given century and genres. After each exam, students will be informed as to how they performed.

After the final written exam, all students will have a one-hour oral pre-prospectus exam on a date to be specified by the department near the beginning of the sixth term (typically, during the first week of February). This examination will explore issues pertaining to the student's future dissertation prospectus. Normally, preparation for the exam will entail a more focused reading of the departmental reading list. For example,

a student who proposes to work on Pasternak would read not only the required and recommended works by Pasternak, but also the required and recommended works by other writers of the twentieth century. Students will also be expected to explore secondary and theoretical sources outside the reading list that are relevant to their chosen topic. Preparation for the examination will be done in consultation with two faculty advisers (see below), and students will be required to prepare in advance a seven- to ten-page text outlining their future dissertation topic, including a discussion of existing scholarship and the way they propose to structure their work. An annotated bibliography of primary and secondary works pertaining to their dissertation topic should also be appended. The pre-prospectus text will be distributed to all departmental faculty one week prior to the exam, and all faculty will attend the exam. The aim of this exam is for the student to take an intermediate step toward developing a dissertation prospectus and also to provide the student with feedback from the faculty about the project.

The departmental reading list is available on the department's website.

Article in lieu of examination As a possible alternative to one of the four written examinations on the nineteenth and twentieth centuries, students may choose to write an article that they will submit for publication to a scholarly journal. The work will be carried out in consultation with a faculty adviser and will focus on a work or works in either poetry or prose (or drama) of the given century. This article will be due on the date that the exam on the given genre is normally scheduled. It is expected that the article will be ambitious in its overview and in its conceptualization of the issue(s) being addressed. The faculty adviser will evaluate the work and will advise the student on publication.

Teaching Since faculty consider teaching to be an integral part of graduate training, all graduate students are expected to teach for a total of four terms. (In most cases, this teaching takes place in the third and fourth years of study.) Students are typically assigned to two terms of language teaching, during which they are mentored and trained by a lead language lector, and two terms of literature/culture teaching, for which they either run discussion sections for large-enrollment lecture courses (e.g., Tolstoy and Dostoevsky) or serve as instructor-apprentices in undergraduate seminars.

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 linguistics, 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. A reading knowledge of French or German is required, and candidates must pass departmental proficiency examinations in Russian.

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

COURSES

RUSS 644a, Dostoevsky, Tolstoy, and the Novel Molly Brunson
An examination of the place of Dostoevsky and Tolstoy in the history and theory of the novel. Topics include modernity and the rise of the novelistic genre; narrative and description, time and space; novelistic form and discourse; psychological interiority and the elaboration of the self; the Realist novel, the *Bildungsroman,* and the epic; limits of novelistic representation. Alongside a selection of novels and contemporaneous critical and theoretical texts, we read the central works of twentieth-century novel theory by Bakhtin, Lukács, and others.

RUSS 651a, Chekhov Edyta Bojanowska
Detailed study of Anton Chekhov's writing in all genres: fiction, nonfiction, and drama. Focus on Chekhov's formal innovations, literary polemics with contemporaries and predecessors, and his works' embeddedness within the social contexts of late imperial Russia and late Victorian Europe. Attentive close reading of texts is combined with interdisciplinary approaches to the study of Chekhov, such as ecocriticism, performance studies, gender studies, postcolonial studies, theories of the spatial turn, and medical humanities. Prerequisite: students without reading knowledge of Russian need permission of the instructor.

RUSS 655b / HSAR 535b, Russian Style: Material Culture and the Decorative Arts in Imperial Russia Molly Brunson
This seminar examines the historical development of a national style in Russian decorative arts and material culture from the eighteenth century to the early twentieth. Although known for borrowing liberally from western European artistic traditions, Russian imperial culture—from the baroque and neoclassical courts of Elizabeth and Catherine to the exported "native" imaginaries of the Ballets Russes—also sought to distinguish itself in design, scale, manufacture, and style. Structured around a series of case studies, this seminar considers highlights from the history of Russian decorative arts, all while exploring broader questions about the transnational movement of style, the intersection of nationalism and design, the invention of "native" cultures, and the materialities of empire and modernity. Topics include the branding of Catherine the Great; Russia's natural resources and trade networks; consumer culture in St. Petersburg; the materialism of realism; the Abramtsevo artists' colony and the discovery of folk art; *russkii stil'* (Russian Style) at the World's Fairs; curating ethnographies and archaeologies; and the "relics" of the Romanovs. Organized as an intensive research seminar, this course brings the central conceptual and theoretical concerns of visual and material culture studies (e.g., materiality and thing theory, ornament and the decorative, the socioeconomics of taste) to a historical and object-

based consideration of Russian style. Significant use is made of the museum and library collections at Yale and nearby.

RUSS 680b, Space and Place in Modern Theory and Fiction Edyta Bojanowska
The study of literature has been dominated by questions of time and chronology, but recent scholarship has seen a surge of interest in the spatial discourses of literary texts. This course considers geometric, geographic, social, and epistemic spaces of literary texts. How do humans organize—and are organized by—space? How do literary texts conceptualize and sometimes transgress their own spatial order? How does spatial discourse situate knowledge, culture, and society? Borders, thresholds, and in-between spaces occupy us, along with transformations and animations of space. Theoretical readings span philosophy, literary and cultural theory, anthropology, sociology, phenomenology, and geography and include Plato, Heidegger, Goffman, Lefebvre, Foucault, Anderson, Bakhtin, Lotman, Tuan, Bachelard, de Certeau, Moretti, Massey, Grosz, Said, Bhabha, Deleuze, and Guattari. Literary readings include Russian texts from the nineteenth to the twenty-first century by Pushkin, Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov, Bely, Zamyatin, Platonov, Nabokov, Ulitskaya, and Pelevin. Readings are in Russian.

RUSS 682a, Russian Avant-Garde Poetry Marijeta Bozovic
This graduate seminar explores generations of Russian poetic avant-gardes in their cultural, historical, and political contexts. We focus on poetry but draw on visual culture, music, performance, and political actions as we follow our iconoclasts across genres and media, into and outside of the institutions they critique. We read seminal and recent theories of the avant-garde (Frankfurt school; Bürger; Mann; Sell) and poetry and aesthetic productions of the twentieth and early twenty-first centuries. From the demiurgic ambitions of the historical avant-garde (Khlebnikov, Mayakovsky, Vertinsky) we move to its Soviet continuation and transformation (Kharms, Oberiu); nonconformist Soviet-era practices (Nekrasov, Roald Mandelstam); Conceptualism (Prigov, Rubinstein); and finally post-Soviet and contemporary leftist avant-gardes (Medvedev, Chukhrov). Our readings include the works of Tsvetaeva, recontextualized in an alternative tradition of Russian poetry, as well as poems published this very year. What do such interventions mean today? The artistic avant-garde has always stood as a metaphorical surrogate for political violence; but has the "avant-garde tradition" become a travesty of the ambitions that marked its historical beginnings? Our approach emphasizes language, form, and medium as well as theory, philosophy, and politics. Weekly practices involve close reading, research, theoretical reframing, and ongoing collaborative participation.

RUSS 695a / FILM 778a, Russian Literature and Film in the 1920s and 1930s Katerina Clark
This course presents a historical overview, incorporating some of the main landmarks of the 1920s and 1930s including works by Pilnyak, Bakhtin, the Formalists, Platonov, Mayakovsky, Bulgakov, Zoshchenko, Eisenstein, Protazanov, Pudovkin, the Vasilyev "brothers," and G. Aleksandrov.

RUSS 851b, Proseminar in Slavic Literature Katerina Clark
Introduction to the graduate study of Russian literature. Topics include literary theory, methodology, introduction to the profession.

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
Grace Kao

Director of Graduate Studies
Philip Gorski

Professors Julia Adams, Jeffrey Alexander, Elijah Anderson, Scott Boorman, Nicholas Christakis, Philip Gorski, Grace Kao, Philip Smith

Associate Professors Rene Almeling, Emily Erikson, Jonathan Wyrtzen

Assistant Professors Daniel Karell, Alka Menon, Rourke O'Brien, 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. (en route to the Ph.D.) Eight term courses are required for the M.A. degree. Two of these courses must include statistics and theory. A grade of High Pass or Honors must be achieved in five of the eight required courses. The M.A. is normally conferred in the term that follows completion of the course requirements. In special circumstances, students may petition to receive the degree in the same term.

Program materials are available at http://sociology.yale.edu.

COURSES

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 534b, Cultural Sociology Jeffrey Alexander
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 537b / S&DS 575b, YData: Measuring Culture Daniel Karell
Culture is increasingly digital. Cultural objects, such as songs and artwork, are frequently digitized. Creating cultural objects often involves digital tools and takes place in digital domains. The effects of culture on our social lives are now typically mediated by digital platforms and devices. In this introductory course, we explore how data science is being used to measure the cultural landscape, the consumption and production of culture, and the impact of culture on society. To do so, we review current theories and methodologies, as well as conduct our own analyses of popular culture, the rhetoric and social connections underlying online extremist communities, and other topics. The course provides opportunities to practice the data science skills presented

in S&DS 523 with applications to the social scientific study of culture. Can be taken concurrently with or after successfully completing S&DS 523.

SOCY 539a / AFAM 518a / PSYC 536a, Is That Racist? Theory and Methods for Diagnosing and Demonstrating Racism Phillip Atiba Goff

How do we know when something is racist? And how do we prove it to those who are skeptical? This course is designed to allow students to go beyond armchair pontificating about racism by exploring a broad range of ways social theorists have defined the term and methods they have used to demonstrate it. Together, we read, critique, and synthesize scholarship from across disciplines, with the goal of refining our own definition of the term. To accomplish this, we examine the stakes of calling something racist, who benefits and who suffers from a given definition, and how racism functions across contexts (mostly) within the United States. We also learn about popular methods for demonstrating that an idea, feeling, behavior, person, or institution is racist and evaluate how evidence about racism (or lack thereof) can obscure a diagnosis of racism—or lead to an erroneous one. Throughout the course, we take opportunities to translate the theoretical and methodological lessons we learn to the world we live in today, from popular culture to dinner table conversations. This course is designed to be mostly *synchronous,* with synchronous sections accompanying lectures. Videos are made available for students who are not able to attend lectures or sections, but taking the course asynchronously is discouraged. Prerequisite: students should be comfortable reading journal articles and thinking critically about contentious social/political topics. Readings and other course materials span a wide range of disciplines. While there are no statistical prerequisites, students are asked to think about the logic of statistical analysis and should be comfortable reasoning about numbers.

SOCY 542a, Sociological Theory Julia Adams

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 554a, Research Topics on Human Nature and Social Networks Nicholas Christakis
This seminar focuses on ongoing research projects in human nature, behavior genetics, social interactions, and social networks.

SOCY 560a or b / PLSC 734a or b, Comparative Research Workshop Staff
This weekly workshop is dedicated to group discussion of work-in-progress by visiting scholars, Yale graduate students, and in-house faculty from Sociology and affiliated disciplines. Papers are distributed a week ahead of time and also posted on the website of the Center for Comparative Research (http://ccr.yale.edu). Students who are enrolled for credit are expected to present a paper-in-progress.

SOCY 580a, Introduction to Methods in Quantitative Sociology 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 581b, Intermediate Methods in Quantitative Sociology Daniel Karell
Second part of a two-term introduction to statistical analysis for quantitative social science research. Covers review of linear regression; introduction to models for categorical and count data, the analysis of time data, and longitudinal data; overview of missing data and weighting; and discussion of data that are complicated by issues of nonrandom design. Prerequisite: SOCY 580.

SOCY 584b / AFAM 584b, Inequality, Race, and the City Elijah Anderson
Urban inequality in America. The racial iconography of the city is explored and represented, and the dominant cultural narrative of civic pluralism is considered. Topics of concern include urban poverty, race relations, ethnicity, class, privilege, education, social networks, social deviance, and crime.

SOCY 595b, Stratification and Inequality Workshop Grace Kao
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 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 620b, 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 or b, Workshop in Cultural Sociology Staff
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 647b, Social Processes Scott Boorman
Focus is on identifying and exploring robust alternatives/complements to the rational choice models that have come to dominate so much of the analysis of social (including organizational) processes in recent years. Specifically, emphasis is placed on a range of mathematical models and related analytic approaches originating outside of the rational choice literature—in fields such as social network analysis, evolutionary biology, organization theory, and the law. Possible starting points include the Boorman-Levitt network matching model and its applications to nonprofits and complex statutes; weak ties models of job information transmission and other information transfer in elite social networks; and "garbage can" models of the internal problem-solving dynamics of complex organizations.

SOCY 656a, Professional Seminar Rene Almeling
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.

Spanish and Portuguese

Humanities Quadrangle, 203.432.5439, 203.432.1151
http://span-port.yale.edu
M.A., M.Phil., Ph.D.

Chair
Jesús Velasco

Director of Graduate Studies
Aníbal González-Pérez

Professors Larissa Brewer-García (*Visiting*), Aníbal González-Pérez, K. David Jackson, Noël Valis, Jesús Velasco, Lisa Voigt (*Visiting*)

Senior Lector I Ame Cividanes

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, Film and Media Studies, History of Art, Medieval Studies, Philosophy, and Renaissance Studies, 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 Renaissance Studies offered in conjunction with the Renaissance 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 Renaissance Studies

The Department of Spanish and Portuguese also offers, in conjunction with the Renaissance Studies Program, a combined Ph.D. in Spanish and Portuguese and Renaissance Studies. For further details, see Renaissance 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 905b / CPLT 974b, The Short Story: Major Authors Kenneth David Jackson
Close reading of modern short stories by major authors writing in Portuguese, with an emphasis on Brazilian literature. Dominant critical and thematic currents; analysis of social forces. In Portuguese.

PORT 922b, Brazil's Modern Art Movement Kenneth David Jackson
Study of Brazilian modernism in literature and the arts, centered on São Paulo's "Modern Art Week" of 1922, from the perspective of the European avant-gardes (cubism, futurism, surrealism) and Brazilian content. Themes include the Cannibal Manifesto and cultural independence from Europe; and avant-garde practices in literature and the arts from the 1920s to the construction of Brasília and São Paulo Concrete Poetry. Special attention to major authors—Oswald de Andrade, Mário de Andrade, Manuel Bandeira, Carlos Drummond de Andrade, Murilo Mendes, João Cabral, Haroldo and Augusto de Campos—and artists Villa-Lobos, Portinari, Di Cavalcanti, and Tarsila do Amaral. Includes influential visitors to Brazil, as well as radio, film, and music of the period.

PORT 941a, Crossing Cultures in the Portuguese Diaspora Kenneth David Jackson
Inquiry into the first encounters of the Portuguese with the people and cultures of Africa, Asia, and Brazil after the voyage of Vasco da Gama (1497–99). Topics include acculturation, contact peoples and languages, creolistics and hybrid cultures, music, plants and cuisines, and the theory of space between cultures. Readings include the

epic, histories, memoirs, travel literature, and the "Cannibal Manifesto." Reading knowledge of Portuguese suggested.

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.

SPAN 748a, Representing the Spanish Civil War Noel Valis
This course examines the continuing fascination and complexities of the Spanish Civil War (1936–39) through a dual national and international perspective and an analysis of the literature and culture produced during and after the conflict. The course is divided into four sections: the war "from within," the war "from without," women in the war, and memory of the war. Texts include Sender's *Réquiem por un campesino español,* Rodoreda's *La plaza del Diamante,* Llamazares's *Luna de lobos,* Cercas's *Soldados de Salamina,* Orwell's *Homage to Catalonia,* Hemingway's *For Whom the Bell Tolls,* poems by Miguel Hernández, Auden, and Spender, and films (*Rojo y negro, El laberinto del fauno, The Spanish Earth*). In Spanish.

SPAN 790b, Methodologies of Modern Language Teaching Ame M Cividanes
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 866b / CPLT 976b, Roberto Bolaño in the Twenty-First Century Anibal González-Pérez
Readings of the poetry, short stories, novellas, novels, and essays of the Chilean-Mexican author Roberto Bolaño (1953–2003), regarded as a founding figure of early twenty-first-century Spanish American narrative. Topics explored include issues of truth and reality; ethics; materiality; self-fictionalization; post-nationalism; gender; Bolaño's politics; humor; fractals; and narrative.

SPAN 870a / CPLT 973a / RNST 870a, Imagining the New World Lisa Voigt
This course focuses on the use of images of and in the "New World" during the first century of European exploration, conquest, and colonization in the Americas. We explore printed illustrations that shaped European perceptions of New World "exoticism" and "barbarism," as well as indigenous pictorial manuscripts that continued and adapted native visual practices and offered alternative views of the conquest. Besides reading texts by European and indigenous authors in which images played an important role (Columbus, Las Casas, Oviedo, Staden, Léry, Raleigh, Sahagún, Guaman Poma), we study nonalphabetic visual sources such as Nahua codices and maps, and portraits and festive performances of Afro-descendants. We also examine how images of the Americas were disseminated in Europe through copied illustrations, generating clichés and stereotypes—terms originally associated with printing techniques—that contributed to the racism and colonialism that have shaped the modern world. We conclude with a discussion of examples of contemporary films that reimagine the colonial Americas.

SPAN 873a / CPLT 873a, New Latin American Cinemas: 1950–1990 Moira Fradinger
This seminar is a study of cinema produced in Latin America between 1950 and 1990, when filmmakers throughout the region articulated anew the relationship

between cinema and politics. In Latin America, scholars identify the films of this era as "New Latin American Cinema," on account of their rejection of the national cinema traditions of the thirties and forties, which were dependent on the control of studios and Hollywood conventions. We study a vast array of films from the period that are usually hard to access, but deserving of scholarly attention. We watch, for example, many "firsts": the first Honduran film (1962), the first Haitian feature-length film (1975), the first film by a woman in Peru (Nora de Izcue), the first film in Quechua (1961), the first fully Paraguayan film (1978). Our corpus includes films from Peru, Argentina, Chile, Brazil, Colombia, Venezuela, Cuba, Mexico, Honduras, Paraguay, Bolivia, Ecuador, and Haiti. We read film manifestos that launched concepts such as "cine imperfecto," "cine urgente," "cinema novo," "estética da fome," and so forth. Readings are in Spanish and Portuguese. The seminar requires approximately four hours of film viewing *per* week. Prerequisite: a high level of proficiency in Spanish. Many films have no subtitles in English, and the seminar is conducted in Spanish.

SPAN 914b / CPLT 960b, Microliteratures: The Margins of the Law Jesus Velasco
Examining marginal writing in manuscripts and printed books from the Middle Ages and the early modern period, we interrogate the productive relations between law and culture. We focus on a wide array of sources from the Iberian Peninsula and the Mediterranean. Likewise, we consider different legal systems.

Statistics and Data Science

24 Hillhouse Avenue, 203.432.0666
http://statistics.yale.edu
M.A., M.S., Ph.D.

Chair
To be announced

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 & Biomedical Imaging*), John Emerson (*Adjunct*), Debra Fischer (*Astronomy*), Alan Gerber (*Political Science*), Mark Gerstein (*Molecular Biophysics & Biochemistry*), Anna Gilbert, John Hartigan (*Emeritus*), Edward Kaplan (*School of Management/ Operations Research*), Harlan Krumholz (*Internal Medicine*), John Lafferty, David Pollard (*Emeritus*), Nils Rudi (*School of Management*), Jasjeet Sekhon, Donna Spiegelman (*Biostatistics*), Daniel Spielman, Hemant Tagare (*Radiology & Biomedical Engineering*), Van Vu (*Mathematics*), Heping Zhang (*Biostatistics*), Hongyu Zhao (*Biostatistics*), Harrison Zhou, Steven Zucker (*Computer Science*)

Associate Professors Peter Aronow (*Political Science*), Forrest Crawford (*Biostatistics*), Amin Karbasi (*Electrical Engineering*), Ethan Meyers (*Visiting*), Sahand Negahban, Sekhar Tatikonda, Yihong Wu

Assistant Professors Elisa Celis, Zhou Fan, Joshua Kalla (*Political Science*), Roy Lederman, Vahideh Manshadi (*School of Management/Operations*), Fredrik Savje (*Political Science*), Ilker Yildirim (*Psychology*)

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.

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 teach, usually for two terms, regardless of the nature of their funding. This teaching is typically completed in the first two years of study, although the actual timing is at the discretion of the DGS. Students who require additional support from the Graduate School after their second year will be required to teach additional terms, if needed.

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 (en route to the Ph.D. in Statistics and Data Science) This degree may be awarded upon completion of eight term courses in Statistics with 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. This degree is awarded upon completion of eight term courses in Statistics, chosen in consultation with the DGSs, with all grades HP or higher. Most of these courses 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. To qualify for the M.A., the student must successfully complete an approved program of eight term courses with an average grade of HP or higher and receive at least one grade of Honors, chosen in consultation with the DGS. Full-time students must take a minimum of four courses per term. Part-time students are also accepted into the master of arts program. 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. Full-time students must take a minimum of four courses per term. Part-time students are also accepted into the program. 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 500b, Introductory Statistics Ethan Meyers
An introduction to statistical reasoning. Topics include numerical and graphical summaries of data, data acquisition and experimental design, probability, hypothesis testing, confidence intervals, correlation and regression. Application of statistical concepts to data; analysis of real-world problems.

S&DS 501a / E&EB 510a, Introduction to Statistics: Life Sciences Jonathan Reuning-Scherer and Walter Jetz
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 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 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 517b, Applied Machine Learning and Causal Inference Jas Sekhon
Approaches to causal inference using machine learning. Covers randomized experiments with and without noncompliance, observational studies with and without ignorable treatment assignment, instrumental variables, and regression discontinuity. Machine-learning methods include bagging, boosting, tree-based methods such as random forests, and neural networks. Assignments provide students with hands-on experience with the methods. Applications are drawn from a variety of fields including political science, economics, public health, and medicine. Programming is central to the course and is based on the R programming language. Prerequisites: the equivalent of at least two of the following courses: S&DS 530, S&DS 538, S&DS 541, and S&DS 542; and previous programming experience (e.g., R, MATLAB, Python, C++), R preferred. Strong knowledge of OLS is assumed.

S&DS 520b, Intensive Introductory Statistics Staff
An introduction to statistical reasoning designed for students with particular interest in data science and computing. Using the R language, topics include exploratory data analysis, probability, hypothesis testing, confidence intervals, regression, statistical modeling, and simulation. Computing is taught and used extensively throughout the course. Application of statistical concepts to the analysis of real-world data science problems.

S&DS 523b, YData: An Introduction to Data Science Ethan Meyers
Computational, programming, and statistical skills are no longer optional in our increasingly data-driven world; they are essential for opening doors to manifold research and career opportunities. This course aims to dramatically enhance students' knowledge and capabilities in fundamental ideas and skills in data science, especially computational and programming skills and inferential thinking. It emphasizes the development of these skills while providing opportunities for hands-on experience and

practice. The course is designed to be accessible to students with little or no background in computing, programming, or statistics, but also engaging for more technically oriented students through extensive use of examples and hands-on data analysis. Python 3 is the computing language used. Enrollment is limited.

S&DS 530a or b / PLSC 530a or b, Data Exploration and Analysis Staff
Survey of statistical methods: plots, transformations, regression, analysis of variance, clustering, principal components, contingency tables, and time series analysis. The R computing language and web data sources are used.

S&DS 538a, Probability and Statistics Joseph Chang
Fundamental principles and techniques of probabilistic thinking, statistical modeling, and data analysis. Essentials of probability: conditional probability, random variables, distributions, law of large numbers, central limit theorem, Markov chains. Statistical inference with emphasis on the Bayesian approach: parameter estimation, likelihood, prior and posterior distributions, Bayesian inference using Markov chain Monte Carlo. Introduction to regression and linear models. Computers are used throughout for calculations, simulations, and analysis of data. Prerequisite: after or concurrently with MATH 118 or MATH 120.

S&DS 540a, An Introduction to Probability Theory Elisa Celis
Introduction to probability theory. Topics include probability spaces, random variables, expectations and probabilities, conditional probability, independence, discrete and continuous distributions, central limit theorem, Markov chains, and probabilistic modeling. *This course may be appropriate for non-S&DS graduate students.* Prerequisite: MATH 115 or equivalent.

S&DS 541a, Probability Theory 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 542b, Theory of Statistics Andrew Barron and William Brinda
Principles of statistical analysis: maximum likelihood, sampling distributions, estimation, confidence intervals, tests of significance, regression, analysis of variance, and the method of least squares. Prerequisite: S&DS 541.

S&DS 551b / ENAS 502b, Stochastic Processes Staff
Introduction to the study of random processes, including Markov chains, Markov random fields, martingales, random walks, Brownian motion, and diffusions. Techniques in probability such as coupling and large deviations. Applications chosen from image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, genetics, and evolution.

S&DS 562a, Computational Tools for Data Science Roy Lederman
An introduction to computational tools for data science. The analysis of data using regression, classification, clustering, principal component analysis, independent component analysis, dictionary learning, topic modeling, dimension reduction, and network analysis. Optimization by gradient methods and alternating minimization. The application of high-performance computing and streaming algorithms to the analysis of large data sets. Prerequisites: linear algebra, multivariable calculus, and programming.

S&DS 563b, Multivariate Statistical Methods for the Social Sciences Jonathan Reuning-Scherer
An introduction to the analysis of multivariate data. Topics include principal components analysis, factor analysis, cluster analysis (hierarchical clustering, k-means), discriminant analysis, multidimensional scaling, and structural equations modeling. Emphasis on practical application of multivariate techniques to a variety of examples in the social sciences. Students complete extensive computer work using either SAS or SPSS. Prerequisites: knowledge of basic inferential procedures, experience with linear models (regression and ANOVA). Experience with some statistical package and/or familiarity with matrix notation is helpful but not required.

S&DS 565a, Introductory Machine Learning John Lafferty
This course covers the key ideas and techniques in machine learning without the use of advanced mathematics. Basic methodology and relevant concepts are presented in lectures, including the intuition behind the methods. Assignments give students hands-on experience with the methods on different types of data. Topics include linear regression and classification, tree-based methods, clustering, topic models, word embeddings, recurrent neural networks, dictionary learning, and deep learning. Examples come from a variety of sources including political speeches, archives of scientific articles, real estate listings, natural images, and others. Programming is central to the course and is based on the Python programming language.

S&DS 575b / SOCY 537b, YData: Measuring Culture Daniel Karell
Culture is increasingly digital. Cultural objects, such as songs and artwork, are frequently digitized. Creating cultural objects often involves digital tools and takes place in digital domains. The effects of culture on our social lives are now typically mediated by digital platforms and devices. In this introductory course, we explore how data science is being used to measure the cultural landscape, the consumption and production of culture, and the impact of culture on society. To do so, we review current theories and methodologies, as well as conduct our own analyses of popular culture, the rhetoric and social connections underlying online extremist communities, and other topics. The course provides opportunities to practice the data science skills presented in S&DS 523 with applications to the social scientific study of culture. Can be taken concurrently with or after successfully completing S&DS 523.

S&DS 576b, YData: Humanities Data Mining Catherine DeRose
What new modes of inquiry become available when we transform novels into bags of words and images into pixels? What is lost in the process? This course explores how we can use computational methods to pursue questions in the humanities, while also looking at how humanistic methods can inform the work of algorithms in research and society at large. We begin this course with a series of questions at the intersections of the humanities and quantitative analysis: What is data? How can we turn texts into data? To explore these questions from both theoretical and technical perspectives, each course week is divided into discussion and lab sessions. Discussion sessions introduce concepts and humanities-based case studies that ground the hands-on technical work done in the labs. We survey some of the most popular methods in modern data science —classification, vectorization, and visualization—to see what kinds of questions we can ask and answer. We conclude the semester with open lab sessions during which students leverage the skills covered in this course to create their own data science projects with cultural heritage data.

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 Zhou Fan
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 William Brinda
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 617a / PLSC 511a, Applied Machine Learning and Causal Inference Research Seminar Jas Sekhon
In this seminar we discuss recent advances in machine learning and causal inference. Emphasis is placed on research designs and methods that have succeeded. We carefully examine successful examples to see why they work. The seminar is also a forum for students to discuss the research designs and methods needed in their own work. It should be particularly helpful for students writing their prospectus or designing a major research project. Applications are drawn from a variety of substantive domains including political science, economics, medicine, and public health. It is assumed that students come with diverse backgrounds. A good background would be provided by S&DS 542, ECON 551, or equivalent, plus some experience with applications and statistical computing. More important than the precise course background are research maturity and familiarity with modern statistical and machine-learning methods.

S&DS 625a, Statistical Case Studies Jay Emerson
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 626a or b, Practical Work Jay Emerson
Individual one-term projects, with students working on studies outside the department, under the guidance of a statistician.

S&DS 627a and S&DS 628b, Statistical Consulting Jay Emerson
Statistical consulting and collaborative research projects often require statisticians to explore new topics outside their area of expertise. This course exposes students to real problems, requiring them to draw on their expertise in probability, statistics, and data analysis. Students complete the course with individual projects supervised jointly by faculty outside the department and by one of the instructors. Students enroll for both terms (S&DS 627 and 628) and receive one credit at the end of the year. Enrollment limited; requires permission of the instructor. ½ Course cr per term

S&DS 631a / AMTH 631a, Optimization and Computation Anna Gilbert
An introduction to optimization and computation motivated by the needs of computational statistics, data analysis, and machine learning. This course provides

foundations essential for research at the intersections of these areas, including the asymptotic analysis of algorithms, an understanding of condition numbers, conditions for optimality, convex optimization, gradient descent, linear and conic programming, and NP hardness. Model problems come from numerical linear algebra and constrained least squares problems. Other useful topics include data structures used to represent graphs and matrices, hashing, automatic differentiation, and randomized algorithms. Prerequisites: multivariate calculus, linear algebra, probability, and permission of the instructor. Enrollment is limited, with preference given to graduate students in Statistics and Data Science.

S&DS 632b, Advanced Optimization Techniques Sekhar Tatikonda
This course covers fundamental theory and algorithms in optimization, emphasizing convex optimization. Topics covered include convex analysis; duality and KKT conditions; subgradient methods; interior point methods; semidefinite programming; distributed methods; stochastic gradient methods; robust optimization; and an introduction to nonconvex optimization. Applications from statistics and data science, economics, engineering, and the sciences. Prerequisites: knowledge of linear algebra, such as MATH 222 or MATH 225; multivariate calculus, such as MATH 120; probability, such as S&DS 541; optimization, such as S&DS 631; and comfort with proof-based exposition and problem sets.

S&DS 661b, Data Analysis Staff
By analyzing data sets using the R statistical computing language, a selection of statistical topics are studied: linear and nonlinear models, maximum likelihood, resampling methods, curve estimation, model selection, classification, and clustering. Prerequisite: after or concurrent with S&DS 542.

S&DS 664b, Information Theory Andrew Barron
Foundations of information theory in communications, statistical inference, statistical mechanics, probability, and algorithmic complexity. Quantities of information and their properties: entropy, conditional entropy, divergence, redundancy, mutual information, channel capacity. Basic theorems of data compression, data summarization, and channel coding. Applications in statistics.

S&DS 665b, Intermediate Machine Learning John Lafferty
Techniques for data mining and machine learning from both statistical and computational perspectives, including support vector machines, bagging, boosting, neural networks, and other nonlinear and nonparametric regression methods. Discussion includes the basic ideas and intuition behind these methods, a more formal understanding of how and why they work, and opportunities to experiment with machine-learning algorithms and apply them to data.

S&DS 679a, High-Dimensional Statistical Estimation Andrew Barron
In this course we review the recent advances in high-dimensional statistics, covering concepts in empirical process theory, concentration of measure, and random matrix theory in the context of understanding the statistical properties of high-dimensional estimation methods. We also cover the computational constraints that are involved with solving high-dimensional problems and touch upon concepts in convex optimization and online learning.

S&DS 690a or b, Independent Study Jay Emerson
By arrangement with faculty. Approval of DGS required.

S&DS 695b, Summer Internship in Statistics and Data Science Jay Emerson
The purpose of this course is to provide students with the opportunity to gain practical experience in statistics and data science. Students who identify a suitable summer internship consult with the DGS and prepare a one-page description of the plan. The internship must be full-time: 35–40 hours per week for 10–12 weeks during the summer. Upon completion of the internship, the student must submit a written report of the work to the instructor no later than October 1. Prerequisites: completion of at least one term of the M.S. program (or the M.A. program if transferring into the M.S. program) and permission of the DGS.

S&DS 700a or b, Departmental Seminar Staff
Presentations of recent breakthroughs in statistics and data science. 0 Course cr

Women's, Gender, and Sexuality Studies

315 William L. Harkness Hall, 203.432.0845
http://wgss.yale.edu
M.A., M.Phil., Ph.D.

Chair
Roderick Ferguson

Director of Graduate Studies
Joseph Fischel

Professors Roderick Ferguson, Scott Herring, Margaret Homans, Regina Kunzel, Gail Lewis (*Visiting*), Dara Strolovitch, Laura Wexler

Associate Professor Joseph Fischel

Assistant Professors Eda Pepi, Evren Savci

Senior Lecturer Maria Trumpler

Lecturers Melanie Boyd, Graeme Reid, Craig Canfield

Affiliated faculty Julia Adams (*Sociology*), Rene Almeling (*Sociology*), Carol Armstrong (*History of Art*), Daniel Botsman (*History*), Claire Bowern (*Linguistics*), Marijeta Bozovic (*Slavic Languages & Literatures*), Daphne Brooks (*African American Studies; American Studies; Theater & Performance Studies*), Jill Campbell (*English*), Becky Conekin (*History*), Aimee Cox (*African American Studies; Anthropology*), Rohit De (*History*), 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*), Jennifer Klein (*History*), Greta LaFleur (*American Studies*), Kathryn Lofton (*American Studies; Religious Studies*), Lisa Lowe (*American Studies; Ethnicity, Race, & 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 & Performance Studies*), Sally Promey (*American Studies; Religious Studies*), Ana Ramos-Zayas (*Ethnicity, Race, & Migration; American Studies*), Jill Richards (*English*), Naomi Rogers (*History of Science & Medicine*), Alicia Schmidt Camacho (*Ethnicity, Race, & Migration; American Studies*), George Syrimis (*Hellenic Studies*), Linn Tonstad (*Divinity School*), Michael Warner (*English*)

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); 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 529a / GLBL 529a, Sexuality, Gender, Health, and Human Rights Ali Miller
This course explores the application of human rights perspectives and practices to issues in regard to sexuality and health. Through reading, interactive discussion, paper presentation, and occasional outside speakers, students learn the tools and implications of applying rights and law to a range of sexuality and health-related topics. The overall goal is twofold: to engage students in the world of global sexual health and rights policy making as a field of social justice and public health action; and to introduce them to conceptual tools that can inform advocacy and policy formation and evaluation. Class participation, short reaction papers, and a final paper are required.

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 Roderick Ferguson

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 613a / AMST 775a / ANTH 612a, Latinx Ethnography Ana Ramos-Zayas

Consideration of ethnography within the genealogy and intellectual traditions of Latinx studies. Topics include questions of knowledge production and epistemological traditions in Latin America and U.S. Latino communities; conceptions of migration, transnationalism, and space; perspectives on "(il)legality" and criminalization; labor, wealth, and class identities; contextual understandings of gender and sexuality; theorizations of affect and intimate lives; and the politics of race and inequality under white liberalism and conservatism in the United States.

WGSS 651b / ANTH 651b, Intersectionality and Women's Health Marcia Inhorn

This interdisciplinary seminar explores how the intersections of race, class, gender, and other axes of "difference" (age, sexual orientation, disability status, nation, religion) affect women's health, primarily in the contemporary United States. Recent feminist approaches to intersectionality and multiplicity of oppressions theory are introduced. In addition, the course demonstrates how anthropologists studying women's health issues have contributed to social and feminist theory at the intersections of race, class, and gender.

WGSS 666b / AMST 778b / ANTH 666b, 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 677b / PHIL 677b, 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 693b / AFAM 724b / AMST 732b / FILM 693b / HSAR 759b, Imaging War, Imagining Peace: Memory, Justice, and Repair Laura Wexler

This course explores the ways in which both war and peace have been imagined and represented, and how those visual practices might be unlearned and reimagined. What do images and imaginings of war and peace leave out of view, and how can we bring both underlying social vulnerability and extant networks of protest and resistance into greater visibility? How might we avoid automatized reiterations of well-worn locations and scenarios of violence, for example in constructions of "the enemy," and develop new approaches to the nationalist, racialized, and gendered stakes of conflict? What alternative acts of intervention, witnessing, and reparation might we create so as to see emergencies more freshly—at a time of conflict, as well as in anticipation and in retrospect? Can the visual archives of violence be reframed and recirculated to shape more firmly the potential of justice, cohabitation, and peace? How can visualizations of antiwar movements and peace actions be mobilized more effectively? This team-taught course is inspired by the documentary work of Susan Meiselas. Her distinctive photographic practice with communities in Nicaragua, El Salvador, Chile, Kurdistan, and elsewhere, her repeated return to sites of conflict over time, and her collaboration with the subjects of her images, as well as her extensive and innovative archival work, serve as one model for the kinds of approaches we want to explore and foster. In addition, our work is guided by close study of authors such as Leni Riefenstahl, Virginia Woolf, Alain Resnais, Susan Sontag, Sigmund Freud, Errol Morris, Judith Butler, Ariella Azoulay, Diana Taylor, Thy Phu, David Shneer, Amitav Ghosh, Anne McClintock, Grace Paley, Maaza Mengiste, Viet Thanh Nguyen, Karla Cornejo Villavicencio, Jenny Holzer, Walid Raad, Harun Farocki, Sam Durant, Sim Chi Yin, and more.

WGSS 697b / AMST 687b / HIST 723b, Colonial Domesticity and Reproductive Relations Lisa Lowe

In this interdisciplinary seminar, we study the central importance of kinship, family, and domestic labor to the social reproduction of racial colonial processes. Settler colonialism, colonial slavery, overseas empire, and their aftermaths depend not only on the brute force of war, captivity, and occupation; they are also sustained and contested through culture, language, forms of family and household, and the social reproduction of race, gender, intimacy, and filiation. We trace a genealogy of "colonial domesticity" that considers histories of the sexual violation and separation of slave women from their children, compulsory boarding schools for Native Americans, racialized gendered divisions of care labor, transnational Asian adoption, and contemporary migrant detention and family separation; this genealogy also includes alternative forms of kinship, domesticity, generation, and relation. Readings include historical and

anthropological studies of colonialism, feminist debates on social reproduction, and literary and visual culture materials by Maria Mies, Ann Laura Stoler, Silvia Federici, Tithi Bhattacharya, Ruha Benjamin, Kalindi Vora, Thavolia Glymph, Saidiya Hartman, Dorothy Roberts, Audra Simpson, Jodi Byrd, Amy Kaplan, Evelyn Nakano Glenn, Laura Briggs, Elizabeth Freeman, Chandan Reddy, Alys Weinbaum, Louise Erdrich, Mary Prince, Toni Morrison, Patricia Powell, Chang-rae Lee, Octavia Butler, and others. Permission of the instructor required.

WGSS 700b, Feminist and Queer Theories Greta LaFleur
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 720a, Race, Gender, and AI Staff
This course explores the idea of artificial life in art and science. We address the tension between visions of minds without body and bodies without mind, their relation to the quest to identify what makes us human, and the role gender and race have played in this. We look at dominant (scientific, political, economic) models and at their critiques, in particular those from marginalized perspectives, and we explore alternative forms of engaging with new technologies. The course's main texts are Mary Shelley's *Frankenstein; or, The Modern Prometheus* (1818) and Jeanette Winterson's *Frankissstein: A Love Story* (2019).

WGSS 724a / AMST 724a / PLSC 868a, 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 725b / ENGL 983b, Disability and Sexuality Joseph Fischel and Jill Richards
The course examines how intimacies, pleasures, bodies, genders, and sexualities take shape across the spectrum of ability. The course draws from an array of scholarly

approaches to dis/ability to theorize normative parameters around sex and sociality, and to imagine alternatives. Scholarly theoretic texts are integrated with cultural artifacts, including poetry, visual art, cinema, podcasts, and other media. Topics include embodiment and gender pluralism, the social model and its discontents, pregnancy and reproductive justice, HIV/AIDS, pornography and representation, toxicity and contagion, care work and dependency, and vulnerability.

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 746a / AMST 729a / FILM 810a, Visual Kinship: Families and Photographs Laura Wexler

Exploration of the history and practice of family photography from an interdisciplinary perspective. Study of family photographs from the analog to the digital era, from snapshots to portraits, and from instrumental images to art exhibitions. Particular attention to the ways in which family photographs have helped establish gendered and racial hierarchies and examination of recent ways of reconceiving these images.

WGSS 750a, Neoliberalisms, Queer Feminisms, and Social Responsibility Eda Pepi

This seminar focuses on the intersections and divergences of neoliberal and feminist approaches to the governance of work, welfare, and corporate and personal philanthropy at a time of newly intensifying anthropocenic and epidemiological crises. Historically, some strands of feminist thought—like socialist and Marxist feminisms or, more recently, queer feminist scholars of racial capitalism—have certainly critiqued the structural inequalities produced by a neoliberal economic system. Yet more mainstreamed liberal feminisms have too easily allied with racist state projects of neoliberal individual empowerment. While neoliberal policies have seen to the shrinking of the welfare states that tempered the racializing and gendered alienation of market economics in the global North, queer feminist liberalisms have sometimes turned to and facilitated militarily globalizing security state formations in the global South. The course engages critically both classical sociological and neoliberal economic preoccupations with capitalist rationality as well as the components of queer feminist ideology that have been committed to economizing notions of agency. We do so at a time when the global COVID-19 pandemic has demanded the resurgence of the state, halted production, transformed labor, and isolated most of the world's population within domestic domains. In this current moment, we undertake the difficult task of suggesting ways in which we might reconfigure labor, family values, wealth, health care, and other state and nonstate forms necessary for sustenance and daily renewal as well as birthing and rearing the next generation. The readings selected are concerned with how issues of capitalism, value, politics, governance, and social transformation intersect with gender, race, sexuality, and kinship. Students are encouraged, but not required, to enroll in the three courses of a multiyear series of seminars that takes up queer feminist approaches to how conceptions and practices of welfare—or the very category of the "social"—are negotiated through various political economic ideologies of

the modern state. This is the second in the series. It was preceded in 2020 by WGSS 718 and will be followed in 2022 by Liberalisms, Queer Feminisms, and the Social Contract.

WGSS 767a or b / PSYC 777a or b, Research Topics in Gender and Psychology
Marianne LaFrance
The "Gender Lab" meets weekly to consider research being done in the Psychology department that bears on some gender-related issue.

WGSS 783a / FREN 958a, Social Mobility Today Morgane Cadieu
The seminar examines the representation of upward mobility, social demotion, and interclass encounters in contemporary literature and cinema. Topics include emancipation and determinism; inequality, precarity, and class struggle; social mobility and migration; the interaction between social class and literary style; intersectionality; mixed couples; labor and the workplace; homecomings. We also discuss ways of approaching a contemporary corpus. Works by Angot, Eribon, Ernaux, Houellebecq, Linhart, Louis, NDiaye, Taïa. Films by Cantet, Diop, Kechiche, Klotz. Theoretical readings by Berlant, Bourdieu, Foucault, Nancy, Rancière. Members of the seminar have the opportunity to compare French mobilities to other literary traditions. Conducted in English. No knowledge of French required.

WGSS 800b, Methods in Gender and Sexuality Studies Eda Pepi
Will be offered in 2021–2022.

WGSS 857b / AMST 857b, Frailties Terrell Herring
An overview of the methodologies and interdisciplinary potentials of critical age studies. After beginning with a recent issue of *Radical History Review* on "Old/Age," we spend our weeks discussing topics such as ageism and age discrimination; immigrant caregiving and servitude; black debility; creative iterations of queer and trans aging; age standardizations in the early twentieth-century United States; "deaths of despair" amidst "the new longevity"; feminist critiques of optimal aging; and junctures of disability and aging. The course brings together a range of thinkers including historians such as Corinne T. Field and Nicholas L. Syrett; theorists such as Kathleen Woodward and Margaret Morganroth Gullette; disability justice activists such as Leah Lakshmi Piepzna-Samarasinha; and sociologists such as Mignon R. Moore. Two governing concerns that we answer as a class: How do considerations of age, aging, and gerontophobia featured in our readings amplify the contemporary investments of American studies? How can we chart political and aesthetic formations of the frail that offset their persistent nonrecognition?

WGSS 900a or b, Colloquium and Working Group Joseph Fischel
The course is made up of two components: the WGSS Graduate Colloquium, in which graduate students present ongoing research (meets every two to three weeks); and the WGSS Working Group, in which faculty present pre-circulated works-in-progress for critical feedback from the WGSS community (meets every two to three weeks).

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 & Literatures*)
Nadine Moeller (*Near Eastern Languages & Civilizations*)

Steering Committee Oswald Chinchilla (*Anthropology*), John J. Collins (*Emeritus; Divinity*), Maria Doerfler (*Religious Studies*), Steven Fraade (*Religious Studies; Judaic Studies*), Eckart Frahm (*Near Eastern Languages & Civilizations*), Milette Gaifman (*Classics; History of Art*), Felicity Harley-McGowan (*Divinity*), Michael Hunter (*East Asian Languages & Literatures*), Andrew Johnston (*Classics*), Jacqueline Jung (*History of Art*), Edward Kamens (*East Asian Languages & Literatures*), Noel Lenski (*Classics; History*), Yii-Jan Lin (*Divinity*), J.G. Manning (*Classics; History*), Susan Matheson (*Yale Art Gallery*), Laura Nasrallah (*Divinity*), Kevin van Bladel (*Near Eastern Languages & Civilizations*)

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 2021–2022 Core Seminar had not yet been scheduled when the Graduate School Programs and Policies bulletin was published. Please check the Archaia website for details: http://archaia.yale.edu.

Atmospheric Science

Advisory Committee Sarbani Basu (*Astronomy*), Michelle Bell (*School of the Environment*), Alexey Fedorov (*Earth & Planetary Sciences*), Debra Fischer (*Astronomy*), Gary Haller (*Emeritus; Chemical & Environmental Engineering*), Xuhui Lee (*School of the Environment*), Juan Lora (*Earth & Planetary Sciences*), Mitchell Smooke (*Mechanical Engineering & Materials Science; Applied Physics*), Mary-Louise Timmermans (*Earth & Planetary Sciences*), John Wettlaufer (*Earth & Planetary Sciences; Mathematics; Physics*)

A number of departments of the Graduate School offer courses dealing with the physics, dynamics, and chemistry of the atmosphere, and the interactions of the atmosphere with the biosphere, oceans, and cryosphere, including all biogeochemical cycles. The mathematical and physical science basis for these phenomena is developed in course work and research foci across a range of departments. In order to permit students whose interests lie in the field of atmospheric science to develop an integrated program of studies, an interdisciplinary program is offered. Typical areas of interest included in the scope of the program are theory of weather and climate, computational fluid dynamics, air pollution from industrial and natural sources, urban environmental health, global climatic change, paleoclimatology, hydrometeorology, and dynamics of atmospheric and oceanic motions. The program is individually planned for each student through a faculty adviser system.

SPECIAL ADMISSIONS REQUIREMENTS

A student should, on the basis of scientific orientation, seek admission to one of the participating departments. Individuals interested in Atmospheric Science should complete the admissions requirements for the specific participating department to which they will be applying, which may include the GRE General or Subject Test. The Department of Earth and Planetary Sciences is the focus for studies of physical and dynamical meteorology, oceanography, and atmospheric chemistry, with allied methods and approaches in the Program on Applied Mathematics. The departments of Applied Physics, Public Health, and Engineering & Applied Science (which includes the programs of Biomedical Engineering, Chemical & Environmental Engineering, Electrical Engineering, and Mechanical Engineering & 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 350 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
Computational Biology and Bioinformatics
Immunology
Microbiology
Molecular Cell Biology, Genetics, and Development
Molecular Medicine, Pharmacology, and Physiology
Neuroscience
Plant Molecular Biology

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 Just 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 eleven 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

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 average time to degree is 5.5 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 grants from foundations and companies.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Computational Biology and Bioinformatics track, the Molecular Cell Biology, Genetics, and Development track, the Neuroscience track, or the Biochemistry, Quantitative Biology, Biophysics, and Structural Biology track of the BBS program 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.

MEDICAL RESEARCH SCHOLARS PROGRAM (MRSP)

The Medical Research Scholars Program bridges barriers between traditional predoctoral and medical training by providing both medically oriented course work and a mentored clinical experience to select BBS students. The course work 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 to Ph.D. students and enhances the training in basic science already provided within the BBS program. Upon completion of their training, MRSP graduates will be capable of working much more closely with physicians and physician-scientists and will be better prepared to conduct clinically relevant basic research.

The MRSP is open only to students who have already been accepted into the BBS program, and a separate application is required. Five or six incoming students are admitted into the program each year. They remain in their BBS tracks but will participate in the additional MRSP curriculum. For more information see https://medicine.yale.edu/bbs/training/nihprograms.

Program materials are available upon request to Bonnie Ellis, Associate Director, BBS Program, Yale University, PO Box 208084, New Haven CT 06520-8084; telephone 203.785.5663; fax 203.785.3734; email, bbs@yale.edu; website, https://medicine.yale.edu/bbs.

COURSES

B&BS 640a / PATH 640a, Developing and Writing a Scientific Research Proposal Katerina Politi and Jean-Ju Chung
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 Karen Anderson and Joseph Craft
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.

B&BS 879a / PHYS 530a, Theory and Practice of Scientific Teaching Rona Ramos
The course discusses the fundamentals of learning theory and practical strategies for teaching in the physical and life sciences. Students learn evidence-based teaching strategies, including engaging students through active learning, incorporating inclusive teaching practices, and developing effective assessments, while building a community of scientific educators. In the second half of the course, students (1) apply these principles as they develop and evaluate instructional materials for a college-level science course and (2) develop peer-reviewed teaching and diversity statements. Prerequisite: completion of one term of required teaching at Yale (n/a for postdocs).

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 associated with the Yale Department of Economics, the Economic Growth Center (EGC) supports and communicates research on the economic advancement of poor and marginalized people in developing countries. 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. It also hosts the master's degree program in International and Development Economics (IDE) and the Program in Economic History, which supports historical analysis of economic growth in developed as well as developing countries.

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 & Medicine*), Ned Blackhawk (*History; American Studies*), Jill Campbell (*English*), Carol Carpenter (*School of the Environment*), Oksana Chefranova (*Film & Media Studies*), Susan Clark (*School of the Environment*), Deborah Coen (*History of Science & 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 & Media Studies; Theater Studies*), John Peters (*English; Film & Media Studies*), Richard Prum (*Ecology & Evolutionary Biology*), Jennifer Raab (*History of Art*), Joanna Radin (*History of Science & Medicine; Anthropology; History*), William Rankin (*History*), Kristin Reynolds (*School of the Environment*), Carolyn Roberts (*History of Science & 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 & 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 & Civilizations; School of the Environment*), Kenneth Winkler (*Philosophy*), Carl Zimmer (*Adjunct; School of Medicine*)

GRADUATE CERTIFICATE IN ENVIRONMENTAL HUMANITIES

Yale Environmental Humanities aims to deepen our understanding of the ways that culture is intertwined with nature and to contribute to a broad interdisciplinary conversation about humanity and the fate of the planet. Humanities scholars have an opportunity to reshape how we think about environmental problems and "the environment" itself. In turn, interdisciplinary dialogue with scientists and social scientists can stimulate the humanities in productive ways, raising new research

questions and providing fresh ways to approach long-standing issues. As an interdisciplinary initiative, Yale Environmental Humanities draws particularly on faculty and courses from across the humanities departments, including American Studies, Anthropology, Comparative Literature and other literature departments, English, Film and Media Studies, History, History of Art, and Philosophy, as well as from professional schools, including Architecture, Divinity, Drama, Environment, and Public Health.

The Graduate Certificate in Environmental Humanities is available to students already enrolled in a Ph.D. program at Yale who seek to establish a strong foundation in environmental humanities topics and methodologies across the humanities disciplines. Students who complete the graduate certificate will gain skills working in interdisciplinary environmental settings and representing humanities perspectives on a broad range of environmental topics. Interested students are strongly encouraged to register for the certificate by meeting with the director of graduate studies (DGS) during their first year.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE IN ENVIRONMENTAL HUMANITIES

Students who wish to receive the certificate must complete the following course work, research, and teaching requirements:

1. Three approved graduate or professional school courses focusing entirely or substantially on environmental themes, broadly defined. At least one of the courses should involve approximately 50 percent of its material from outside a student's home department or discipline. In consultation with the DGS and the student's Environmental Humanities adviser (who can also be their departmental adviser), each student is expected to organize their elective courses around a concentration related to their departmental course work and doctoral research. Elective courses will be chosen from a list of the environmental humanities graduate courses that are being offered each term.
2. Two terms of the Environmental Humanities certificate workshop, Topics in the Environmental Humanities (HIST 963 and HIST 964). Students must complete both a fall term and a spring term of the workshop, but the two terms of student participation need not be consecutive. Topics in the Environmental Humanities is a half-credit course that will be offered in both the fall and spring terms (one credit total). Academic credit from the workshop course typically does not count toward departmental course work requirements.
3. Students must demonstrate the capacity to pursue independent, interdisciplinary research in environmental humanities by presenting a qualifying paper at a meeting of the Environmental Humanities workshop, Graduate Research Symposium, or other approved venue.
4. Students must fulfill a teaching requirement by serving as a teaching fellow for an approved environmental humanities course or by completing an approved public humanities project. Other options are possible if appropriate teaching opportunities are not available.

Each of these requirements will require approval from the DGS of Environmental Humanities. Additional certificate program information, including the application

and requirements checklist for the certificate, is available on the Environmental Humanities website (https://environmentalhumanities.yale.edu) or by contacting environmentalhumanities@yale.edu.

CERTIFICATE WORKSHOP

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

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

½ Course cr per term

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
Francesco Casetti

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

The Film and Media Studies Program gives students the tools necessary to grapple with the decisive media of the past one hundred years: from film to television to the platform-agnostic digital images of today. That knowledge is critical and practical, analytic and experimental, historical and theoretical. As an interdisciplinary program, Film and Media Studies draws on courses from Art to Comparative Literature to Slavic Languages and Literatures to American Studies, taught by a dedicated group of world-renowned faculty.

The Certificate in Film and Media Studies is open to students already enrolled in a Ph.D. program at Yale. The 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 technologies. Interested students are strongly encouraged to register for the certificate by meeting with the director of graduate studies (DGS) during their first year.

SPECIAL REQUIREMENTS FOR THE GRADUATE CERTIFICATE IN FILM AND MEDIA STUDIES

Students who wish to receive the certificate must complete the following: (1) FILM 601, Foundations of Film and Media; (2) two electives, one of which must be drawn from the Film and Media Studies curriculum; the second may focus on media relevant to the student's own research interests, but must be approved by the DGS of Film and Media Studies; (3) FILM 605 and FILM 606, Certificate Workshop, offered only to certificate students; the workshop meets biweekly over two terms and counts as one regular course credit. Students will be required to present a qualifying paper demonstrating their capacity to do interdisciplinary work.

In approved cases, certificate students may serve as TFs in Film and Media Studies courses. However, there is no formal teaching requirement for the certificate program.

Each of these requirements will require approval from the DGS of Film and Media Studies, the DGS of the student's degree department, and a Film and Media Studies adviser. A plan for fulfilling the requirements will be worked out in advance, in

consultation with all three of the above. Students may apply to count a course they took during their first year.

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 2021, students will register for these courses as part of the internship approval process and not through the typical online or paper 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, 203.432.6242
http://iss.yale.edu

Director
Arne Westad (*History*)

International Security Studies (ISS) at Yale was founded in 1988 and is supported by the Smith Richardson Foundation, the Jewett Foundation, and the Friends of ISS. ISS operates in partnership with the Brady-Johnson Program in Grand Strategy, directed by Beverly Gage, and is dedicated to the study of international history, grand strategy, and global security.

Although ISS is not a degree-granting program, its faculty members, fellows, and affiliates write and teach about numerous aspects of international history and world affairs. Their interests range from high politics and economic change to cultural transfer and nongovernmental activism. ISS strives to understand the genealogy of the present through diverse historical and methodological approaches, and to develop and apply holistic insights into the most pressing concerns of the twenty-first century.

ISS organizes an array of extracurricular activities each academic year. It hosts lectures, dinner debates, conferences, colloquia, and discussion groups. It also provides competitive summer grants to support language training and archival research for Yale students. Postdoctoral fellowships and predoctoral fellowships are available to scholars from other universities, and to serving members of the U.S. Armed Forces.

Inquiries should be directed to iss@yale.edu or to International Security Studies, Yale University, PO Box 208353, New Haven CT 06520-8353. Further information on ISS can be found at http://iss.yale.edu.

Jackson Institute for Global Affairs

Horchow Hall, 203.432.6253
http://jackson.yale.edu

Director
James Levinsohn (*Global Affairs; School of Management*)

Faculty
For faculty listings, see the section on Global Affairs under Degree-Granting Departments and Programs in this bulletin.

The Jackson Institute for Global Affairs promotes education and scholarship on global affairs at Yale. The institute serves the entire University through courses and core teaching programs in global affairs, career counseling, and public lectures. The institute's mission is to inspire and prepare Yale students for global leadership and service.

Jackson's academic programs are interdisciplinary, embedded in Yale, and designed to help students gain a comprehensive understanding of global affairs. Jackson Institute faculty study, teach, and research global affairs across disciplines ranging from diplomacy to public health and from international finance to law. For a full list of faculty affiliated with Jackson, see http://jackson.yale.edu/meet-us/faculty/overview.

Each year the Jackson Institute hosts Senior Fellows, leading practitioners in government, business, international organizations, the NGO community, and other global affairs fields. Senior Fellows spend a term or full academic year at Yale, teaching classes and mentoring students. For a full list of Senior Fellows, see http://jackson.yale.edu/senior-fellows.

Jackson's Career Services Office provides career counseling services to all Yale students interested in careers in public service and other areas of international affairs.

The Jackson Institute is also home to Yale's World Fellows program and the Global Health Initiative.

For more information, visit http://jackson.yale.edu, email jackson.institute@yale.edu, or call 203.432.6253.

Judaic Studies

Humanities Quadrangle, Rm. 423, 203.432.0843
http://judaicstudies.yale.edu

Chair
Maurice Samuels

Director of Graduate Studies
Steven Fraade

Professors Joel Baden (*Divinity*), Steven Fraade (*Religious Studies*), Paul Franks (*Philosophy*), Christine Hayes (*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*), Katie Trumpener (*Comparative Literature; English*), Laura Wexler (*Women's, Gender, & Sexuality Studies; American Studies*)

Associate Professors Elli Stern (*Religious Studies; History*), Marci Shore (*History*)

Assistant Professor Jacqueline Vayntrub (*Divinity*)

Senior Lecturer Peter Cole (*Comparative Literature*)

Senior Lector II Shiri Goren (*Near Eastern Languages & Civilizations*)

Senior Lector I Dina Roginsky (*Near Eastern Languages & Civilizations*)

Lectors Josh Price (*German*), Orit Yeret (*Near Eastern Languages & Civilizations*)

Judaic 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 Judaic Studies Seminar, several lecture series, postdoctoral fellowships, and graduate fellowships in Judaic 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 Judaic 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 695b / HEBR 563b, From Biblical to Modern Hebrew Dina Roginsky
This course aims to support students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. The course concentrates on reading and aims at enabling students to use Modern Hebrew for research purposes. The texts chosen are tailored to students' particular areas of interest. Prerequisite: two years of Biblical or Modern Hebrew studies, or permission of the instructor. Conducted in English.

JDST 761a / HIST 596a / MDVL 596a / RLST 773a, Jewish History and Thought to 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 806a / HIST 603a / MDVL 603a / RLST 616a, Jews and Christians in the Formation of Europe, 500–1500 Ivan Marcus
This seminar explores how medieval Jews and Christians interacted as religious societies between 500 and 1500.

JDST 835a / HEBR 519a, Israel in Ideology and Practice Dina Roginsky
An advanced Hebrew class that focuses on changing ideology and politics in Israel. Topics include right- and left-wing political discourse, elections, state-religion dynamics, the Jewish-Arab divide, and demographic changes. Materials include newspapers, publications, online resources, speeches of different political and religious groups, and contemporary and archival footage. Also, this course draws comparisons to American political and ideological discourse. Prerequisite: HEBR 502 or equivalent.

JDST 846a / HIST 598a / RLST 771a, Jewish Emancipation in the Nineteenth Century David Sorkin
A study of the various forms of emancipation politics in the nineteenth century. Conventional historiography has identified Haskalah (Jewish Enlightenment) and religious reform as the predominant forms of emancipation politics. This course explores neglected forms of emancipation politics including: the citizen intercessor, lawyers using law, organized community politics, cooperation with the state, opposition to the state, horizontal alliances, public protests, private diplomacy, etc.

JDST 857a / CPLT 924a, Modernism and Avant-Garde in Hebrew Poetry: Poetics and Theory Hannan Hever
Modernism in Hebrew poetry: close readings of the poetry of Nathan Alterman, Lea Goldberg, Nathan Zach, Yona Volakh, Avot Yeshurun. Prerequisites: a high level of reading Hebrew texts in poetry and criticism, and 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
Certificate in Leadership and Research Management for Physician-Scientists

Director
Barbara Kazmierczak

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.

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 3, 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.

COURSE WORK

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.
- Course work must demonstrate broad comparative knowledge of the region rather than focus on a specific country.
- Course work 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 course work 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 course work, 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 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 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 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, 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*), 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*)

Associate Professors Rodrigo Canales (*Management*), 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*)

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), Argentina (Valeggia), Brazil (Jackson, Ko, Ryan-Krause, Schwartz), the Caribbean (Echeverri Muñoz, Eller), Central America (Chinchilla, 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.

Limited financial resources, such as LAIS 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 lecture 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 the 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 556,000 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 (*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*), 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*), Zareena Grewal (*American Studies*), Kaveh Khoshnood (*Public Health*), Hani Mowafi (*Emergency Medicine*), Jonathan Wyrtzen (*Sociology*), Travis Zadeh (*Religious Studies*)

Assistant Professors Supriya Gandhi (*Religious Studies*), Samuel Hodgkin (*Comparative Literature*), Jill Jarvis (*French*), Elizabeth Nugent (*Political Science*), Eda Pepi (*Women's, Gender, & Sexuality Studies*), Evren Savci (*Women's, Gender, & Sexuality Studies*)

Senior Lecturers and Lecturers 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*), Dina Roginsky (*Hebrew*), Farkhondeh Shayesteh (*Persian*), Ezgi Yalcin (*Turkish*), Orit Yeret (*Hebrew*)

Librarians and Curators Roberta Dougherty (*Near East Collection*), Agnete Wisti Lassen (*Babylonian Collection*), Susan Matheson (*Ancient Art, Yale Art Gallery*), Nanette Stahl (*Judaica Collection*)

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

HNDI 510a, Elementary Hindi Staff
An in-depth introduction to modern Hindi, including the Devanagari script. Through a combination of graded texts, written assignments, audiovisual material, and computer-based exercises, the course provides cultural insights and increases proficiency in understanding, speaking, reading, and writing Hindi. Emphasis placed on spontaneous self-expression in the language. No prior background in Hindi assumed.

HNDI 520b, Elementary Hindi II Staff
Continuation of HNDI 510.

HNDI 530a, Intermediate Hindi I Swapna Sharma
First half of a two-term sequence designed to develop proficiency in the four language skill areas. Extensive use of cultural documents including feature films, radio broadcasts, and literary and nonliterary texts to increase proficiency in understanding, speaking, reading, and writing Hindi. Focus on cultural nuances and various Hindi literary traditions. Emphasis on spontaneous self-expression in the language. Prerequisite: HNDI 520 or equivalent.

HNDI 532a, Accelerated Hindi I Swapna Sharma
Development of increased proficiency in the four language skills. Focus on reading and higher language functions such as narration, description, and comparison. Reading strategies for parsing paragraph-length sentences in Hindi newspapers. Discussion of political, social, and cultural dimensions of Hindi culture as well as contemporary global issues.

HNDI 540b, Intermediate Hindi II Swapna Sharma
Continuation of HNDI 530, focusing on further development of proficiency in the four language skill areas. Prerequisite: HNDI 530 or equivalent.

HNDI 542b, Accelerated Hindi II Swapna Sharma
Continuation of HNDI 532. Development of increased proficiency in the four language skills. Focus on reading and higher language functions such as narration, description, and comparison. Reading strategies for parsing paragraph-length sentences in Hindi newspapers. Discussion of political, social, and cultural dimensions of Hindi culture as well as contemporary global issues. Prerequisite: HNDI 532 or equivalent.

HNDI 550a, Advanced Hindi Swapna Sharma
An advanced language course aimed at enabling students to engage in fluent discourse in Hindi and to achieve a comprehensive knowledge of formal grammar. Introduction to a variety of styles and levels of discourse and usage. Emphasis on the written language, with readings on general topics from newspapers, books, and magazines. Prerequisite: HNDI 540 or permission of instructor.

HNDI 598a or b, Advanced Tutorial Swapna Sharma
For students with advanced Hindi language skills who wish to engage in concentrated reading and research on material not otherwise offered by the department. The work must be supervised by an adviser and must terminate in a term paper or its equivalent. Prerequisites: HNDI 540, and submission of a detailed project proposal and its approval by the language studies coordinator.

SAST 670a / RLST 646a, 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 Upani#ads, Mahābhārata, Rāmāya#a, Bhāgavata Purā#a, Bhagavad-gītā, and Yogavāsi##ha; 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.

SAST 839a / HIST 904a, Writing Postcolonial Histories of South Asia: Decolonization, Democracy, and Development Rohit De
Until recently, scholarly histories of South Asia concluded with independence; the period after was presented as the province of political scientists and economists. This was both the result of changing archival practices of postcolonial states as well as the belief, nurtured by the state, that history as a progressive narrative ended with independence. This seminar engages with the newly emerging work to understand models, theoretical questions, and archival methods to study postcolonial India, Pakistan, Sri Lanka, Bangladesh, and Nepal. Postcolonial here refers not only to the period after the end of colonialism, but also "the condition produced by being worked over by colonialism." It focuses on how after independence, anti-colonial movements sought to overcome colonial legacies, built multiethnic polities, constructed and developed national economies, and took their place and reshaped the international stage. The topics and events covered—be they histories of partition, economic planning, mass violence, state science, universal franchise, non-alignment, urban planning, reproductive health—are in dialogue with histories of decolonization and postcolonial state building across the Global South. The course focuses on identifying new archives and techniques of reading, ranging from court litigation to expert commissions, oral histories, diplomatic records, and radio and cinema.

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.

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 *Bhagavad Gita*. Prerequisite: SKRT 520 or equivalent.

SKRT 560a, Advanced Sanskrit: Readings in Poetry and Drama Aleksandar Uskokov
The purpose of this course is to introduce the jargon of classical Sanskrit literature, specifically the interrelated genres of *mahā-kāvya* or court epic; *nā#aka* or drama; and hagiography or *carita*. Special attention is given to matters of style and advanced morphology and syntax. Additionally, the course introduces scholastic techniques of text interpretation. Finally, the course looks at the phenomenon of retelling stories from Vedas, the epics, or the Buddhist *sūtra*s in classical Sanskrit literature, thus combining

advanced language instruction with learning cultural content. Prerequisites: previous terms of Sanskrit to L4 or equivalent.

Council on Southeast Asia Studies

The MacMillan Center
311 Luce Hall, 203.432.3431, seas@yale.edu
http://cseas.yale.edu

Chair
Erik Harms (*Anthropology*)

Professors Michael Dove (*School of the Environment*), J. Joseph Errington (*Anthropology*), Benedict Kiernan (*History*), Mimi Hall Yiengpruksawan (*History of Art*)

Associate Professor Erik Harms (*Anthropology*)

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*), Brandon Miliate (*South & Southeast Asian Studies, Yale University Library*)

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 Brandon Miliate, Librarian for South and Southeast Asian Studies, Sterling Memorial Library (203.432.9350, brandon.miliate@yale.edu).

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; or visit our website, 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 560a or b, Readings in Vietnamese Quang Van
For students with advanced Vietnamese language skills who wish to engage in concentrated reading and research.

Integrated Graduate Program in Physical and Engineering Biology (PEB)

http://peb.yale.edu
peb@yale.edu

Director
Corey O'Hern (*Mechanical Engineering & Materials Science; Physics; Applied Physics; Computational Biology & Bioinformatics*)

Associate Director
Dorottya Noble

Executive Committee Julien Berro (*Molecular Biophysics & Biochemistry; Cell Biology*), Joerg Bewersdorf (*Cell Biology; Biomedical Engineering*), Enrique De La Cruz (*Molecular Biophysics & Biochemistry*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology; Physics*; *Computational Biology & Bioinformatics*), Jonathon Howard (*Molecular Biophysics & Biochemistry; Physics*), Megan King (*Cell Biology*), Andre Levchenko (*Biomedical Engineering*), Kathryn Miller-Jensen (*Biomedical Engineering; Molecular, Cellular, & Developmental Biology*), Simon Mochrie (*Physics; Applied Physics*), Michael Murrell (*Biomedical Engineering*), Corey O'Hern (*Mechanical Engineering & Materials Science; Physics; Applied Physics; Computational Biology & Bioinformatics*), Thomas Pollard (*Emeritus; Molecular, Cellular, & 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 & Environmental Engineering; Chemistry; Computational Biology and Bioinformatics (BBS track and also degree-granting program); Mechanical Engineering & 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.

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, & 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, & 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, & Sexuality Studies*), Nicholas Forster (*African American Studies; Film & Media Studies*), Joanne Freeman (*History*), Beverly Gage (*History*), Bryan Garsten (*Political Science*), Jacqueline Goldsby (*English; American Studies; African American Studies; Women's, Gender, & Sexuality Studies*), Paul Grant-Costa (*Lewis Walpole Library*), Emily Greenwood (*Classics; Film & Media Studies*), Zareena Grewal (*American Studies; Ethnicity, Race, & Migration*), Jacob Hacker (*Political Science*), Langdon Hammer (*English*), Daniel HoSang (*American Studies; Ethnicity, Race, & Migration*), Matthew Jacobson (*American Studies; Ethnicity, Race, & Migration; History; African American Studies*), Kathryn James (*Beinecke Library*), Grace Kao (*Sociology; Ethnicity, Race, & Migration*), Alice Kaplan (*French; Women's, Gender, & Sexuality Studies*), Jennifer Klein (*History; Women's, Gender, & Sexuality Studies*), Nancy Kuhl (*Beinecke Library*), Albert Laguna (*American Studies; Ethnicity, Race, & Migration*), Kathryn Lofton (*Religious Studies; American Studies; Women's, Gender, & Sexuality Studies*), Mary Lui (*History; American Studies*), John MacKay (*Slavic Languages & Literatures; Film & Media Studies*), Tracey Meares (*Law School*), George Miles (*Beinecke Library*), Leah Mirakhor (*American Studies; Ethnicity, Race, & Migration*), Lucy Mulroney (*Beinecke Library*), Charles Musser (*Film & 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 & 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, & 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, & 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 (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.

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.

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 or b, 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
Roderick Ferguson

Director of Graduate Studies
Joseph Fischel

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; 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.

International 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.

DSR students engaged in course work or a combination of course work and research 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. 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. 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/visiting-assistant-research-var. DSR applicants must provide evidence of health care 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 normally are not charged tuition.

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, Film and Media Studies, Renaissance 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, Global Affairs, 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.)

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, 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 Associate Dean Jasmina Besirevic Regan (jasmina.besirevic@yale.edu). Applications must be received at least six 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 Associate Dean Jasmina Besirevic Regan (jasmina.besirevic@yale.edu).

International Exchange Programs

Anthropology
Masarykova Univerzita, Brno, Czech Republic

Chemistry
Universität Göttingen, Germany

Council on East Asian Studies
Sophia University, Tokyo, Japan; Universität Heidelberg, Germany; University of Tokyo, Japan

Earth and Planetary Sciences
University of Helsinki, Finland

Economic Growth Center
Research Institute for Economics and Business Administration, Kobe University, Japan

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, Paris, France; Institut d'Études Politiques de Paris ["Sciences Po"], France

German
Humboldt-Universität zu Berlin, Germany

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; Universität Konstanz, Germany

History
Institut d'Études Politiques de Paris ["Sciences Po"], France; Universität Heidelberg, Germany

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

Religious Studies
Hebrew University, Jerusalem, Israel

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 courses in the summer, language for reading instruction is available through the Yale Summer Session, and graduate students may wish to take advantage of those 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 less 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 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 course work 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 master'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 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. The Honors requirement must be met in courses other than those concerned exclusively with dissertation research and preparation.

A student who has not met the Honors requirement 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 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, 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, 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 the 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 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 appointments are encouraged to meet with their associate dean. A student must be registered in the Graduate School, at least half-time, 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. PTAIs 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 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 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.S./M.A./M.S. Degrees, students are not admitted as candidates for the Master of Arts or Master of Science degree. However, students in most doctoral departments may be awarded the M.A. or M.S. en route to the Ph.D. degree.

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 as well.

Terminal M.A.S./M.A./M.S. Degrees

The M.A.S./M.A./M.S. degrees are offered as terminal degrees in nineteen 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, Global Affairs, 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.S./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.

With the approval of the department and the appropriate associate dean, a student may be admitted for part-time study toward the 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.

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.S./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.S./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, Global Affairs, 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 apply for admission no later than their first year of study in the J.D. program and 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 tuition requirement for J.D./M.A. students in one-year M.A. programs is one year of tuition; students in two-year M.A. programs have a one and one-half year tuition 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 mirrors standard, departmental packages. Students will pay one and one-half years of tuition for the three terms registered at SOM.

The School of Management 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 the departmental 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. The 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 spring 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 in the fall (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.

Students enrolled in Ph.D. programs should not petition for M.A./M.S. and M.Phil. degrees 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.S./M.A./M.S. programs may petition for their degrees in the term in which they expect to complete them.

COMMENCEMENT

GScommencement@yale.edu
https://commencement.yale.edu

There is only one University Commencement ceremony each year, in May. All degrees awarded for both December and May of each academic year are presented at the May ceremony. Graduating students must complete the Commencement form found at the site listed above by mid-April each year in order to attend the GSAS diploma ceremony in person, or, alternatively, to receive the diploma by mail.

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 less for Ph.D. programs and one or two years for students in M.A.S./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 the Office of International Students and Scholars (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.S./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 less. 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 online 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 may hold this status for a maximum of four consecutive terms and will be charged the Continuous Registration Fee in each term for which it is approved. 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 associate dean for graduate student advising and academic support. 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 Continuous Registration Fee and doctoral students continue to receive the 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. 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/sites/default/files/graduate_credit_request_form_0.pdf) 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 School of Management or the Law School must also obtain written permission from the

respective school's registrar to be officially enrolled. Permission must be obtained within two weeks of the close of registration 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 online course selection 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 then filed with the registrar. 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 through the student's department and online at http://gsas.yale.edu/forms.

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.

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) (available on the Graduate School website at http://gsas.yale.edu/forms) 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 selected 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 Temporary Incomplete. 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 selected 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 or 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.S./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 Continuous Registration Fee, below.) Students who will be in residence during any term are required to register through the online course selection process during the normal registration period at the beginning of that term. (See the Schedule of Academic Dates and Deadlines.) Ph.D. students who are not registered in absentia to peform required fieldwork, research, or study are expected to register in residence.

A fee will be charged to students who register in residence after the close of the registration period. 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 (246 Church St.) 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://gsas.yale.edu/forms 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 for any term in which they serve as Teaching Fellows.

Summer Registration

Ph.D. students receive funding and are expected to continue full-time independent 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 their associate dean prior to May 15.

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.

Students can obtain verification of summer registration from the Registrar's Office.

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 Ph.D.
- 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.
- Students participating in a summer internship normally forgo their summer 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, 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 apply for a leave of absence.
- Students on internships who remain registered full-time will continue to receive the Health Award and other benefits of registration. Internships do not stop a student's "academic clock."
- 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. International students 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 chief physician 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.S./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. Leaves of absence for students in M.A.S./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. International students who apply for a leave of absence must consult with OISS regarding their visa status.
4. Students on leave may complete outstanding work in courses for which they have been granted approved 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 in fact 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 charge in M.A.S./M.A./M.S. programs) or from paying the Continuous Registration Fee (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 normally 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. In order 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 registrar in writing of their intention to return. Such notification should be given 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 chief physician or their designee. A student who wishes to take a medical leave of absence may request it from a physician at Yale Health and from the student's associate dean. 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.

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 chief physician 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 spring coverage ends July 31. Ph.D. students cleared to register for the following fall term receive a Graduate School Health Award for the month of August.

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.

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. 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 associate dean for graduate student advising and academic support 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.S./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 the term before the planned modifications would occur.

Withdrawal and Readmission

A student may withdraw from a program of study voluntarily or may be 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 on an official withdrawal form (available on the Graduate School website at http://gsas.yale.edu/forms) are required. The associate dean will determine the effective date of the withdrawal, upon consultation with the department. The University identification card must be submitted with the approved withdrawal form in order for 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 will be 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 the University identification card will be liable for the tuition charge (or Continuous Registration Fee) 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 Continuous

Registration Fee 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 of Arts and Sciences 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 a philosophy 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. They 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, religion, sex, gender identity, sexual orientation, 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 Sexual Misconduct Response and Prevention website (https://smr.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 each of the associate deans of the Graduate School or on the Graduate School website (https://gsas.yale.edu/academic-professional-development/professional-ethics-regulations/student-grievances). The deans 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 regulations.

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://student-dhr.yale.edu/deans-designees) 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
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.

GRIEVANCE PROCEDURES

To address complaints and grievances of various kinds, the Graduate School maintains a set of procedures. Copies of the grievance procedures of the Graduate School may be obtained from the office of each of the associate deans of the Graduate School or via the Graduate School website (https://gsas.yale.edu/academic-professional-development/professional-ethics-regulations/student-grievances). The deans may be consulted for further information and advice.

The Graduate School Procedure for Student Complaints

This procedure governs student complaints against a member of the faculty or administration of the Graduate School with the exception of complaints of sexual misconduct, discrimination, and harassment. Complaints that involve a misapplication of Graduate School policy are also appropriate for consideration by the Dean's Advisory Committee on Student Grievances. Complaints that require an emendation of policy will be referred to the Graduate School Executive Committee. Complaints of sexual misconduct, which includes sexual harassment and sexual assault, should 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 on Sexual Misconduct under Yale University Resources and Services. Complaints of discrimination and harassment (https://student-dhr.yale.edu/policies-definitions) should be brought to either the discrimination and harassment resource coordinators (https://student-dhr.yale.edu/deans-designees) or the Office of

Institutional Equity and Access (https://oiea.yale.edu) for support, investigation, and resolution (https://student-dhr.yale.edu/complaint-resolution).

Office of Institutional Equity and Access

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 Access, 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 on 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.

FINANCING GRADUATE SCHOOL

Tuition and Fees

TUITION, 2021–2022*

Full-time study, per term: $22,850

Full-time study in IDE, per term: $23,350

Half-time study, per term: $11,450

Master's programs, less than half-time per term

One-quarter time study, per term: $5,712.50

Division of Special Registration (DSR, nondegree study)

Course work, per course, per term (including audited courses): $5,712.50

Visiting Students, per term: $22,850

Visiting Assistants in Research, per month: $425

FEES, 2021–2022†

Continuous Registration Fee (CRF), per term‡: $737.50

Yale Health Hospitalization/Specialty Coverage, twelve months§: $2,650

* 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 Financial Services, which is 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://sfas.yale.edu/proxy-access-and-authorization).

The Office of Student Financial Services 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 should not be made to a Student Account that are in excess of the balance due (net of pending financial aid credits). 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 365/24/7 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 Student Financial Services Cashier's Office, located at 246 Church Street. The Cashier's Office is 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, the following penalties may apply if a payment is rejected:

1. If the payment was for a term bill, late fees of $125 per month will be charged for the period the bill was unpaid, as noted above.
2. If the payment was for a term bill to permit registration, the student's registration may be revoked.
3. If the payment was given to settle an unpaid balance in order to receive a diploma, the University may refer the account to an attorney for collection.

YALE PAYMENT PLAN

A Yale Payment Plan provides parents and students with the option to pay education expenses monthly. It is designed to relieve the pressure of lump-sum payments by

allowing families to spread payments over a period of months without incurring any interest charges. Participation is optional and elected on a term basis. The cost to sign up is $50 per term.

Depending on the date of enrollment, students may be eligible for up to five installments for the fall and spring terms. Payment Plan installments will be automatically deducted on the 5th of each month from the bank account specified when enrolling in the plan. For enrollment deadlines and additional details concerning the Yale Payment Plan, see https://student-accounts.yale.edu/ypp.

BILL PAYMENT AND PENDING MILITARY BENEFITS

Yale will not impose any penalty, including the assessment of late fees, the denial of access to classes, libraries, or other facilities, or the requirement that a student borrow additional funds, on any student because of the student's inability to meet their financial obligations to the institution, when the delay is due to the delayed disbursement of funding from VA under chapter 31 or 33.

Yale will permit a student to attend or participate in their course of education during the period beginning on the date on which the student provides to Yale a certificate of eligibility for entitlement to educational assistance under chapter 31 or 33 and ending on the earlier of the following dates: (1) the date on which payment from VA is made to Yale; (2) ninety days after the date Yale certifies tuition and fees following the receipt of the certificate of eligibility.

Interruption or Temporary Suspension of University Services or Programs

Certain events that are beyond the University's control may cause or require the interruption or temporary suspension of some or all services and programs customarily furnished by the University. These events include, but are not limited to, epidemics or other public health emergencies; storms, floods, earthquakes, or other natural disasters; war, terrorism, rioting, or other acts of violence; loss of power, water, or other utility services; and strikes, work stoppages, or job actions. In the face of such events, the University may, at its sole discretion, provide substitute services and programs or appropriate refunds. The decision to suspend services and programs 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 $4,900, issued in installments of $2,450 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 $1,000 ($500 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 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.)

DISSERTATION FELLOWSHIPS

The Graduate School offers University Dissertation Fellowships (UDF) as part of its financial aid package to eligible advanced graduate students in the humanities and social sciences once they have advanced to doctoral candidacy. Students receive the UDF when engaged in full-time research and writing, normally in the fifth year of study. The UDF is usually taken in consecutive terms (beginning in either the fall or spring term) and must be completed by the end of the sixth year of study. Students on the UDF may not teach in the GSAS Teaching Fellow Program, but are permitted to

accept teaching positions with the Yale Summer Session or outside of the University as long as they are limited to an average of ten hours per week or less. Students who accept a Teaching Fellow position in the fall or spring of the year of final eligibility will forfeit that term's dissertation fellowship amount. Students receiving external funding for dissertation research or writing may be eligible for a combined award and should consult the External Fellowships and Combined Award Policy.

TEACHING FELLOWSHIPS

Teaching and Admission Offers

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 is earlier or is flexible across 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 on 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.

In the humanities and social sciences, students may be guaranteed teaching in the sixth year of study if there are no alternate sources of funding and the director of graduate studies certifies that the student will submit the dissertation by the end of the sixth year of study.

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 will 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 TF-20 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 TF-20 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 TF-20 level will receive University funds with no teaching obligation. Students receiving University funds are ineligible to seek additional teaching assignments that are 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 or who are eligible for a guaranteed sixth-year teaching position. Students in years two through six who have completed their required teaching may teach if enrollments permit and as long as they have been admitted to candidacy and do not

concurrently hold a dissertation fellowship. In the humanities and social sciences, students who are on funding extensions are expected to teach at the TF-20 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 TF-20 assignment (up to twenty hours per week) per term. Students in the natural sciences teaching above the requirement are limited to one TF-10 assignment per term. Seventh-year students may teach up to three TF-20 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 TF-10 level. Students who are teaching to fulfill a teaching obligation 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 are 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 TF-10 level are expected to teach for up to 10 hours per week. Students assigned at the TF-20 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 assignment. Doctoral students in the humanities and social sciences are typically expected to perform required teaching at the TF-20 level. All students, including master's and professional school students, who are teaching outside of a doctoral financial aid package will receive $4,000 for a TF-10 assignment and $8,000 for a TF-20 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 all of the 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 or (2) defer financial support awarded in their admission offer for up

to one year. Students must report to their associate dean any scholarship/fellowship received from an outside agency or organization. The 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. 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.

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 should 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 are limited 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 WORK-STUDY

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, 246 Church St.

Eligible students in the Graduate School may be able to borrow from the Federal Direct Loan Program.

The College Work-Study (CWS) program, which is federally funded, enables eligible graduate students to meet a portion of their academic year financial need through part-time employment.

All students applying for any of these federal programs must fill out a Free Application for Federal Student Aid (FAFSA). Information on loan and work-study 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://fafsa.ed.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 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 and are entitled to a refund of any University charges 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.

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, a round-the-clock acute care clinic, and specialty services such as allergy, dermatology, orthopedics, and a travel clinic. Yale Health coordinates and provides payment for the services provided at the Yale Health Center, as well as for emergency treatment, off-site specialty services, inpatient hospital care, and other ancillary services. 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 Coverage. Yale Health Basic Coverage 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 or on extended study and paying less than half tuition are not eligible for Yale Health Basic Coverage 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 Coverage 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 Coverage 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 Coverage 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 day the dormitories officially open. 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 Coverage 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 or extended study, students paying less than half tuition, students enrolled in the EMBA 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 Coverage (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.

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, 2021. 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 (available after June 20), and all supporting documents must be uploaded to http://yale.medicatconnect.com. The final deadline is August 1.

COVID-19 Effective April 2021, all students are required to provide proof of completed immunization against COVID-19. Antibody titers or evidence of previous infection are *not* accepted as proof of immunity. Currently approved vaccines include Pfizer-BioNTech (two doses), Moderna (two doses), and Janssen/Johnson & Johnson (one dose). International vaccines that are authorized for emergency use by the World Health Organization will also be accepted by Yale as meeting the COVID-19 vaccination requirement. Yale Health's website will be updated as new vaccines are reviewed (https://yalehealth.yale.edu/covid-19-vaccination-faq-international-students-and-scholars). Students who encounter insurmountable difficulties in being vaccinated at home, or live internationally and do not have access to an accepted vaccine, will be provided with free vaccine on campus by special arrangement. Students who are not compliant with this vaccine requirement will not be permitted to register for classes or move into the dormitories for the fall term, 2021.

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 measles vaccine, two doses

of mumps vaccine, two doses of 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, 2021.

Quadrivalent meningitis All students living in on-campus dormitory facilities 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, 2021. 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. 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.

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.

Student Accessibility Services

https://sas.yale.edu

Student Accessibility Services (SAS) facilitates reasonable accommodations for all Yale students with disabilities who choose to register with the office. Registration with SAS is kept private. SAS helps arrange academic, transportation, dietary, and housing accommodations across campus. To qualify as a student with a disability, supporting documentation must be provided. The required first step for a student with a disability is completion of the registration form, which will initiate the process of obtaining disability-related accommodations; see https://yale-accommodate.symplicity.com/public_accommodation.

SAS works with students with sporadic and temporary disabilities as well. At any time during a term, students with a newly diagnosed disability requiring accommodations should register following the above instructions. More information can be found at https://sas.yale.edu, including instructions for requesting or renewing accommodations and the guidelines for supporting documentation. You can also reach us at sas@yale.edu or by phone at 203.432.2324.

Office of International Students and Scholars

https://oiss.yale.edu

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 staff assist with issues related to employment, immigration, and personal and cultural adjustment, as well as serve 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, faculty, and staff obtain and maintain legal nonimmigrant status in the United States. All international students and scholars must register with OISS as soon as they arrive at Yale.

OISS programs, like daily English conversation groups, U.S. culture workshops and discussions, 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), which organizes a variety of programs.

The OISS website provides useful information to students and scholars prior to and upon arrival in New Haven, as well as throughout their stay at Yale. International students, scholars, and their families and partners can connect with OISS and the Yale international community virtually through Facebook.

OISS is housed in the International Center for Yale Students and Scholars, which serves as a welcoming venue for students and scholars who want to peruse resource materials, check their email, grab a cup of coffee, and meet up with a friend or colleague. Open until 9 p.m. on weekdays during the academic year, the center—located at 421 Temple Street, across the street from Helen Hadley Hall—also provides meeting space for student groups and a venue for events organized by both student groups and University departments. For more information about reserving space at the center, go to https://oiss.yale.edu/about/the-international-center/international-center-room-reservations. For information about the center, visit https://oiss.yale.edu/about/international-center.

Resources on Sexual Misconduct

Yale University is committed to maintaining and strengthening an educational, working, and living environment founded on mutual respect. Sexual misconduct is antithetical to the standards and ideals of our community, and it is a violation of Yale policy and the disciplinary regulations of Yale College and the graduate and professional schools.

Sexual misconduct incorporates a range of behaviors including sexual assault, sexual harassment, intimate partner violence, stalking, voyeurism, and any other conduct of a sexual nature that is nonconsensual, or has the purpose or effect of threatening, intimidating, or coercing a person. Violations of Yale's Policy on Teacher-Student Consensual Relations also constitute sexual misconduct. Sexual activity requires affirmative consent, which is defined as positive, unambiguous, and voluntary agreement to engage in specific sexual activity throughout a sexual encounter.

Yale aims to eradicate sexual misconduct through education, training, clear policies, and serious consequences for violations of these policies. In addition to being subject to University disciplinary action, many forms of sexual misconduct are prohibited by Connecticut and federal law and may lead to civil liability or criminal prosecution. Yale provides a range of services and resources for victims of sexual misconduct. Information on options for reporting an incident, accommodations and other supportive measures, and policies and definitions may be found at https://smr.yale.edu.

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 hotline: 203.432.2000
https://sharecenter.yale.edu

SHARE, the Sexual Harassment and Assault Response and Education Center, has trained counselors available 24/7 via direct hotline, as well as for drop-in hours on weekdays during regular business hours. SHARE is 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. SHARE works closely with the University-Wide Committee on Sexual Misconduct, the Title IX coordinators, 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 and you would like to contact the SHARE staff during regular business hours, you can contact Jennifer Czincz, the director of SHARE (203.432.0310, jennifer.czincz@yale.edu), Anna Seidner (203.436.8217, anna.seidner@yale.edu), Cristy Cantú (203.432.2610, cristina.cantu@yale.edu), or Freda Grant (freda.grant@yale.edu).

TITLE IX COORDINATORS

203.432.6854
Office hours: 9 a.m.–5 p.m., M–F
https://provost.yale.edu/title-ix

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 a deputy Title IX coordinator, reporting to Stephanie Spangler, Vice Provost for Health Affairs and Academic Integrity and the University Title IX Coordinator. Coordinators respond to and address specific complaints, provide information on and coordinate with the available resources, 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 are knowledgeable about, and will provide information on, all options for complaint resolution, and can initiate institutional action when necessary. Discussions with a Title IX coordinator are confidential. 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 comprised of faculty, senior administrators, and graduate and professional students drawn from throughout the University. UWC members are trained in the protocols for maintaining confidentiality and 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 Sergeant Kristina Reech, the Sensitive Crimes & Support coordinator, she can be reached at 203.432.9547 during business hours or via email at kristina.reech@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 University's Title IX coordinators, 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 Advanced Study (M.A.S.), 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/education/admissions, 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 06516-7399.

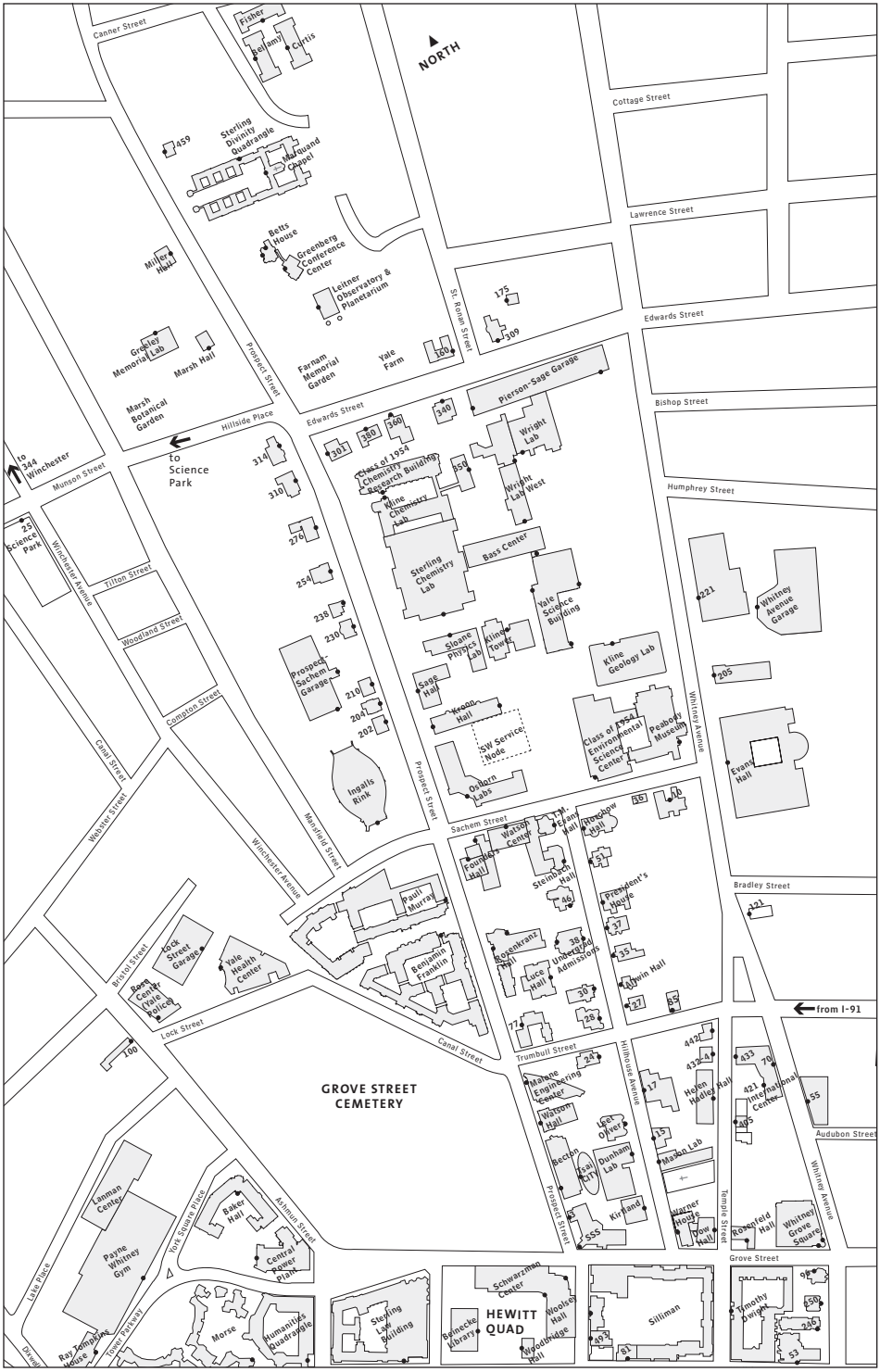
David Geffen School of Drama Est. 1925. Courses for college graduates and certificate students. Master of Fine Arts (M.F.A.), Certificate in Drama, Doctor of Fine Arts (D.F.A.).

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.

YALE UNIVERSITY CAMPUS NORTH



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YALE UNIVERSITY CAMPUS SOUTH & YALE MEDICAL CENTER

© Yale University. Map not to scale

The University is committed to basing judgments concerning the admission, education, and employment of individuals upon their qualifications and abilities and affirmatively seeks to attract to its faculty, staff, and student body qualified persons of diverse backgrounds. In accordance with this policy 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, race, color, religion, age, disability, status as a protected veteran, or national or ethnic origin; nor does Yale discriminate on the basis of sexual orientation or gender identity or expression.

University policy is committed to affirmative action under law in employment of women, minority group members, individuals with disabilities, and protected veterans.

Inquiries concerning these policies may be referred to Valarie Stanley, Senior Director of the Office of Institutional Equity and Access, 203.432.0849. For additional information, see 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, Stephanie Spangler, at 203.432.4446 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, fax 617.289.0150, TDD 800.877.8339, or ocr.boston@ed.gov.

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://publicsafety.yale.edu.

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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