

Graduate School of Arts and Sciences

Programs and Policies

2018–2019



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Series 114 Number 5 July 15, 2018

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THE PRESIDENT AND FELLOWS OF YALE UNIVERSITY

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

Fellows

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

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Senior Vice President for Institutional Affairs and General Counsel

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Vice President for Alumni Affairs and Development

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Vice President for Global Strategy

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Vice President for Facilities and Campus Development

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THE ADMINISTRATION OF THE GRADUATE SCHOOL

OFFICE OF THE DEAN

Lynn Cooley, Ph.D., Dean of the Graduate School

Susan Hacking, M.S., Senior Manager of Communication and Alumni Affairs

Susanne Olsen, Senior Executive Assistant to the Dean

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

Michelle Nearon, Ph.D., Associate Dean for Graduate Student Development and Diversity; Director, Office for Graduate Student Development and Diversity

Richard G. Sleight, Ph.D., Associate Dean for Graduate Student Advising and Academic Support

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

Robert Harper-Mangels, Ph.D., Assistant Dean

Elena D. Kallestinova, Ph.D., Assistant Dean of the Graduate School; Director of Graduate Writing Laboratory, Yale Center for Teaching and Learning

GRADUATE STUDENT LIFE

Lisa Brandes, Ph.D., Assistant Dean for Student Affairs; Director, Graduate Student Life, McDougal Graduate Student Center

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Lisa Furino, Assistant Director of Admissions

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Sara Estrom, M.B.A., CPA, Director of Financial Aid

Howard el-Yasin, M.A., M.F.A., Assistant Director, Teaching Fellow Program

Susan Wroszek, B.S., Assistant Director of Financial Aid

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Mary Magri, M.B.A., Lead Administrator for the Dean's Administration

Alexa Schlieker, M.S., Operations Manager

OTHER ACADEMIC OFFICERS WITH RESPONSIBILITIES IN THE GRADUATE SCHOOL

Peter Salovey, Ph.D., President

Benjamin Polak, Ph.D., Provost

Tamar S. Gendler, Ph.D., Dean of the Faculty of Arts and Sciences

SCHEDULE OF ACADEMIC DATES AND DEADLINES

FALL TERM 2018

Aug. 20	M	New student orientation week begins Oral Performance Assessment for continuing international students in Ph.D. programs
Aug. 22	W	Fall-term online course selection begins
Aug. 23	TH	Matriculation ceremony
Aug. 27	M	Teaching @ Yale Day: orientation for all new Teaching Fellows
Aug. 29	W	Fall-term classes begin, 8:20 a.m.
Aug. 31	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. 3	M	Labor Day. Classes do not meet
Sept. 7	F	Final day to apply for a fall-term personal leave of absence The entire fall-term tuition charge or continuous registration fee (CRF) will be canceled for students who withdraw from the Graduate School on or before this date or who are granted a leave of absence effective on or before this date
Sept. 12	W	Fall-term online course selection ends Final day for registration. A fee of \$50 is assessed for course schedules accepted after this date
Sept. 14	F	Final day to file petitions for M.A., M.S., and M.Phil. degrees to be awarded in December
Sept. 21	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	M	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. 16	T	October recess begins, 5:20 p.m.
Oct. 22	M	Classes resume, 8:20 a.m.
Oct. 26	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	TH	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in December

Nov. 7	W	Final day to withdraw a degree petition for degrees to be awarded in December
Nov. 8	TH	Oral Proficiency Assessment for international students in all GSAS degree programs
Nov. 12	M	Deadline for departments to return Degree Recommendation Forms for December degrees to registrar
Nov. 16	F	November recess begins, 5:20 p.m.
Nov. 26	M	Classes resume, 8:20 a.m. Final day to submit petitions for extended registration and Dissertation Completion status for the spring term
Dec. 13	TH	Classes end, 5:20 p.m.
Dec. 14	F	Final examinations begin
Dec. 19	W	Examinations end. Winter recess begins
Dec. 20	TH	Date of December degree award

SPRING TERM 2019

Jan. 2	W	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. 9	W	Spring-term online course selection begins
Jan. 11	F	Teaching @ Yale Day: orientation for all new Teaching Fellows
Jan. 14	M	Spring-term classes begin, 8:20 a.m.
Jan. 18	F	Monday classes meet on Friday
Jan. 21	M	Martin Luther King, Jr. Day. Administrative offices are closed; classes do not meet
Jan. 24	TH	Final day to apply for a spring-term personal leave of absence The entire spring-term tuition charge or 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. 25	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. 8	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	F	Due date to notify department of intention to submit dissertation for award of the Ph.D. in May
Mar. 1	F	Final day to file petitions for M.A.S., M.A., M.S., and M.Phil. degrees to be awarded in May

Mar. 8	F	Midterm 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 Spring recess begins, 5:20 p.m. One-quarter of the spring-term full-tuition charge will be canceled for students who withdraw from the Graduate School on or before this date or who are granted a medical leave of absence effective on or before this date. The CRF is not prorated Teaching appointments will not appear on the transcripts of students who withdraw from the assignment on or before this date
Mar. 15	F	Due date for dissertations to be considered by the Degree Committee for award of the Ph.D. in May
Mar. 25	M	Classes resume, 8:20 a.m.
Apr. 15	M	Readers' Reports are due for dissertations to be considered by the Degree Committee for award of the Ph.D. in May Oral Proficiency Assessment for international students in all GSAS degree programs
Apr. 18	TH	Deadline for departments to return Degree Recommendation Forms for May graduation Final day to withdraw a degree petition for degrees to be awarded in May
Apr. 19	F	Good Friday. Administrative offices closed; classes meet
May 1	W	Final day to submit Dissertation Progress Reports
May 2	TH	Classes end, 5:20 p.m.
May 3	F	Final examinations begin
May 8	W	Final examinations end
May 10	F	Final grades for spring-term courses are due for candidates for terminal M.A.S., M.A., and M.S. degrees to be awarded at Commencement
May 19	SU	Graduate School Convocation
May 20	M	University Commencement Date of May degree award
May 31	F	Final grades for spring-term courses and full-year courses are due Final day that faculty may submit a request for the assignment of a grade of Temporary Incomplete
June 1	SA	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 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

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-six departments and programs offer courses of study leading to the Ph.D. degree. There are eighteen programs that terminate with the master's degree.

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 all these callings.

Yale's standing as a great international research university is based on the strength and attractiveness 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 in training and apprentice teachers engage with undergraduates and the faculty. A shared sense of common purpose makes Yale a community of scholars, and a place for an unusually intimate exchange of ideas.

MISSION STATEMENT

The mission of the Graduate School of Arts and Sciences is to seek students of the highest intellectual promise and achievement of all backgrounds, from across the nation and around the world, and to educate them to be scholars, teachers, and leaders for many sectors of society. The larger aim of this enterprise is to prepare and stimulate each new generation to perpetuate and advance human knowledge and to contribute to the health and development of the human community.

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

Yale continues to evolve as a global university, educating leaders and advancing the frontiers of knowledge across the entire world. The University's engagement beyond the United States dates from its earliest years. Yale has drawn students from abroad for nearly two centuries, and international topics have been represented in its curriculum for the past hundred years and more.

This year, Yale welcomed the largest number of international students and scholars in its history. The current enrollment of more than 2,800 international students from 121 countries comprises 22 percent of the student body. Yale is 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. The number of international scholars (visiting faculty, researchers, and postdoctoral fellows) has also grown to nearly 2,700 each year.

Yale's globalization is guided by the vice president for global strategy and deputy provost for international affairs, 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 and deputy provost works closely with academic colleagues in all of the University's schools and provides support and strategic guidance to the many international programs and activities undertaken by Yale faculty, students, and staff.

The Whitney and Betty MacMillan Center for International and Area Studies (<http://macmillan.yale.edu>) is the University's focal point for teaching and research on international affairs, societies, and cultures.

The Jackson Institute for Global Affairs (<http://jackson.yale.edu>) seeks to institutionalize the teaching of global affairs throughout the University and to inspire and prepare Yale students for global citizenship and leadership.

The Office of International Affairs (<http://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 (<http://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 World Fellows Program (<http://worldfellows.yale.edu>) hosts fifteen emerging leaders from outside the United States each year for an intensive semester of individualized research, weekly seminars, leadership training, and regular interactions with the Yale community.

The Association of Yale Alumni (<http://aya.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 (<http://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.

ASSOCIATE AND ASSISTANT DEANS FOR ACADEMIC AFFAIRS

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

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Jasmina Besirevic Regan, Assistant Dean for Graduate Education; jasmina.besirevic@yale.edu

Robert Harper-Mangels, Assistant Dean; robert.harper-mangels@yale.edu

The academic deans of the Graduate School are responsible for the administration of graduate programs, normally 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. Dean Schirmeister oversees initiatives linking the schools in the Faculty of Arts and Sciences, including the Teaching Fellow Program.

Deans Besirevic Regan, Gaylin, and Harper-Mangels oversee graduate education at the programmatic level, as well as the distribution of admissions resources.

Dean Sleight oversees individual student progress and academic support services.

Dean Nearon oversees initiatives to build and maintain a diverse and supportive campus community.

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 of graduate study 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, Associate Dean for Graduate Student Development and Diversity;

Director, OGSDD; 206 Warner House, 1 Hillhouse Ave., 203.436.1301

Denzil Streete, Assistant Director of OGSDD; 406 Dow Hall, 370 Temple St.,

203.436.4171

<http://gsas.yale.edu/diversity>

The Office for Graduate Student Development and Diversity's mission is to expand the diversity of the student body and to enhance the intellectual experience of the entire scholarly community. The office coordinates efforts to recruit and retain students of color, women, and other diverse groups at the Yale Graduate School. The associate dean works collaboratively with departments and programs to support the needs of traditionally underrepresented students as they pursue graduate study. The associate dean advises prospective and current graduate students, directs the Summer Undergraduate Research Fellowship (SURF) Program, directs the Post-baccalaureate Research Education Programs, oversees Diversity Recruitment Days, coordinates the Annual Yale Bouchet Conference on Diversity and Graduate Education, writes and administers grants, and provides reports on the Graduate School's progress in recruiting and retaining diverse students. Graduate Diversity Fellows within the office are also appointed annually to assist the office in the development and implementation of a wide array of programs, such as social justice discussion seminars, mentoring programs, workshops and lectures presented by diverse scholars, and social and professional development events. An Advisory Committee, appointed by the dean, meets regularly to discuss and review the office's programmatic efforts.

MCDUGAL 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 fifty McDougal Fellows in five offices who create programs and services for the graduate community through collaborative offices of Development and Diversity, Career Strategy, Graduate Student Life, and the Center for Teaching and Learning.

Graduate Student Life

Lisa Brandes, Assistant Dean for Student Affairs and Director, McDougal Center; Founders Hall, 135 Prospect St., upper level, Rm. 185, 203.432.2583, lisa.brandes@yale.edu

Jennifer Mendelsohn, Associate 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 concerts; 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 fifty graduate student organizations, which sponsor events at the center or on campus. Activities are announced in the weekly e-mail 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.

In collaboration with the Office of the Vice President for Student Life, the assistant dean for student affairs coordinates general campus services for graduate students, serving as a graduate student advocate and departmental liaison 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 that 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 departmental recruitment activities and organizes new student orientation and GS Dean's social events. GSL 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-graduate-school>

The Office of Graduate Admissions coordinates and oversees all aspects of application to the Graduate School for individuals seeking master's and doctoral degrees, as well as for nondegree study. The office also works with the associate deans and academic departments to provide relevant information and decisions to applicants.

BUSINESS OPERATIONS

Mary Magri, Lead Administrator for the Dean's Administration; Warner House,
1 Hillhouse Ave., 203.432.6346, mary.magri@yale.edu

Alexa Schlieker, Operations Manager; Warner House, 1 Hillhouse Ave., 203.436.9376,
alexa.schlieker@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
<http://gsas.yale.edu/funding-aid/office-financial-aid>

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

REGISTRAR'S OFFICE

Shonna Marshall, Associate University Registrar for Student Support; 246 Church St.,
203.436.8036, 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, Senior Associate Dean of the Graduate School;
pamela.schirmeister@yale.edu

Howard el-Yasin, Assistant Director; 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 assistant director of the Teaching Fellow Program or their associate dean.

AFFILIATED OFFICES

Office of Career Strategy

Hyun Ja Shin, Director, Graduate and Postdoctoral Career Services;
careerstrategy@yale.edu
Brian Frenette, Senior Associate Director, Graduate and Postdoctoral Career Services;
careerstrategy@yale.edu
55 Whitney Ave., 3rd floor; and McDougal Center, Founders Hall, 135 Prospect St.,
Rm. 187B
<https://ocs.yale.edu/gsas-postdocs>

The Office of Career Strategy assists currently enrolled degree students in the Graduate School of Arts and Sciences, postdocs, and recent alumni with career advising, nonacademic employment opportunities, and career development resources. Offerings include individual advising appointments and daily walk-in hours; workshops, programs, and online webinars; employer recruiting events, information sessions, and an on-campus interview program; alumni networking events; an employer database with more than 10,000 registered employers and an online job posting resource with current opportunities; an interactive mock interview system; partnerships with external career partners; and the Office of Career Strategy McDougal Fellows, who plan programming unique to graduate students and offer peer advising. All degree students in the Graduate School of Arts and Sciences receive regular communication and program updates from the Office of Career Strategy via its weekly e-newsletter. In addition, degree students can view its calendar of events and make appointments with a career adviser via Symplicity, the office's career services management system.

Yale Center for Teaching and Learning

Jennifer Frederick, Executive Director; jennifer.frederick@yale.edu
Sterling Memorial Library, 301 York St. entrance
<http://ctl.yale.edu>

The Yale Center for Teaching and Learning (CTL) supports teaching excellence across the campus and unites Yale's work in online education with the University's other pedagogical initiatives. Several units within the CTL are focused exclusively on professional development and skill-based training for graduate and professional school students.

GRADUATE AND POSTDOCTORAL TEACHING DEVELOPMENT

Suzanne Young, Director

301 York St.

<https://ctl.yale.edu/teaching/graduate-student-professional-student-and-postdoctoral-teaching-development>

This CTL unit 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 assistance and training in essential teaching topics and issues. For first-time teaching fellows in the GSAS, the center provides a required training that equips graduate teaching fellows with knowledge of key policies and effective teaching practices. The CTL also offers Fundamentals of Teaching courses for specific departments, such as Chemistry, Engineering & Applied Science, History, Music, Political Science, and Physics. (Departments and programs seeking their own discipline-centered program should contact the CTL.) In addition, the center offers Fundamentals of Teaching courses in the humanities, social sciences, sciences, and foreign languages. For more advanced graduate teachers, the CTL offers workshops on topics such as classroom management, course design, grading, instructional technology, and leading discussions. It also offers upper-level programs to help graduate students prepare for the academic job market, including sessions on interview preparation and developing a teaching portfolio, including syllabus design and writing a teaching statement. The CTL also offers an extensive program of individual consultations and coaching, which may include classroom visits and videotaping. All CTL programs and consultations are strictly confidential. Graduate students who avail themselves of these and other on-campus teaching programs can obtain a Certificate of College Teaching Preparation (CCTP). Through its Spring Teaching Forum, the CTL provides a venue for members of the Yale community to discuss issues in education and pedagogy. The Associates in Teaching program allows graduate students to co-design and co-teach a course with a faculty mentor.

On the CTL website, graduate students will find a variety of online teaching resources, including a calendar of events, descriptions of the CTL programs, a “Teaching How-To” for new and returning teachers, and modules on important teaching topics. The CTL connects with graduate students through its blog, Facebook page, and Twitter account, all of which are accessible at <http://ctl.yale.edu/teaching>. All graduate students also receive an e-newsletter about upcoming and new programs and events. In addition, Yale is part of a national network that aims to broaden and diversify training opportunities for graduate students and postdocs in the sciences. The Center for the Integration of Research, Teaching and Learning (CIRTL) Network (<https://www.cirtl.net>) brings future faculty from across the nation to online and in-person training in science education. These programs complement and extend the CTL’s offerings, and allow Yale scholars to participate in diverse and enriching learning communities.

GRADUATE WRITING LABORATORY

Elena D. Kallestinova, Assistant Dean and Director; 301 York St., 203.432.7725,

elena.kallestinova@yale.edu, grad.writing@yale.edu

Julia Istomina, Assistant Director; 35 Broadway, julia.istomina@yale.edu

<http://ctl.yale.edu/writing/graduate>

The Graduate Writing Laboratory (GWL), a unit of the CTL, offers resources to all currently enrolled GSAS students who want to grow as successful academic writers. The GWL offers support through individual advising, academic writing workshops, writing groups, and online resources. Graduate students are encouraged to schedule individual writing consultations with Graduate Writing Advisers, available throughout the academic year to meet in the CTL, the Center for Science and Social Science Information (CSSSI), and the Cushing/Whitney Medical Library. During these consultations, students receive feedback on their written course work, grant proposals, fellowship applications, conference presentations, research papers, prospectuses, and dissertation chapters. In addition, the GWL offers a comprehensive program of workshops, seminars, and discussion panels led by the professional staff, McDougal Graduate Writing Fellows, and invited speakers. These workshops relate to topics of academic research, writing, and publishing and take place at campus locations convenient for graduate students. The center also organizes regular writing groups including peer-review groups, dissertation boot camps, and study halls. These groups help students with the process of writing and provide accountability and peer support. A complete list of programs, together with a variety of handouts and online resources, is available through the GWL website and the 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.
<http://cls.yale.edu>

The Center for Language Study (CLS) supports language teaching and learning across the university. For graduate students in language and literature programs, it offers a Certificate in Second Language Acquisition that includes pedagogy workshops, a capstone course in SLA, and a series of professional development workshops that, taken together, give graduate students grounding in the theory and practice of language teaching. 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. For international graduate students, the CLS offers the English Language Program (ELP), which includes a Summer Program for incoming students, a series of courses that focus on academic English and teaching in the American classroom, workshops on a range of topics such as pronunciation and public speaking, and a final assessment that certifies graduate students for teaching at Yale. The goal of ELP is to prepare international graduate students for success in their academic and professional lives here at Yale and beyond. For more information, contact James Tierney at james.tierney@yale.edu. 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, and for fellowship applications. For more information, contact Angela Gleason at angela.gleason@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 Policies and Regulations).

The Graduate School of Arts and Sciences Climate and Inclusion Committee Comprised of faculty, students, and staff, this committee serves as an advisory committee to 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 (see Personal Conduct, under Policies and Regulations).

GRADUATE STUDENT ASSEMBLY (GSA)

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

Students in the Graduate School are represented collectively by the Graduate Student Assembly, which provides a forum for students to address issues across the Graduate School and University. It 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

<http://gpss.yale.edu>

The Graduate and Professional Student Senate (GPSS or “Yale G&P Senate”) 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 Graduate and Professional Student Center at Yale (GPSCY), located at 204 York Street. GPSCY provides office and event space for GPSS and other student organizations and houses Gryphon’s Pub.

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.

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

Acting Chair (2018–2019)

Gerald Jaynes (81 Wall St., gerald.jaynes@yale.edu)

Director of Graduate Studies

Kobena Mercer (81 Wall St., kobena.mercer@yale.edu)

Professors Elijah Anderson, David Blight, Daphne Brooks, Hazel Carby, Jacqueline Goldsby, Emily Greenwood, Matthew Jacobson, Gerald Jaynes, Kobena Mercer, Christopher Miller, Tavia Nyong'o, Claudia Rankine, Robert Stepto, Michael Veal

Associate Professors Simone Browne (*Visiting*), Aimee Cox, Crystal Feimster, Anthony Reed, Edward Rugemer

Assistant Professors Rizvana Bradley, Carolyn Roberts

Lecturers Aaron Carico, Thomas Allen Harris, Lauren Meyer

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, Political Science, Psychology, Religious Studies, Sociology, and Spanish and Portuguese. 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.

SPECIAL ADMISSIONS REQUIREMENTS

Strong undergraduate preparation in a discipline related to African American studies; writing sample; description of the fields of interest to be pursued in a combined degree. This is a combined degree program. To be considered for admission to this program you must indicate both African American Studies and one of the participating departments/programs listed above. Additionally, please indicate both departments on

all supporting documents (personal statement, letters of recommendation, transcripts, etc.).

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

A student currently enrolled in one of the departments or programs participating in the combined Ph.D. in African American Studies who desires to transfer into the combined Ph.D. program may do so after:

1. Providing the DGS of African American Studies with a written statement of interest detailing the reasons for the transfer;
2. Providing the DGS with a letter of support from an African American Studies faculty member agreeing to serve as the student's adviser;
3. A vote by the African American Studies faculty approving the transfer, with such vote held at a department meeting no earlier than the spring term of the student's first year as a graduate student at Yale.

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/AMST 643), 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. 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 505b / AMST 643b, Theorizing Racial Formations Kobena Mercer

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 537b / FILM 710b, Contemporary Art, Race, and the Philosophy of Media

Rizvana Bradley

This course draws from a diverse range of writing in philosophy (especially the philosophy of media), contemporary critical theory (phenomenology, new materialism), contemporary feminist thought, queer theory, and black studies in order to question underlying assumptions about the body and embodied spaces in contemporary art and culture. Drawing from film, literature, performance, and contemporary art, students think about a range of philosophical and critical themes, including the role of the body, the virtual construction of time and space, questions of affect, and sensation, all of which inform concerns over representation, embodiment, and materiality.

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 588b / AMST 710b / ENGL 948b, Autobiography in America Robert Stepto

A study of autobiographical writings from Mary Rowlandson's Indian captivity narrative (1682) to the present. Classic forms such as immigrant, education, and cause narratives; prevailing autobiographical strategies involving place, work, and

photographs. Authors include Franklin, Douglass, Jacobs, Antin, Kingston, Uchida, Balakian, Als, and Karr.

AFAM 624a / FREN 624a, Slavery and Its Aftermath in French and Francophone

Literature Christopher Miller

The practices, effects, and culture of both slavery and emancipation in the French empire and the postcolonial francophone world, as seen through literary writings. Readings on New France, the Code Noir, the *Encyclopédie*, the Haitian Revolution. Literary authors include Olympe de Gouges, Claire de Duras, Victor Séjour, Alfred Mercier, Aimé and Suzanne Césaire, Edouard Glissant, Maryse Condé, Ousmane Sembène, Gisèle Pineau.

AFAM 723b / AMST 645b / CPLT 949b / WGSS 645b, Caribbean Diasporic

Intellectuals Hazel Carby

This course examines work by artists and writers of Caribbean descent from different regions of the transatlantic world. In response to contemporary interest in issues of globalization, the premise of the course is that in the world maps of these black intellectuals we can see the intertwined and interdependent histories and relations of the Americas, Europe, and Africa. Thinking globally is not a new experience for black peoples, and we need to understand that what is represented as “Caribbeanness” is a condition of movement. Literature and art are most frequently taught within the boundaries of a particular nation, but this course focuses on the work of writers and artists who shape the Caribbean identities of their characters as traveling black subjects and refuse to restrain their work within the limits of any one national identity. We practice a new and global type of cognitive mapping as we read and explore the meanings of terms like black transnationalism, migrancy, globalization, and empire. Diasporic practice embraces and represents the geopolitical realities of the modern, modernizing, and postmodern worlds in which multiple racialized histories are inscribed on modern bodies.

AFAM 738a / AMST 706a / HIST 711a / WGSS 716a, Readings in African American

Women's History Crystal Feimster

The diversity of African American women's lives from the colonial era through the late twentieth century. Using primary and secondary sources we explore the social, political, cultural, and economic factors that produced change and transformation in the lives of African American women. Through history, fiction, autobiography, art, religion, film, music, and cultural criticism we discuss and explore the construction of African American women's activism and feminism; the racial politics of the body, beauty, and complexion; hetero- and same-sex sexualities; intraracial class relations; and the politics of identity, family, and work.

AFAM 745a / HSAR 786a, Black Atlantic Visual Arts since 1980 Kobena Mercer

This seminar surveys black diaspora practices in late-twentieth- and early twenty-first-century art while questioning the survey genre as such. Examining contributions of black artists to paradigm shifts that have interrogated the identity of art over the past thirty years, we review the demands that issues of race and ethnicity place on interpretive models in the historiography of art. Considering thematic categories in which to understand what is distinctive to the diasporic conditions of Black Atlantic practitioners, while consistently relating their concerns to broad patterns in art practice as a whole in an era of globalization, the aim is to identify critical terms that best narrate

the transformations black diaspora artists have introduced to a period characterized by the shift from modern to postmodern to contemporary.

AFAM 763a / AMST 731a / HIST 747a, Methods and Practices in U.S. Cultural

History Matthew Jacobson

This sampling of U.S. cultural history from the early national period to the present is designed to unfold on two distinct planes. The first is a rendering of U.S. culture itself—a survey, however imperfect, of the major currents, themes, and textures of U.S. culture over time, including its contested ideologies of race and gender, its organization of productivity and pleasure, its media and culture industries, its modes of creating and disseminating “information” and “knowledge,” its resilient subcultures, and its reigning nationalist iconographies and narratives. The second is a sampling of scholarly methods and approaches, a meta-history of “the culture concept” as it has informed historical scholarship in the past few decades. The cultural turn in historiography since the 1980s has resulted in a dramatic reordering of “legitimate” scholarly topics, and hence a markedly different scholarly landscape, including some works that seek to narrate the history of the culture in its own right (Kasson’s history of the amusement park, for instance), and others that resort to cultural forms and artifacts to answer questions regarding politics, nationalism, and power relations (Melani McAlister’s *Epic Encounters*). In addition to providing a background in U.S. culture, then, this seminar seeks to trace these developments within the discipline, to understand their basis, to sample the means and methods of “the cultural turn,” and to assess the strengths and shortcomings of culture-based historiography as it is now constituted.

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

David Blight

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

AFAM 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 805b / FREN 949b, Novel, Film, and History in French Africa Christopher Miller

African history as represented in historiography, novels, and films. Limited to French and Francophone Africa. Themes include empire and epic; orality and literacy; the slave trade; contact, conquest, and resistance; the Congo Free State; the role of colonial intermediaries; the two world wars; decolonization and neocolonialism; and the 1994 genocide in Rwanda.

AFAM 825a / SOCY 660a, Black Urban America As Sociological Memoir Gerald Jaynes

This interdisciplinary course traces formation of contemporary African American class and family structures through investigation of how evolving racialized class-gender relations shaped twenty-first-century populations of poor and affluent blacks. Sources drawn from social sciences, history, literature to explore relationships between social behavior (agency) and blocked opportunity (structure).

AFAM 880a or b, Directed Reading Staff

By arrangement with faculty.

AFAM 895a and AFAM 896b, Dissertation Prospectus Workshop Gerald Jaynes

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
136 Rosenkranz Hall, 203.432.1425
<http://african.macmillan.yale.edu>
M.A.

Chair

Michael Cappello (*Pediatrics; Microbial Pathogenesis; Public Health*)

Director of Graduate Studies

David Simon (203.432.5243, david.simon@yale.edu)

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*), John Darnell (*Near Eastern Languages & Civilizations*), Owen Fiss (*Law*), Gerald Friedland (*Internal Medicine; Epidemiology*), Robert Harms (*History*), Ann Kurth (*Nursing*), Daniel Magaziner (*History*), Roderick McIntosh (*Anthropology*), Christopher Miller (*French; African American Studies*), Stephanie Newell (*English*), Catherine Panter-Brick (*Anthropology*), Curtis Patton (*Emeritus, Epidemiology*), David Post (*Ecology & Evolutionary Biology*), Asghar Rastegar (*Internal Medicine*), Lamin Sanneh (*Divinity; History*), Ian Shapiro (*Political Science*), Robert Thompson (*Emeritus, History of Art*), Michael Veal (*Music*), Sten Vermund (*Epidemiology; Pediatrics*), Immanuel Wallerstein (*Emeritus, Sociology*), David Watts (*Anthropology*), Elisabeth Wood (*Political Science*)

Associate Professors Theodore Cohen (*Epidemiology*), Kaveh Khoshnood (*Epidemiology*), Urania Magriples (*Obstetrics, Gynecology & Reproductive Sciences*), Elijah Paintsil (*Pediatrics; Epidemiology; Pharmacology*), Sunil Parikh (*Public Health; Internal Medicine*), Jonathan Wyrzten (*Sociology*)

Assistant Professors Katharine Baldwin (*Political Science*), Jill Jarvis (*French*), Louisa Lombard (*Anthropology*), Frank Minja (*Radiology & Biomedical Imaging*), Hani Mowafi (*Emergency Medicine*), Christine Ngaruiya (*Emergency Medicine*), Oluwatosin Onibokun (*Obstetrics, Gynecology, & Reproductive Sciences*), Doruk Ozgediz (*Surgery; Pediatrics*), Tracy Rabin (*Internal Medicine*), Jeremy Schwartz (*Internal Medicine*), Sheela Shenoit (*Internal Medicine*), Carla Staver (*Ecology & Evolutionary Biology*)

Lecturers Adalgisa Caccone (*Ecology & Evolutionary Biology*), Anne-Marie Foltz (*Epidemiology & Public Health*), W. Casey King (*Public Health*), Sarah Ryan (*Law*), David Simon (*Political Science*), Veronica Waweru (*African Languages*)

Senior Lectors II Oluseye Adesola (*African Languages*), Sandra Sanneh (*African Languages*), Kiarie Wa'Njogu (*African Languages*)

Senior Lector Matuku Ngame (*French*)

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 Forestry & Environmental Studies, 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 catalogues, photographs, manuscripts, correspondence, and theses, many published in Africa.

SPECIAL ADMISSIONS REQUIREMENT

The GRE General Test is required.

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: two compulsory introductory interdisciplinary seminars, Research Methods in African Studies (AFST 501) and Topics in African Studies (AFST 764) or an alternate course, as specifically designated 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. 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 four major languages from sub-Saharan Africa: Kiswahili (eastern and central Africa), Wolof (west Africa), 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 567a / PLSC 798a, Bureaucracy in Africa: Revolution, Genocide, and Apartheid Staff

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

AFST 639a / ANTH 639a, 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 832a / HIST 832a, Methods and Practices in African History Daniel Magaziner

This course provides a survey of African historical methods, considering topics from the use of historical linguistics and oral tradition to creative archival and narrative methodologies. We read monographs and other scholarly works, including classics in the discipline and new methodologically innovative studies. Students produce a substantive historiographical essay as well as a detailed analysis of a primary source of their choosing.

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 951a or b, Directed Reading and Research David Simon

By arrangement with faculty.

AFST 969a / CPLT 985a / FREN 969a, Islands, Oceans, Deserts Jill Jarvis

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

American Studies

Arnold Hall, 304 Elm Street, 203.432.1186

<http://americanstudies.yale.edu>

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

Chair

Matthew Jacobson (A25 Arnold Hall, 203.432.1186)

Director of Graduate Studies

Tavia Nyong'o (A25 Arnold Hall, 203.432.1186)

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

Associate Professors Rene Almeling, Laura Barraclough, Crystal Feimster, Zareena Grewal, Daniel HoSang, Elihu Rubin, Tisa Wenger

Assistant Professors Greta LaFleur, Albert Laguna

Lecturer James Berger

FIELDS OF STUDY

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

SPECIAL ADMISSIONS REQUIREMENT

A twenty-page writing sample is required with the application.

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.

American Studies and Film and Media Studies

The American Studies Program also offers, in conjunction with the Film and Media Studies Program, a combined Ph.D. in American Studies 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 American Studies and to Film and Media Studies. 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.) 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.

Public Humanities Concentration The M.A. with a concentration in Public Humanities is granted upon the completion of all requirements for the en route M.A. Of the seven term courses required, students must take four Public Humanities courses, including AMST 903, AMST 904, AMST 905.

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 600a, American Scholars Tavia Nyong'o

"What would we really know the meaning of? The meal in the firkin; the milk in the pan; the ballad in the street; the news of the boat; the glance of the eye; the form and the gait of the body. The literature of the poor, the feelings of the child, the philosophy of the street, the meaning of household life, are the topics of the time." —Ralph Waldo Emerson, *The American Scholar*, 1837. A half-century ago American studies was a movement; now it is an institution. But it remains an anomaly in the academy, with neither method nor discipline: a modest program, not a department, that immodestly claims the space between disciplines, beyond disciplines, and perhaps encompassing disciplines. In the early days, American studies was imagined as a home for Emerson's American scholar; these days Emerson's scholar is apt to be eyed more skeptically. Nevertheless the philosophy of the street and the meaning of household life continue to be the topics of the time, and American studies remains an oddly Emersonian place for nurturing intellectuals. To explore the various kinds of American scholars and American studies, the American Scholars colloquium meets weekly. Each week, we ask a member of the American Studies faculty: What are the key works that shape your intellectual project? What works pose the crucial issues? What works engage what you would really know the meaning of? Each speaks briefly and leads a discussion of the works chosen. There is no writing assignment, and students receive a credit for participating. This course is mandatory for first-year American Studies graduate students.

AMST 622a / 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. There are a small number of openings for second-year graduate students. Students interested in participating should contact michael.denning@yale.edu.

AMST 623b / CPLT 822b, 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.

AMST 643b / AFAM 505b, Theorizing Racial Formations Kobena Mercer

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.

AMST 645b / AFAM 723b / CPLT 949b / WGSS 645b, Caribbean Diasporic Intellectuals Hazel Carby

This course examines work by artists and writers of Caribbean descent from different regions of the transatlantic world. In response to contemporary interest in issues of globalization, the premise of the course is that in the world maps of these black intellectuals we can see the intertwined and interdependent histories and relations of the Americas, Europe, and Africa. Thinking globally is not a new experience for black peoples, and we need to understand that what is represented as “Caribbeanness” is a condition of movement. Literature and art are most frequently taught within the boundaries of a particular nation, but this course focuses on the work of writers and artists who shape the Caribbean identities of their characters as traveling black subjects and refuse to restrain their work within the limits of any one national identity. We practice a new and global type of cognitive mapping as we read and explore the meanings of terms like black transnationalism, migrancy, globalization, and empire. Diasporic practice embraces and represents the geopolitical realities of the modern, modernizing, and postmodern worlds in which multiple racialized histories are inscribed on modern bodies.

AMST 650a / HIST 807a, Resistance, Rebellion, and Survival Strategies in Modern Latin America Gilbert Joseph

An interdisciplinary examination of new conceptual and methodological approaches to such phenomena as peasants in revolution, millenarianism, “banditry,” refugee movements, and transnational migration.

AMST 705b / HIST 582b / RLST 705b, Readings in Religion in American Society, 1600–2018 Tisa Wenger

This seminar explores intersections of religion and society in American history from the colonial period to the present as well as methodological problems important to

their study. It is designed to give graduate students a working knowledge of the field, ranging from major recent studies to bibliographical tools. In short, the seminar is a broad readings course surveying religion in American history from colonization to the present. It is not a specialized research seminar, but it does require a basic understanding of historiography.

AMST 706a / AFAM 738a / HIST 711a / WGSS 716a, Readings in African American Women's History Crystal Feimster

The diversity of African American women's lives from the colonial era through the late twentieth century. Using primary and secondary sources we explore the social, political, cultural, and economic factors that produced change and transformation in the lives of African American women. Through history, fiction, autobiography, art, religion, film, music, and cultural criticism we discuss and explore the construction of African American women's activism and feminism; the racial politics of the body, beauty, and complexion; hetero- and same-sex sexualities; intraracial class relations; and the politics of identity, family, and work.

AMST 710b / AFAM 588b / ENGL 948b, Autobiography in America Robert Stepto

A study of autobiographical writings from Mary Rowlandson's Indian captivity narrative (1682) to the present. Classic forms such as immigrant, education, and cause narratives; prevailing autobiographical strategies involving place, work, and photographs. Authors include Franklin, Douglass, Jacobs, Antin, Kingston, Uchida, Balakian, Als, and Karr.

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

David Blight

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

AMST 719a / RLST 703a, Interrogating the Crisis of Islam Zareena Grewal

In official and unofficial discourses in the United States, diagnoses of Islam's various "crises" are ubiquitous, and Muslim "hearts and minds" are viewed as the "other" front in the War on Terror. Since 9/11, the U.S. State Department has made the reform of Islam an explicit national interest, pouring billions of dollars into USAID projects in Muslim-majority countries, initiating curriculum development programs for madrasas in South Asia, and establishing the Arabic Radio Sawa and the satellite TV station Al-Hurra to propagate the U.S. administration's political views as well as what it terms a "liberal" strain of Islam. Muslim Americans are also consumed by debates about the "crisis" of Islam, a crisis of religious authority in which the nature and rapidity of change in the measures of authority are felt to be too difficult to assimilate. This course maps out the various and deeply politically charged contemporary debates about the "crisis of Islam" and the question of Islamic reform through an examination of official U.S. policy, transnational pulp Islamic literature, fatwas and essays authored by

internationally renowned Muslim jurists and scholars, and historical and ethnographic works that take up the category of crisis as an interpretive device.

AMST 729b / FILM 810b / WGSS 746b, Visual Kinship, Families, and Photography

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 731a / AFAM 763a / HIST 747a, Methods and Practices in U.S. Cultural

History Matthew Jacobson

This sampling of U.S. cultural history from the early national period to the present is designed to unfold on two distinct planes. The first is a rendering of U.S. culture itself—a survey, however imperfect, of the major currents, themes, and textures of U.S. culture over time, including its contested ideologies of race and gender, its organization of productivity and pleasure, its media and culture industries, its modes of creating and disseminating “information” and “knowledge,” its resilient subcultures, and its reigning nationalist iconographies and narratives. The second is a sampling of scholarly methods and approaches, a meta-history of “the culture concept” as it has informed historical scholarship in the past few decades. The cultural turn in historiography since the 1980s has resulted in a dramatic reordering of “legitimate” scholarly topics, and hence a markedly different scholarly landscape, including some works that seek to narrate the history of the culture in its own right (Kasson’s history of the amusement park, for instance), and others that resort to cultural forms and artifacts to answer questions regarding politics, nationalism, and power relations (Melani McAlister’s *Epic Encounters*). In addition to providing a background in U.S. culture, then, this seminar seeks to trace these developments within the discipline, to understand their basis, to sample the means and methods of “the cultural turn,” and to assess the strengths and shortcomings of culture-based historiography as it is now constituted.

AMST 741b / HIST 752b, Indians and Empires Ned Blackhawk

This course explores recent scholarship on Indian-imperial relations throughout North American colonial spheres from roughly 1500 to 1900. It examines indigenous responses to Spanish, Dutch, French, English, and lastly American and Canadian colonialism and interrogates commonplace periodization and geographic and conceptual approaches to American historiography. It concludes with an examination of American Indian political history, contextualizing it within larger assessments of Indian-imperial and Indian-state relations.

AMST 752a / PLSC 812a, Progressivism: Theory and Practice Stephen Skowronek

The progressive reform tradition in American politics. The tradition’s conceptual underpinnings, social supports, practical manifestations in policy and in new governmental arrangements, and conservative critics. Emphasis on the origins of progressivism in the early decades of the twentieth century, with attention to latter-day manifestations and to changes in the progressive impulse over time.

AMST 768b / HIST 768b, Asian American History and Historiography Mary Lui

This reading and discussion seminar examines Asian American history through a selection of recently published texts and established works that have significantly

shaped the field. Major topics include the racial formation of Asian Americans in U.S. culture, politics, and law; U.S. imperialism; U.S. capitalist development and Asian labor migration; and transnational and local ethnic community formations. The class considers both the political and academic roots of the field as well as its evolving relationship to “mainstream” American history.

AMST 775b / ENGL 838b, Performing American Literature Wai Chee Dimock

A broad selection of short stories, poems, and novels, accompanied by class performances, culminating in a term project with a significant writing component. “Performance” includes a wide range of activities including: staging; making digital films and videos; building websites; game design; and creative use of social media. Readings include poetry by Walt Whitman, Emily Dickinson, Yusef Komunyakaa, and Claudia Rankine; fiction by Herman Melville, F. Scott Fitzgerald, Jhumpa Lahiri, and Junot Díaz.

AMST 803a / HIST 703a, Research in Early National America Joanne Freeman

A research seminar focused on the early national period of American history, broadly defined. Early weeks familiarize students with sources from the period and discuss research and writing strategies. Students produce a publishable article grounded in primary materials.

AMST 814a / FILM 603a, Historical Methods in Film Study Charles Musser

A range of historiographic issues in film studies, including the roles of technology, exhibition, and spectatorship. Topics include intermediality and intertextuality. Consideration of a range of methodological approaches through a focus on international early cinema and American race cinema of the silent period. Particular attention to the interaction between scholars and archives.

AMST 832a and AMST 833b / FILM 735a and FILM 736b, Documentary Film

Workshop Charles Musser

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

AMST 838a / HIST 749a / HSHM 753a, Research in Twentieth-Century United States

Environmental History Paul Sabin

Students conduct advanced research in primary sources and write original essays over the course of the term. Topics are particularly encouraged in twentieth-century environmental history (broadly defined, no specified geography) as well as in U.S. history, with a focus on politics, law, and economic development. Readings and library activities inform students’ research projects. Interested graduate students should contact the instructor with proposed research topics.

AMST 840a / ENGL 976a, Asian Inhumanities Sunny Xiang

What might it mean to think from a position other to the “Western humanities”? This course takes the “Asian inhumanities” as neither a direct opposite nor even a direct challenge to the “Western humanities,” but as a heuristic device for self-conscious reflection about critical method, racial formation, knowledge production, and political action. The aim is not necessarily to decenter the human or the humanities—I suspect that we will talk a good deal about both. Rather, we juxtapose “Asia” to “human” with an openness to contemplating the idiosyncrasies that each reveals about the other.

We start by surveying how scholars have posited “Asia as method” (to borrow Kuan-Hsing Chen’s formulation). From there, we pursue the “Asian inhumanities” in two movements. The first examines historically specific “inhuman” typologies (that is, stereotypes) arising from U.S.-Asian encounters: the yellow peril during the era of Asian exclusion, the model minority during the era of Asian inclusion, and the flexible citizen during the era of Asian globalization. The second tracks the relation between “Asian” and “human” at especially fraught scenes of contact: law, war, gender, biology, and technology. Finally, we approach the “Asian inhumanities” as a question of race-based politics, both within and beyond the university. What is at stake in taking the human as a political, ethical, and literary reference point—for example, in desiring well developed and emotionally nuanced characters or even in reading for character at all? How does race figure into alternative critical approaches circulating within the humanities—for example, surface reading, distant reading, new formalism, and weak theory? How does an attention to what is “Asian” impact our received critical frameworks for analyzing race?

AMST 848b / ENGL 853b, *Inventing the Environment in the Anthropocene* Michael Warner

Although the concept of the Anthropocene can be dated in various ways, two of the most important benchmarks seem to be the beginning of industrial production in the late eighteenth century and the uptick in carbon dioxide emissions from the mid-nineteenth century (petroleum came into use during the Civil War). The period between these two moments is also that in which the modern language of the environment took shape, from Cuvier’s discovery of extinction and Humboldt’s holistic earth science to the transformative work of Thoreau and George P. Marsh. This course shuttles between the contemporary debate about the significance and consequences of the Anthropocene and a reexamination of that environmental legacy. We look at the complexity of “nature,” beginning with the Bartrams, Jefferson, Cuvier, and the transatlantic literatures of natural history; georgics and other genres of nature writing; natural theology; ambiguities of pastoral in American romantic writing (Bryant, mainly); the impact of Humboldt (Emerson, Thoreau, Whitman); westward expansion and Native American writing about land; Hudson School painting and landscape architecture. We also think about the country/city polarity and the development of “grid” consciousness in places like New York City. One aim is to assess the formation and legacy of key ideas in environmentalism, some of which may now be a hindrance as much as a foundation. Secondary readings from Leo Marx, Henry Nash Smith, and William Cronon, as well as more recent attempts to reconceive environmental history (Joachim Radkau), ecocriticism (Lawrence Buell), and related fields, as well as science journalism (Elizabeth Kolbert). Students are invited to explore a wide range of research projects; and one assignment is to devise a teaching unit for an undergraduate class on the same topic.

AMST 852b / ANTH 852b / WGSS 852b, *Reading the Americas, Reading Ethnography* Ana Ramos-Zayas

The course uses ethnographic approaches to understand “America” as a hemispheric formation, while simultaneously examining “ethnography” as methodological, epistemological, and representational craft. Complemented by critical readings and seminar discussions about some of the trademarks of ethnographic research—e.g., participant observation, life history, field notes, and field sites—the course is designed

to encourage students to interrogate the theoretical and methodological models that have been used in the production of knowledge about the Americas. Emphasizing ethnography's concern with everyday life, practices, routines, and relationships, it analyzes how micro-processes and manifestations of race, sexuality, class, and gender entwine with macro-processes of empire and nation-state building, globalization, neoliberalism, transnationalism, urbanism, and social inequality in the United States, Latin America, and parts of the Caribbean. While this is not a "how to" course on ethnographic research, we use classic and contemporary ethnography to understand the region and gain greater knowledge about the process, epistemology, and politics of fieldwork. We analyze a number of aspects and approaches to doing and writing ethnography, including the challenges of entering, being in, and leaving the field; and as we build familiarity with the components of ethnography, we consider its applicability to an array of topics, settings, objects, cultural dynamics, and relationships.

AMST 853a, Archives: Imperial and Non-Imperial Histories, Practices, and Theories

Laura Wexler

In this seminar we explore theoretical, historical, material, practical, methodological, and curatorial questions related to archives. Students work in archives and experiment with creating archives. We read texts by Achille Mbembe, Okwui Enwezor, Ann L. Stoler, Saidiya Hartman, Avery Gordon, Tina Campt, Michel-Rolph Trouillot, Jacques Derrida, Carolyn Kay Steedman, and others. Several Brown/Yale faculty present their engagement with archives. The seminar takes place in the Beinecke Library, with field trips to other archives and to Brown University.

AMST 878a / 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, cultural, and intellectual history of medicine, focusing on the United States. Reading and discussion of the recent scholarly literature on medical cultures, public health, and illness experiences from the early national period through the present. Topics include the role of gender, class, ethnicity, race, religion, and region in the experience of health care and sickness and in the construction of medical knowledge; the interplay between vernacular and professional understandings of the body; the role of the marketplace in shaping professional identities and patient expectations; health activism and social justice; citizenship, nationalism, and imperialism; and the visual cultures of medicine.

AMST 900a, Independent Research Staff

AMST 901a, Directed Reading Staff

AMST 902a, Prospectus Workshop Tavia Nyong'o

Upon completion of course work, students are required to participate in at least one term of the prospectus workshop, ideally the term before the prospectus colloquium is held. Open to all students in the program and joint departments, the workshop serves as a forum for discussing the selection of a dissertation topic, refining a project's scope, organizing research materials, and evaluating work in progress. The workshop meets once a month.

AMST 903a / HIST 746a, Introduction to Public Humanities Staff

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. Required for the M.A. with a concentration in Public Humanities.

AMST 904a, Practicum in Public Humanities Staff

AMST 905a, Master's Project in Public Humanities Staff

Required for the M.A. with a concentration in Public Humanities.

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 920a / HIST 701a, Writing Workshop in U.S. History Joanne Meyerowitz

For advanced graduate students in History, American Studies, and related fields. Students share and comment on draft dissertation chapters, article manuscripts, and conference papers.

Anthropology

10 Sachem Street, 203.432.3670

<http://anthropology.yale.edu>

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

Chair

Anne Underhill

Director of Graduate Studies

David Watts

Professors Richard Bribiescas, Richard Burger, Michael Dove (*Forestry & Environmental Studies*), Kathryn Dudley (*American Studies*), J. Joseph Errington, Eduardo Fernandez-Duque, Inderpal Grewal (*Women's, Gender & Sexuality Studies*), Marcia Inhorn (*Middle East Studies*), William Kelly (*Emeritus*), Paul Kockelman, Roderick McIntosh, Catherine Panter-Brick, Douglas Rogers, Eric Sargis, James Scott (*Political Science*), Helen Siu, Kalyanakrishnan Sivaramakrishnan, Anne Underhill, Claudia Vaggia, David Watts

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

Assistant Professors Louisa Lombard, Lisa Messeri

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.

COMBINED PH.D. PROGRAMS

The Anthropology department also offers a combined Ph.D. in Anthropology and Forestry & Environmental Studies in conjunction with the School of Forestry & Environmental Studies, and a combined Ph.D. in Anthropology and African American Studies in conjunction with the Department of African American 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.

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.

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; e-mail, anthropology@yale.edu; website, <http://anthropology.yale.edu>.

COURSES

ANTH 500a, The Development of the Discipline: Contemporary Themes Douglas Rogers

The major theoretical orientations in social and cultural anthropology (especially in the United States and Europe), their historical development and importance, their relation to one another and to other disciplines. The seminar is reserved for first-year doctoral students in Anthropology.

ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HIST 502b / HSAR 564b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual
Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

ANTH 559b / ARCG 559b, Introduction to Experimental Archaeology Roderick McIntosh and Ellery Frahm

Experimental archaeology is one of the most important tools to develop and test models that link human behaviors and natural forces to the archaeological record. This class explores the elements of good experimental design and procedures.

ANTH 575b / EAST 575b, Hubs, Mobilities, and Global Cities Helen Siu
Analysis of urban life in historical and contemporary societies. Topics include capitalist and postmodern transformations, class, gender, ethnicity, migration, and global landscapes of power and citizenship.

ANTH 600b, Contemporary Social Theory Staff

An overview of central themes and debates in contemporary social theory, with a focus on the integration of theory and research, rather than a hermeneutical analysis of particular theoretical texts. Concentrating on questions of power, inequality, the self, and community, assessment of the relevance of sociological theory to advancing an understanding of the complexities of late-twentieth-century Western society. Critical

theory, feminist theories, postmodernism, and the contributions of individual theorists are reviewed and critiqued.

ANTH 639a / AFST 639a, 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 684b / WGSS 660b, Men, Manhood, and Masculinity Andrew Dowe

Cultural and historic constructions of masculinity through an investigation of male bodies, sexualities, and social interactions. Examination of multiple masculinities and exploration of the relationships among hegemonic, non-hegemonic, and subordinate masculinities.

ANTH 692b / ARCG 692b / NELC 537b, Imaging Ancient Worlds Roderick

McIntosh, John Darnell, and Agnete Lassen

The interpretation of epigraphic and archaeological material within the broader context of landscape, by means of creating a virtual model to reconstruct the sensory experiences of the ancient peoples who created the sites. Use of new technologies in computer graphics, including 3-D imaging, to support current research in archaeology and anthropology.

ANTH 700b, The Development of the Discipline: Contemporary Themes Staff

Second term of yearlong core course on the major theoretical orientations in social and cultural anthropology (especially in the United States and Europe, their historical development and importance, their relation to one another and to other disciplines. Reserved for first-year doctoral students in Anthropology. Prerequisite: ANTH 500.

ANTH 701b, Foundations of Modern Archaeology Richard Burger

How method, theory, and social policy have influenced the development of archaeology as a set of methods, an academic discipline, and a political tool. Prerequisite: a background in the basics of archaeology equivalent to one of the introductory courses.

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

Staff

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 718b / ARCG 718b, Archaeological Study of Craft Specialization Anne

Underhill

In this seminar we evaluate methods for investigating the nature of craft specialization in antiquity. We consider methods to identify material traces of production activities and insights gained from ethnoarchaeological and ethnohistoric data. Several types of craft production are included. Another component of the course is discussion of the theoretical significance of the nature of craft specialization.

ANTH 735b / WGSS 737b, Gendering the Modern Subject Eda Pepi

This seminar familiarizes students with how the analytical categories of sex and gender interrogate "classic" philosophical texts and restructure key debates on the nature of the human subject as a locus of unmarked, universal reason and purposeful action as well as embodied perception and passion. From Spinoza and Descartes to Hegel and

Merleau-Ponty, we engage an overview of the conceptual and historical development of modern, Western ideas of personhood and the emergence of liberalism as the basis of new technologies of the self. We read these texts alongside feminist, critical race, and postcolonial commentaries that highlight the sexual and racial constitution of a seemingly universal subject of modernity. These commentaries trace how practical theories of “lower” or minor selves—the subject people of the colonies, slaves, and others—were integral to the very development of ideas of the modern, autonomous, and acting self in the Western world.

ANTH 743a / ARCG 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 754a / ARCG 754a, 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 755b / ARCG 755b, Inca Culture and Society Richard Burger

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

ANTH 756a / ARCG 756a, The Archaeology of Trade and Exchange Richard Burger

This seminar focuses on archaeological approaches to exchange and trade. As background, we review some of the principal theories of exchange from anthropology and sociology, such as those of Mauss, Malinowski, and Polanyi. The role of trade and exchange in different kinds of societies is examined by contextualizing these transactions within specific cultural configurations and considering the nature of production and consumption as they relate to movement of goods. We consider methods and models that have been used to analyze regions of interaction at different spatial scales and the theoretical arguments about the social impact of inter-regional and intra-regional interactions involving the transfer of goods, including approaches such as world systems, unequal development, and globalization. In addition, we examine the ways that have been utilized in archaeology to identify different kinds of exchange systems, often through analogies to well-documented ethnographic and historic cases. Finally, we consider the range of techniques that have been employed

in order to track the movement of goods across space. These sourcing techniques are evaluated in terms of their advantages and disadvantages from an archaeological perspective, and in terms of how the best technical analyses may vary according to the nature of natural or cultural materials under consideration (ceramics, volcanic stone, metals, etc.). The theme for this year's seminar is obsidian; students select some aspect of obsidian research for their final paper and presentation.

ANTH 763b / ARCG 763b / NELC 589b, Archaeologies of Empire Harvey Weiss
Comparative study of origins, structures, efficiencies, and limitations of imperialism, ancient and modern, in the Old and New World, from Akkad to "Indochine," and from Wari to Aztec. The contrast between ancient and modern imperialisms examined from the perspectives of nineteenth- and twentieth-century archaeology and political economy.

ANTH 773b / ARCG 773b / NELC 588b, Abrupt Climate Change and Societal Collapse
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 776b / ARCG 776b, GIS and Spatial Analysis for Archaeology William Honeychurch

Introduction to the practice of Geographical Information Systems in anthropology with attention to archaeological applications. The growing use of GIS among anthropologists has transformed the way we carry out research and conceive of space. The course draws on research examples from a range of theoretical, analytical, and geographical contexts and introduces students to current software. Emphasis is placed on understanding how anthropological archaeologists have employed GIS as part of generating evidence to assess their hypotheses.

ANTH 779b / ARCG 779b, Anthropology of Mobile Societies William Honeychurch
The social and cultural significance of the ways that hunter-gatherers, pastoral nomads, maritime traders, and members of our own society traverse space. The impact of mobility and transport technologies on subsistence, trade, interaction, and warfare from the first horse riders of five thousand years ago to jet-propulsion tourists of today.

ANTH 785a / ARCG 785a, Archaeological Ceramics I Staff
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 797b / ARCG 797b, 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 835b / E&EB 842b, Primate Diversity and Evolution Eric Sargis

The diversity and evolutionary history of living and extinct primates. Focus on major controversies in primate systematics and evolution, including the origins and relationships of several groups. Consideration of both morphological and molecular studies. Morphological diversity and adaptations explored through museum specimens and fossil casts.

ANTH 848a, Hormones, Behavior, and Life History Claudia Valeggia and Eduardo Fernandez-Duque

This seminar focuses on the interaction between hormones and behavior from an evolutionary and developmental perspective. We begin with an overview of general principles of endocrine physiology. The course then focuses, from a life history perspective, on how hormones affect the brain and body throughout development. We explore human sexuality and reproduction, energy metabolism, parenting, stress, social interactions, and affective disorders. We also cover field and laboratory endocrinology methods.

ANTH 852b / AMST 852b / WGSS 852b, Reading the Americas, Reading Ethnography Ana Ramos-Zayas

The course uses ethnographic approaches to understand “America” as a hemispheric formation, while simultaneously examining “ethnography” as methodological, epistemological, and representational craft. Complemented by critical readings and seminar discussions about some of the trademarks of ethnographic research—e.g., participant observation, life history, field notes, and field sites—the course is designed to encourage students to interrogate the theoretical and methodological models that have been used in the production of knowledge about the Americas. Emphasizing ethnography’s concern with everyday life, practices, routines, and relationships, it analyzes how micro-processes and manifestations of race, sexuality, class, and gender entwine with macro-processes of empire and nation-state building, globalization, neoliberalism, transnationalism, urbanism, and social inequality in the United States, Latin America, and parts of the Caribbean. While this is not a “how to” course on ethnographic research, we use classic and contemporary ethnography to understand the region and gain greater knowledge about the process, epistemology, and politics of fieldwork. We analyze a number of aspects and approaches to doing and writing ethnography, including the challenges of entering, being in, and leaving the field; and as we build familiarity with the components of ethnography, we consider its applicability to an array of topics, settings, objects, cultural dynamics, and relationships.

ANTH 861b, Love and Relationships: An Evolutionary Perspective Eduardo Fernandez-Duque

Across the world, relationships between men and women shape the structure and functioning of human societies. Whether as friendship, love, or marriage, a man and a woman develop a relationship between them that is special, different from the relationship that they have with other adults in the community. Psychologists, historians, poets, anthropologists, artists, biologists, economists have all testified to this ubiquitous phenomenon. There is a bond, an attachment between them, and there is

some implicit or explicit commitment to share space, time, resources, offspring, and labor.

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

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

ANTH 950a, Directed Research: Preparation for Qualifying Exam David Watts

By arrangement with faculty.

ANTH 951a, Directed Research in Ethnology and Social Anthropology David Watts

By arrangement with faculty.

ANTH 953a, Directed Research in Archaeology and Prehistory David Watts

By arrangement with faculty.

ANTH 954a, Directed Research in Biological Anthropology David Watts

By arrangement with faculty.

ANTH 955a, Directed Research in Evolutionary Biology David Watts

By arrangement with faculty.

ANTH 965a, Directed Research in Physical Anthropology David Watts

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

Peter Jones

Professors Andrew Barron (*Statistics & Data Science*), Joseph Chang (*Statistics & Data Science*), Ronald Coifman (*Mathematics; Computer Science*), Stanley Eisenstat (*Computer Science*), John Emerson (*Adjunct; Statistics & Data Science*), Michael Fischer (*Computer Science*), Peter Jones (*Mathematics*), David Pollard (*Statistics & Data Science*), Nicholas Read (*Physics; Applied Physics; Mathematics*), Vladimir Rokhlin (*Computer Science; Mathematics*), Wilhelm Schlag (*Mathematics*), Martin Schultz (*Emeritus, Computer Science*), Mitchell Smooke (*Mechanical Engineering & Materials Science; Applied Physics*), Daniel Spielman (*Computer Science; Mathematics*), Van Vu (*Mathematics*), Günter Wagner (*Ecology & Evolutionary Biology*), John Wettlaufer (*Geology & Geophysics; Mathematics; Physics*), Huibin Zhou (*Statistics & Data Science*), Steven Zucker (*Computer Science; Biomedical Engineering*)

Associate Professors Thierry Emonet (*Molecular, Cellular, & Developmental Biology; Physics*), Josephine Hoh (*Public Health*), Yuval Kluger (*Pathology*), Michael Krauthammer (*Pathology*), Sekhar Tatikonda (*Statistics & Data Science*)

Assistant Professors Jeremy Hoskins, Ariel Jaffe, Gal Mishne, Krill Serkah, Gil Shabat

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.

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. The normal time for completion of the Ph.D. program is four years.

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. 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 the above, all first-year students (including terminal M.S. 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. See 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 Peter Jones

This course consists of weekly seminar talks given by a wide range of speakers. Required of all first-year students.

AMTH 663b / CPSC 663b, Deep Learning Theory and Applications Smita Krishnaswamy

Deep neural networks have gained immense popularity in the past decade due to their outstanding 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 and a final project—either group or individual, depending on the total number enrolled—with both a written and oral (i.e., presentation) component.

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

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

AMTH 745b / CB&B 745b / CPSC 745b, Advanced Topics in Machine Learning and Data Mining Smita Krishnaswamy and Guy Wolf

An overview of advances in the past decade in machine learning and automatic data-mining approaches for dealing with the broad scope of modern data-analysis challenges, including deep learning, kernel methods, dictionary learning, and bag of words/features. This year, the focus is on a broad scope of biomedical data-analysis tasks, such as single-cell RNA sequencing, single-cell signaling and proteomic analysis, health care assessment, and medical diagnosis and treatment recommendations. The seminar is based on student presentations and discussions of recent prominent publications from leading journals and conferences in the field. Prerequisite: basic concepts in data analysis (e.g., CPSC 545 or 563) or permission of the instructor.

AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b / PHYS 562b, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or a 200-level biology course, or permission of the instructor.

Applied Physics

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

Chair

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, Richard Chang (*Emeritus*), 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*), Tso-Ping Ma (*Electrical Engineering*), Simon Mochrie, Corey O'Hern (*Mechanical Engineering & Materials Science*), Vidvuds Ozolins, Daniel Prober, Nicholas Read, Mark Reed (*Electrical Engineering*), 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*), Liang Jiang, Peter Rakich

Assistant Professor Owen Miller

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.

SPECIAL ADMISSIONS REQUIREMENTS

The prerequisites for work toward a Ph.D. degree in Applied Physics include a sound undergraduate training in physics and a good mathematical background. The GRE General Test is required, and the Subject Test in Physics is strongly recommended.

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 608), 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 608)^{*}; 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 Measurements and FR 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 608, 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); Theory of Solids I, II (APHY 650, APHY 651); Statistical Physics II (APHY 628); Nonlinear Optics and Lasers (APHY 679); Materials Topics (course number TBD); Biological Physics (PHYS 523); Introduction to Dynamical Systems in Biology (PHYS 561). 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 director of graduate studies (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 a Teaching Fellow for one term, 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 the first year of study. Students whose advisers experience disruption in funding may require additional support from Yale. In these cases, students will be required to teach for up to an additional two terms, but would not be required to teach more than three terms over their first five years.

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 second term of full-time study. An extension of one term may be granted at the discretion of the DGS.

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; e-mail, applied.physics@yale.edu; website, <http://appliedphysics.yale.edu>.

COURSES

APHY 500a / ENAS 500a, Mathematical Methods I J. Rimas Vaišnys

A beginning, graduate-level introduction to ordinary and partial differential equations, vector analysis, linear algebra, and complex functions. Laplace transform, series expansion, Fourier transform, and matrix methods are given particular attention. Applications to problems frequently encountered in engineering practice are stressed throughout.

APHY 506a, Basic Quantum Mechanics Liang Jiang

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

APHY 548a / ENAS 850a / PHYS 548a, Solid State Physics I Sohrab Ismail-Beigi

A two-term sequence (with APHY 549) covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structures, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonance, phase transitions, and superconductivity.

APHY 549b / ENAS 851b / PHYS 549b, Solid State Physics II 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, Mathematical Methods in Nanophotonics Owen Miller

Linear algebra and eigensystems for Maxwell's equations; group theory; coupled-mode theory; causality, dispersion relations, and sum rules; equivalence and reciprocity principles; perturbation theory; quasi-static EM and plasmonics; metamaterials; computational photonics: spectral, finite-difference, finite-element, and boundary-element approaches; large-scale optimization and design.

APHY 633b / PHYS 633b, Introduction to Superconductivity Staff

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

APHY 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 677a / PHYS 677a, Noise, Dissipation, Amplification, and Information Michel Devoret

Graduate-level non-equilibrium statistical physics applied to noise phenomena, both classical and quantum. The aim of the course is to explain the fundamental link between the random fluctuations of a physical system in steady state and the response of the same system to an external perturbation. Several key examples in which noise appears as a resource rather than a limitation are treated: spin relaxation in nuclear magnetic resonance (motional narrowing), Johnson-Nyquist noise in solid state transport physics (noise thermometry), photon correlation measurements in quantum optics (Hanbury Brown-Twiss experiment), and so on. The course explores both passive and active systems. It discusses the ultimate limits of amplifier sensitivity and speed in physics measurements.

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

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

APHY 816b / PHYS 816b, Techniques Microwave Measurement Robert Schoelkopf

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

APHY 990a or b, Special Investigations 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.

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*), Diana Kleiner (*Classics; History of Art*), J.G. Manning (*Classics; History*), Roderick McIntosh (*Anthropology*), Mary Miller (*History of Art*), Eric Sargis (*Anthropology; Ecology & Evolutionary Biology*), Ronald Smith (*Geology & Geophysics; Forestry & Environmental Studies*), Anne Underhill (*Anthropology*), David Watts (*Anthropology*), Harvey Weiss (*Near Eastern Languages & Civilizations; Forestry & Environmental Studies*)

Associate Professors Oswaldo Chinchilla (*Anthropology*), Milette Gaifman (*History of Art; Classics*), William Honeychurch (*Anthropology*), Andrew Johnston (*Classics; History*)

Lecturers, Research Associates, and Research Scientists Karen Foster (*Near Eastern Languages & Civilizations; History of Art*), Ellery Frahm (*Anthropology*), Lucy Salazar (*Anthropology*), David Sensabaugh (*Yale University Art Gallery*), Catherine Skinner (*Geology & Geophysics*)

The aims of the program are 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 allows 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, Geology & Geophysics, History, History of Art, Near Eastern Languages & Civilizations, and Religious Studies.

SPECIAL ADMISSIONS REQUIREMENTS

The GRE General Test; an archaeology background is recommended but not required.

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) Ecology & Evolutionary Biology, Forestry & Environmental Studies, or Geology & Geophysics; 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 e-mail, cynthia.dreier@yale.edu.

COURSES

ARCG 531b / ANTH 531b / CLSS 815b / EALL 773b / HIST 502b / HSAR 564b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual
Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

ARCG 559b / ANTH 559b, Introduction to Experimental Archaeology Roderick McIntosh and Ellery Frahm

Experimental archaeology is one of the most important tools to develop and test models that link human behaviors and natural forces to the archaeological record. This class explores the elements of good experimental design and procedures.

ARCG 581a / CLSS 890a / HSAR 581a, Roman Painting: Achievement and Legacy
Diana Kleiner

Roman mural painting in all its aspects and innovations. Individual scenes and complete ensembles in palaces, villas, and houses in Rome and Pompeii are explored, as are their rediscovery and revival in the Renaissance and neoclassical period. Special attention is paid to the four architectural styles; history and mythological painting; the impact of the theater; the part played by landscape, genre, and still life; the accidental survival of painted portraiture; and the discovery and rejection of trompe l'oeil illusionism and linear perspective.

ARCG 611a / CLSS 811a / NELC 611a / RLST 833a, The Ancient Egyptian Temple as Cosmos: Correlation of Architecture and Decoration Program Christina Geisen

The course focuses on the correlation of archaeology, iconography, and philology by analyzing ancient Egyptian temples under the specific consideration of the interplay of architecture and decoration program. The different types of temples and their developments over time are discussed. The main focus is the function of each temple type, which can only be understood by analyzing the architecture of the monument, its decoration program, related texts (such as rituals, myths, and festival description, but also historical texts), and its place in the cultic landscape of the specific location. The class also provides an overview of rituals performed and festivals celebrated in the temples, as well as of the administrative sphere of the temple. Optional field trip to the Metropolitan Museum of Art in New York to see the Temple of Dendur. No previous

knowledge of ancient Egyptian culture or languages is necessary; all texts are read in translation.

ARCG 692b / ANTH 692b / NELC 537b, Imaging Ancient Worlds Roderick

McIntosh, John Darnell, and Agnete Lassen

The interpretation of epigraphic and archaeological material within the broader context of landscape, by means of creating a virtual model to reconstruct the sensory experiences of the ancient peoples who created the sites. Use of new technologies in computer graphics, including 3-D imaging, to support current research in archaeology and anthropology.

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

Staff

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 718b / ANTH 718b, Archaeological Study of Craft Specialization Anne

Underhill

In this seminar we evaluate methods for investigating the nature of craft specialization in antiquity. We consider methods to identify material traces of production activities and insights gained from ethnoarchaeological and ethnohistoric data. Several types of craft production are included. Another component of the course is discussion of the theoretical significance of the nature of craft specialization.

ARCG 743a / 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.

ARCG 744a / NELC 509a, The Age of Akhenaton John Darnell

Study of the period of the Egyptian pharaoh Akhenaton (reigned 1353–1336 B.C.E.), often termed the Amarna Revolution, from historical, literary, religious, artistic, and archaeological perspectives. Consideration of the wider Egyptian, ancient Near Eastern, African, and Mediterranean contexts. Examination of the international diplomacy, solar theology, and artistic developments of the period. Reading of primary source material in translation.

ARCG 754a / ANTH 754a, 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 755b / ANTH 755b, Inca Culture and Society Richard Burger

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

ARCG 756a / ANTH 756a, The Archaeology of Trade and Exchange Richard Burger

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

ARCG 762b / EMD 548b / F&ES 726 / G&G 562b, Observing Earth from Space

Ronald Smith

A practical introduction to satellite image analysis of Earth's surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management.

ARCG 763b / ANTH 763b / NELC 589b, Archaeologies of Empire Harvey Weiss

Comparative study of origins, structures, efficiencies, and limitations of imperialism, ancient and modern, in the Old and New World, from Akkad to "Indochine," and from Wari to Aztec. The contrast between ancient and modern imperialisms examined from the perspectives of nineteenth- and twentieth-century archaeology and political economy.

ARCG 773b / ANTH 773b / NELC 588b, Abrupt Climate Change and Societal Collapse

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 776b / ANTH 776b, GIS and Spatial Analysis for Archaeology William Honeychurch

Introduction to the practice of Geographical Information Systems in anthropology with attention to archaeological applications. The growing use of GIS among anthropologists has transformed the way we carry out research and conceive of space. The course draws on research examples from a range of theoretical, analytical, and geographical contexts and introduces students to current software. Emphasis is placed on understanding how anthropological archaeologists have employed GIS as part of generating evidence to assess their hypotheses.

ARCG 779b / ANTH 779b, Anthropology of Mobile Societies William Honeychurch
The social and cultural significance of the ways that hunter-gatherers, pastoral nomads, maritime traders, and members of our own society traverse space. The impact of mobility and transport technologies on subsistence, trade, interaction, and warfare from the first horse riders of five thousand years ago to jet-propulsion tourists of today.

ARCG 785a / ANTH 785a, Archaeological Ceramics I Staff

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 797b / ANTH 797b, 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 864b / ANTH 864b, Human Osteology Eric Sargis

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

Architecture

Rudolph Hall, 203.432.2288
<http://architecture.yale.edu/phd>
 M.Phil., Ph.D.

Dean

Deborah Berke

Director of Doctoral Studies

Alan Plattus (710 Rudolph, 203.432.2290, alan.plattus@yale.edu)

Professors Deborah Berke, Peggy Deamer, Anna Dyson, Keller Easterling, Peter Eisenman, Kurt Forster, Stanislaus von Moos, Alan Plattus, Robert A. M. Stern, Anthony Vidler

Associate Professors Alexander Felson, Mark Foster Gage, Kyoung Sun Moon, Eeva-Liisa Pelkonen, Elihu Rubin

Adjunct Faculty Sunil Bald, Kent Bloomer, Turner Brooks, Alexander Garvin, Steven Harris, John Jacobson, Bimal Mendis, Joel Sanders

FIELDS OF STUDY

The doctoral program prepares candidates for careers in university teaching, cultural advocacy and administration, museum curatorship, and publishing. It aims chiefly, however, to educate teachers capable of effectively instructing future architects in the history of their own field and its manifold connections with the culture at large. The program forges a unique combination of professional knowledge with a historical and analytical grasp of key phases in the history of architecture, especially those that have a demonstrable share in the field's current state and the critical issues it faces.

The program secures sound training in historical study and historiography, imparting technical knowledge and awareness of intellectual trends that inform the reception and role of architecture around the world. The history of science and technology (as well as its reception in popular culture and the arts), the history of media, and an understanding of architectural practice are as important as the fine arts and literature.

ADMISSION REQUIREMENTS

Applicants must have appropriate academic credentials (a master's degree or equivalent in Architecture, Engineering, Environmental Design, or, exceptionally, in a related field). Two years of professional work in an architecture office are recommended. The Graduate Record Examination (GRE) General Test taken no more than five years prior to application is required. All applicants whose native language is not English are required to take the Internet-based Test of English as a Foreign Language (TOEFL iBT), a test that 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 any 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 this 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; it will need to be uploaded to 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.

The Ph.D. program 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 take twelve graduate and Ph.D. seminars for credit, including 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 narrow topic or focus on producing a collective body of work. Others offer a broader survey of historiographies or focus on the close reading of a body of texts. These four required seminars form the methodological core of the program.

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 literature. 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 on 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 the literature in the chosen language. Competency may be determined by a grade of B or better in a yearlong intermediate-level language course, or through examination.

The student's field of interest is defined by the end of the second year, at which time the director of doctoral studies assigns the student an adviser, who may or may not be from the School of Architecture. At the end of the second year and after the student has taken the three oral examinations, the director of doctoral studies, 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 should be from outside the School of Architecture, with selection based on the student's area of interest. The dissertation committee guides and monitors the student's progress in writing the dissertation and evaluates the dissertation upon completion.

By the end of their second year, doctoral students normally complete all course and language requirements. Oral examinations are taken on topics relevant to the student's doctoral research. Examiners question the candidate in the presence of the director of doctoral studies and the thesis adviser.

During the third year, candidates present and defend a preliminary proposal for a dissertation topic, consisting of a topic statement, detailed program of research, and an annotated bibliography. By the end of the third year, students begin dissertation research and writing, submitting drafts of the dissertation chapters as they are completed.

While this is a five-year program, if the dissertation has not been completed by the end of year five and, 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 in year six for a teaching position and 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, therefore, are expected to teach for four terms, normally in their third and fourth years. During these four terms, it is anticipated that a Ph.D. student teach in two history and theory 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. Each teaching assignment shall be 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 requirements for this degree are that a student has completed

all requirements for the Ph.D., except the teaching fellow assignments and the dissertation.

REQUIRED COURSES

All Ph.D. students are required to take the following courses. For a complete list of Architecture courses, see the School of Architecture bulletin, available online at <http://bulletin.yale.edu>; and Yale Course Search at <https://courses.yale.edu>.

ARCH 551a, Ph.D. Seminar I Staff

1 credit. (Required in, and limited to, Ph.D. first year, fall term.) This seminar centers on a thorough examination of fundamental ideas of historiography, centering on Rome and exploring aspects of geology, culture, mapping, site development, the establishment of institutions, and the construction of buildings across several millennia, as well as a study of literature on the *urbs* and its worldwide impact.

ARCH 552b, Ph.D. Seminar II Staff

1 credit. (Required in, and limited to, Ph.D. first year, spring term.) This seminar centers on concepts of history and their application to architecture from Jacob Burckhardt to the present and a close reading of historiographic theories, including ethnography, modernity, and the emergence of the profession of architecture in the light of present-day critique.

ARCH 553a, Ph.D. Seminar III Staff

1 credit. (Required in, and limited to, Ph.D. second year, fall term.) Seminar content to be announced.

ARCH 554b, Ph.D. Dissertation Preparation Staff

1 credit. (Required in, and limited to, Ph.D. second year, spring term.) Ph.D. tutoring in preparation for oral examinations and formulation of a thesis topic.

Astronomy

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

Chair

Sarbani Basu

Director of Graduate Studies

Jeffrey Kenney (203.432.3013, jeff.kenney@yale.edu)

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

Associate Professors Héctor Arce, Reina Maruyama (*Physics*), Daisuke Nagai (*Physics*), Nikhil Padmanabhan (*Physics*), Frank van den Bosch

Assistant Professor Jessi Cisewski (*Statistics & Data Science*), Laura Newburgh (*Physics*)

FIELDS OF STUDY

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

SPECIAL ADMISSIONS REQUIREMENTS

Applicants are expected to have a strong undergraduate preparation in physics and mathematics. Although some formal training in astronomy is useful, it is by no means a prerequisite for admission. Applicants are required to take the General GRE as well as the subject test in Physics.

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. 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 largely 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.

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 Priyamvada Natarajan

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 520a / G&G 538a, Computational Methods in Astrophysics and Geophysics

Paolo Coppi

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

ASTR 550a, Stellar Astrophysics Sarbani Basu

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

ASTR 560b, Interstellar Matter and Star Formation Hector Arce

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

ASTR 565b, The Evolving Universe Pieter Van Dokkum

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

ASTR 580a or b, Research Jeffrey Kenney

By arrangement with faculty.

ASTR 595b, Astrophysical Flows Gregory Laughlin

Fluid dynamics and hydrodynamics from an astrophysical perspective. The course covers the development of the Navier-Stokes equations from first principles, and discusses flows in which viscosity, gravity, radiation, and magnetic fields play dynamical roles (both separately and together). Specific applications to be covered include spherical collapse; the hydrodynamics of disks; and fluid waves, shocks, and fronts in a variety of contexts. We also discuss (and use) a variety of numerical schemes for solving fluid dynamical problems.

ASTR 600b, Cosmology Priyamvada Natarajan

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

ASTR 610a, The Theory of Galaxy Formation Franciscus van den Bosch

The physical processes of galaxy formation and evolution. Topics include Newtonian perturbation theory, the spherical collapse model, formation and structure of dark matter haloes, cooling and feedback processes, star formation, stellar population synthesis, chemical enrichment, and the statistical treatment of the large-scale distribution of galaxies.

ASTR 710a and ASTR 711b, Professional Seminar Debra Fischer

A weekly seminar covering science and professional issues in astronomy.

Biomedical Engineering

Dunham Laboratory, 203.432.4252
M.S., M.Phil., Ph.D.

Chair

Jay Humphrey

Director of Graduate Studies

Richard Carson (richard.carson@yale.edu)

Professors Richard Carson, Nicholas Christakis, Robin de Graaf, James Duncan, Karen Hirschi, Jay Humphrey, Fahmeed Hyder, Andre Levchenko, Evan Morris, Laura Niklason, Xenophon Papademetris, Douglas Rothman, W. Mark Saltzman, Martin Schwartz, Fred Sigworth, Brian Smith, Lawrence Staib, Hemant Tagare, Paul Van Tassel, Steven Zucker (*Computer Science*)

Associate Professors Joerg Bewersdorf (*Cell Biology*), Stuart Campbell, Michael Choma, Tarek Fahmy, Rong Fan, Anjelica Gonzalez, Themis Kyriakides (*Pathology*), Chi Liu, Kathryn Miller-Jensen

Assistant Professors Michael Mak, Michael Murrell, Steven Tommasini, Jiangbing Zhou

FIELDS OF STUDY

Biological and medical devices, biological signals and sensors, biomaterials, biomechanics, biophotonics, computational medicine, computer vision, digital image analysis and processing, drug delivery, energy metabolism, gene therapy, modeling in mechanobiology, MRI, MRS, PET and tracer kinetic modeling, nanomedicine, network analysis, the physics of image formation (MRI, optics, ultrasound, nuclear medicine, and X-ray), physiology and human factors engineering, signaling pathways, systems biology, systems medicine, tissue engineering and regenerative medicine, and vascular biology.

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

For course listings, 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 Christopher Burd, Michael Caplan (*Cellular & Molecular Physiology*), Lynn Cooley (*Genetics*), Peter Cresswell (*Immunobiology*), Pietro De Camilli, Jorge Galán (*Microbial Pathogenesis*), Fred Gorelick, Carl Hashimoto (*Emeritus*), James Jamieson, 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*), Thomas Pollard (*Molecular, Cellular & Developmental Biology*), Karin Reinisch, James Rothman, Martin Schwartz (*Internal Medicine/Cardiology*), Felix Weiland (*Adjunct*), Sandra Wolin (*Emerita*)

Associate Professors Joerg Bewersdorf, Jonathan Bogan (*Internal Medicine/Endocrinology*), David Calderwood (*Pharmacology*), Daniel Colón-Ramos, Shawn Ferguson, Valentina Greco (*Genetics*), Megan King, Patrick Lusk, Thomas Melia, Christian Schlieker (*Molecular Biophysics & Biochemistry*), Derek Toomre, Yongli Zhang

Assistant Professors David Baddeley (*Adjunct*), Julien Berro, Shangqin Guo, Chenxiang Lin, Malaiyalam Mariappan, Xiaolei Su, Peter Takizawa, Siyuan Wang

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, and crystallography; bacterial, yeast, *Drosophila*, *C. elegans*, and mouse genetics; immunocytochemistry and electron microscopy; live cell and super-resolution imaging.

SPECIAL ADMISSIONS REQUIREMENTS

An undergraduate major in the biological sciences is recommended. GRE General Test is required; GRE Subject Test is recommended (in Biology or in Biochemistry, Cell and Molecular Biology).

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), <http://bbs.yale.edu>.

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 and 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. Laboratory rotations and thesis research may be conducted outside of 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 901 (First-Year Introduction to Research—Ethics: Scientific Integrity in Biomedical Research) 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 500/CBIO 501/CBIO 502 sequence (Molecules to Systems; three terms, counts as one course), 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 (First-Year Introduction to Research—Grant Writing and Scientific Communication), CBIO 901 (First-Year Introduction to Research—Ethics: Scientific Integrity in Biomedical Research), 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 (<http://bbs.yale.edu>), 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, Frontiers in Medicine Fred Gorelick, Karin Finberg, Jonathan Bogan, and George Lister

A full-year graduate credit course (CBIO 600/CBIO 601) for first-year M.D./Ph.D. students and an elective course for M.D. students, emphasizing the connections between basic and clinical science, human physiology, and disease. It parallels the content of Yale School of Medicine's first-year courses and is designed for students who are considering a career in medical research or who choose to explore scientific topics in depth, learn about cutting-edge research, and improve their presentation skills. Discussions cover the challenges faced in research, selecting a topic, and pursuing an academic career. Select topics are presented by eminent faculty who serve as excellent role models for students' academic careers. In most sessions, two students review relevant manuscripts under the guidance of a faculty mentor and present the material to the group. Prior to the start of class, students are required to submit questions concerning techniques and concepts that may not be clear from the assigned papers. These questions are then addressed during the presentation. Student evaluations are

graded on attendance, participation in group discussions, and formal presentations. The organizational meeting/introduction is August 23 at 4:30 pm (most sessions are in Hope 203 at YSM). 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 Charles Lusk, Michael Caplan, Nadya Dimitrova, Thomas Pollard, James Rothman, Valerie Horsley, Thomas Melia, Megan King, Martin Schwartz, Christopher Burd, and Josephina van Wolfswinkel

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 Charles Lusk, Michael Caplan, Nadya Dimitrova, Thomas Pollard, James Rothman, Valerie Horsley, Thomas Melia, Megan King, Martin Schwartz, and Christopher Burd

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

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

CBIO 900a / GENE 900a / MCDB 900a, First-Year Introduction to Research – Grant Writing and Scientific Communication Valerie Horsley

Grant writing, scientific communication, and laboratory rotation talks for Molecular Cell Biology, Genetics, and Development track students.

CBIO 901b / GENE 901b / MCDB 901b, First-Year Introduction to Research – Ethics: Scientific Integrity in Biomedical Research Joerg Bewersdorf

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

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

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

CBIO 913b / GENE 913b / MCDB 913b, Third Laboratory Rotation Valerie Horsley
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 Peter Aronson (*Internal Medicine/Nephrology*), Angelique Bordey (*Neurosurgery*), Thomas Brown (*Psychology*), Cecilia Canessa, Lloyd Cantley (*Internal Medicine/Nephrology*), Michael Caplan, Nancy Carrasco, Lawrence Cohen, Marie Egan (*Pediatrics*), Barbara Ehrlich (*Pharmacology*), Anne Eichmann (*Internal Medicine/Cardiology*), Biff Forbush III, John Geibel (*Surgery*), Leonard Kaczmarek (*Pharmacology*), George Lister (*Pediatrics*), Pramod Mistry (*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*), Nadia Ameen (*Pediatrics*), Sviatoslav Bagriantsev, Nigel Bamford (*Neurology*), Stuart Campbell (*Biomedical Engineering*), Jonathan Demb (*Ophthalmology & Visual Science*), Tore Eid (*Laboratory Medicine*), Elena Gracheva, Shuta Ishibe (*Internal Medicine/Nephrology*), Erdem Karatekin, Richard Kibbey (*Internal Medicine/Endocrinology*), Jesse Rinehart, Satinder Singh, Alda Tufro (*Pediatrics*), Xiaoyong Yang (*Comparative Medicine*)

Assistant Professors Rui Chang, Jean-Ju Chung, Guillaume de Lartigue, Kristopher Kahle (*Neurosurgery*), Rachel Perry, Carson Thoreen

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.

SPECIAL ADMISSIONS REQUIREMENTS

We welcome applications from students with backgrounds in the biological, chemical, and/or physical sciences. These include majors in biology, biochemistry, physiology, genetics, chemistry, physics, mathematics, engineering, computer science, and psychology. Courses in biology, biochemistry, organic and physical chemistry, and mathematics through calculus are recommended. The GRE General Test is required. To enter the Ph.D. program, students will apply to the Molecular Medicine, Pharmacology,

and Physiology track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), <http://bbs.yale.edu>.

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, at a TF level 20. 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 Mark Saltzman and Stuart Campbell

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

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

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 630a / PATH 680a / PHAR 502a, Seminar in Molecular Medicine,
Pharmacology, and Physiology** Don Nguyen

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

**C&MP 710b / MB&B 710b, Electron Cryo-Microscopy for Protein Structure
Determination** Frederick Sigworth and Charles Sindelar

Understanding cellular function requires structural and biochemical studies at an ever-increasing level of complexity. The course is an introduction to the concepts and applications of high-resolution electron cryo-microscopy. This rapidly emerging new technique is the only method that allows biological macromolecules to be studied at all levels of resolution from cellular organization to near atomic detail. ½ Course cr

Chemical & Environmental Engineering

Dunham Laboratory, 203.432.4252
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*), Edgar Hertwich, Edward Kaplan, Jaehong Kim, Michael Loewenberg, Andrew Miranker, Jordan Peccia, Lisa Pfefferle, Daniel Rosner (*Emeritus*), W. Mark Saltzman, Udo Schwarz, T. Kyle Vanderlick, Paul Van Tassel, Julie Zimmerman

Assistant Professors Drew Gentner, Amir Haji-Akbari, Shu Hu, Mingjiang Zhong

Lecturers Aniko Bezur, Katherine Schilling, Paul Whitmore

FIELDS OF STUDY

Fields include nanomaterials, soft matter, interfacial phenomena, biomolecular engineering, energy, water and air quality, and sustainability.

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

For course listings, 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, 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, Alanna Schepartz, Charles Schmittenmaer, Dieter Söll,* David Spiegel, Thomas Steitz,* Scott Strobel,* John Tully (*Emeritus*), Patrick Vaccaro, Elsa Yan, Frederick Ziegler (*Emeritus*), Kurt Zilm

Associate Professors Jason Crawford, Timothy Newhouse

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

Lecturers Paul Anastas, 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 ADMISSIONS REQUIREMENTS

Applicants are expected to have completed or be completing a standard undergraduate chemistry major including a year of elementary organic chemistry with laboratory, and a year of elementary physical chemistry. Other majors are acceptable if the above requirements are met. The GRE General Test is required. The GRE Subject Test is strongly recommended though not required. Students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL).

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

A foreign language is not required. Three term courses are required in each of the first two terms 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 (preparative chemistry students) or two oral examinations (physical chemistry students) 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 proposal (inorganic, organic, and chemical biology students), 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 at a TF level 20. Students may be required by their advisers to teach in additional terms, but would not be required to teach more than five terms over their first five years. All students are required to take CHEM 590, Ethical Conduct and Scientific Research, in the fall term of their first year of study.

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 upon request to the Director of Graduate Studies, Department of Chemistry, Yale University, PO Box 208107, New Haven CT 06520-8107.

COURSES

CHEM 518a, Advanced Organic Chemistry William Jorgensen

Concise overview of structure, properties, thermodynamics, kinetics, reactions, and intermolecular interactions for organic molecular systems.

CHEM 521a, Chemical Biology Sarah Slavoff

A one-term introduction to the origins and emerging frontiers of chemical biology. Discussion of the key molecular building blocks of biological systems and the history of macromolecular research in chemistry.

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 526b, Computational Chemistry and Biochemistry Sharon Hammes-Schiffer and William Jorgensen

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.

CHEM 527b, Fundamentals of Organic Reaction Mechanisms Seth Herzon

Introduction to problem-solving techniques in organic chemistry and chemical biology, focusing on fundamental mechanistic paradigms for synthetic and biosynthetic transformations. Course meetings maximize interaction between students and faculty with the goal of providing students with a strong conceptual skill set in preparation for full-time research.

CHEM 529b, Special Topics in Chemical Biology Sarah Slavoff

Current topics at the interface of chemistry, biology, and medicine with an emphasis on synthetic biology approaches.

CHEM 530a, Statistical Methods and Thermodynamics Victor Batista

The fundamentals of statistical mechanics developed and used to elucidate gas phase and condensed phase behavior, as well as to establish a microscopic derivation of the postulates of thermodynamics. Topics include ensembles; Fermi, Bose, and Boltzmann statistics; density matrices; mean field theories; phase transitions; chemical reaction dynamics; time-correlation functions; Monte Carlo and molecular dynamics simulations.

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 540a, Molecules and Radiation I Kurt Zilm

An integrated treatment of quantum mechanics and modern spectroscopy. Basic wave and matrix mechanics, perturbation theory, angular momentum, group theory, time-dependent quantum mechanics, selection rules, coherent evolution in two-level systems, line shapes, and NMR spectroscopy.

CHEM 542b, Molecules and Radiation II Mark Johnson

An extension of the material covered in CHEM 540 to atomic and molecular spectroscopy, including rotational, vibrational, and electronic spectroscopy, as well as an introduction to laser spectroscopy.

CHEM 549a, Materials Chemistry Hailiang Wang

This course covers fundamental principles in materials chemistry including basic solid-state chemistry; structures, properties, and applications of metals, semiconductors, polymers, and nanomaterials; and material characterization techniques. Special topics at research frontiers of materials chemistry are also covered, including graphene and carbon nanotubes, nanomaterials for batteries, nanomaterials for catalysis, etc. This course aims to serve graduate and senior undergraduate students from various academic departments who are interested in advanced chemistry and nanoscience for materials research.

CHEM 550b, Theoretical and Inorganic Chemistry Patrick Holland

Elementary group theory, molecular orbitals, states arising from molecular orbitals containing several electrons, ligand field theory, and electronic structure of metal complexes. Introduction to physical methods used in the determination of molecular structure and the bonding of polyatomic molecules.

CHEM 552a, Organometallic Chemistry Robert Crabtree

A survey of the organometallic chemistry of the transition elements and of homogeneous catalysis.

CHEM 553b, Small Molecule X-ray Crystallography Patrick Holland and Brandon Mercado

This course provides an introduction to small molecule crystallography. It covers both theoretical and applied concepts and includes hands-on experience on how to solve and refine the structure of small molecules.

CHEM 555b, Inorganic Mechanisms James Mayer

An advanced course studying the mechanisms of important inorganic transformations. Topics such as proton-coupled electron transfer are covered.

CHEM 556b, Biochemical Rates and Mechanisms 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.

CHEM 557a, Modern Coordination Chemistry Nilay Hazari

The principles of modern inorganic chemistry. Main group and transition element chemistry: reactions, bonding, structure, and spectra.

CHEM 559a, Biophysics J. Patrick Loria and Elsa Yan

A discussion of applications of quantitative biophysical methods to biomolecules. Emphasis is placed on interpreting experimental data obtained by various biophysical methods to gain structural and dynamic information to address biological questions at the molecular level. Topics include mainly spectroscopic methods, such as Raman, single-molecule, fluorescence, FTIR, chiroptical, and higher-order optical spectroscopies. Discussions focus on current and classic studies reported in the literature.

CHEM 560La, Advanced Instrumentation Laboratory I Mark Johnson

A laboratory course introducing physical chemistry tools used in the experimental and theoretical investigation of large and small molecules. Modules include electronics, vacuum technology, optical spectroscopy and lasers, and computer programming.

CHEM 562La or b / PHYS 762a or b, Laboratory in Instrument Design and the Mechanical Arts Kurt Zilm and David Johnson

Familiarization with modern machine shop practices and techniques. Use of basic metalworking machinery and instruction in techniques of precision measurement and properties of commonly used metals, alloys, and plastics.

CHEM 564La or b, Advanced Mechanical Instrumentation Kurt Zilm and David Johnson

A course geared for both the arts and sciences that goes beyond the basic introductory shop courses, offering an in-depth foundation study utilizing hands-on instructional techniques that must be learned from experience. Prerequisite: CHEM 562L.

CHEM 565La or b, Introduction to Glass Blowing Patrick Vaccaro and Daryl Smith

The course provides a basic introduction to the fabrication of scientific apparatus from glass. Topics covered include laboratory setup, the fundamental skills and techniques of glass blowing, the operation of glass fabrication equipment, and requisite safety procedures.

CHEM 570a, Quantum Chemistry Sharon Hammes-Schiffer

The elements of quantum mechanics developed and illustrated with applications in chemistry and chemical physics.

CHEM 572b, Advanced Quantum Mechanics Victor Batista

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.

CHEM 590a, Ethical Conduct and Scientific Research Jonathan Parr

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

CHEM 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 and CHEM 721b, Current Topics in Organic Chemistry Seth Herzon

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

CHEM 730a and CHEM 731b, Molecular Science Seminar Mark Johnson

A seminar series based on invited speakers in the areas of physical, inorganic, and biological chemistry.

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

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

CHEM 760a and CHEM 761b, Seminar in Inorganic Chemistry Nilay Hazari

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.

Chair

Emily Greenwood

Director of Graduate Studies

Brad Inwood (dgs.classics@yale.edu)

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

Associate Professors Milette Gaifman (*Classics; History of Art*), Pauline LeVen, Irene Peirano Garrison, Andrew Johnston

Assistant Professor Jessica Lamont

Lecturers Ann Hanson, Timothy Robinson, Barbara Shailor (*Senior Research Scholar*), Joseph Solodow

Affiliated Faculty and Secondary Appointments Harold Attridge (*Divinity School*), Adela Yarbro Collins (*Divinity School; Emerita*), John J. Collins (*Divinity School*), John Hare (*Divinity School*), Susan Matheson (*Curator of Ancient Art, Yale University Art Gallery*), David Quint (*English*), 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.

ADMISSION REQUIREMENTS

A minimum of three years (four preferred) of college training in one of the classical languages and two years (three preferred) in the other.

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. 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.
3. Departmental reading examinations in French (or Italian) and German. The first (in either language) is to be passed by the end of the first year, the second by the end of the second year in residence.
4. A minimum of fourteen term courses: (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 historical or comparative linguistics; (iv) one course in ancient history (either an 800-level seminar or a 600-level materials course), and one in classical art and archaeology; (v) of these fourteen courses, twelve must be taken in the first two years of study; the last two, which must be 800-level seminars, are to be taken in the third year, normally one in each term.
5. Greek and Latin composition (this requirement may but need not be satisfied by courses taken under [4] above).
6. Oral examinations in Greek and Latin literature, based on the syllabus covered by the survey courses, drawn from the Classical Philology Ph.D. reading list. These are to be taken closely following the surveys in the respective literatures, as follows: the first, at the end of the second term (May of the first year), the second at the end of the fourth term (May of the second year).
7. Translation examinations in Greek and Latin, based on the Classical Philology Ph.D. reading list, by the beginning of the fifth term in residence.
8. 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.
9. A dissertation prospectus by the end of the sixth term in residence.
10. A dissertation. All students at the end of each term of dissertation research and writing will present their work in progress in a "chapter colloquium," which will mimic the prospectus defense in format (i.e., a discussion with interested faculty of a presubmitted chunk of written work). If no chapter or written work is presentable at the time of the colloquium, the student would have to justify this.

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.
3. Departmental reading examinations in Italian (or French) and German. The first (in either language) is to be passed by the end of the first year, 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) students must demonstrate a competence in Greek and Latin, usually by passing at least one 400/700-level course in each language; (v) of the remaining four courses, at least two should be seminars in Greek or Latin literature.
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. All students at the end of each term of dissertation research and writing will present their work in progress in a "chapter colloquium," which will mimic the prospectus defense in format (i.e., a discussion with interested faculty of a presubmitted chunk of written work). If no chapter or written work is presentable at the time of the colloquium, the student would have to justify this.

COMBINED PROGRAMS

Classics and Comparative Literature

ADMISSION REQUIREMENTS

Prerequisites for admission through the Department of Classics: same as for Classical Philology. (For admission requirements in the Department of Comparative Literature, consult the DGS of that department.) After admission to the Department of Classics,

qualified students may apply to be admitted to this combined program, normally during the first term of residence; the directors of graduate studies of both departments should be consulted before application to the combined program is made.

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

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 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; (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 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).
5. Translation examinations in Greek and Latin, based on the Classical Philology Ph.D. reading list, 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. All students at the end of each term of dissertation research and writing will present their work in progress in a "chapter colloquium," which will mimic the prospectus defense in format (i.e., a discussion with interested faculty of a presubmitted chunk of written work). If no chapter or written work is presentable at the time of the colloquium, the student would have to justify this.

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. Prospective students may apply through either the Department of History or the Department of Classics.

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.

ADMISSION REQUIREMENTS

Prerequisites for admission through the Department of Classics are the same as for admission to the Classics degree program, i.e., the equivalent of three years (four preferred) of college training in one of the classical languages and two years (three preferred) in the other. Prerequisites for admission through the Department of History are the equivalent of three years (four preferred) of college training in one of the classical languages and two years in another ancient language, not necessarily Greek or Latin.

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

1. A minimum of fourteen 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 that cover two separate disciplinary areas. These courses will be in the history of different periods or different regions, or in other disciplines of the humanities or social sciences outside of history, or in the physical sciences. Possibilities include (but are not limited to): social sciences (economics, anthropology, sociology, environmental science, statistics); religion (religious studies, Divinity School, Jewish studies); law (history of law, comparative law, international law); Near Eastern languages and civilizations (Egyptian language, Hebrew, Aramaic, Syriac, Arabic); anthropology and archaeology (cultural anthropology, archaeological sciences); physical and biological sciences (paleoclimatology, ecology and forestry, genetics, medicine).
2. 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).
 3. Reading examinations in German, and in either French or Italian. The first (in either language) is to be passed by the end of the second term in residence, the second by the end of the fourth term 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 Ancient History Greek and Latin reading lists and will consist of four passages in each language, at least one of which will be poetry and one documentary (epigraphy/papyrology). 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 non-classical 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 four passages 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. All students at the end of each term of dissertation research and writing will present their work in progress in a “chapter colloquium,” which will mimic the prospectus defense in format (i.e., a discussion with interested faculty of

a presubmitted chunk of written work). If no chapter or written work is presentable at the time of the colloquium, the student would have to justify this.

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. Suitably qualified students may apply for entry to the program either through the Classics department for the Classics track, details of which are given below, or through the Philosophy department for the Philosophy track, details of which may be found at <http://philosophy.yale.edu/graduate-program/classics-and-philosophy-program>. Applicants to the combined program are strongly encouraged to submit a writing sample on a topic in ancient philosophy.

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. 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.

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. 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.
3. Departmental reading examinations in French (or Italian) and German. The first (in either language) is to be passed by the end of the first year, the 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 list 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 list 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. All students at the end of each term of dissertation research and writing will present their work in progress in a “chapter colloquium,” which will mimic the prospectus defense in format (i.e., a discussion with interested faculty of a presubmitted chunk of written work). If no chapter or written work is presentable at the time of the colloquium, the student would have to justify this.

Classics and Renaissance Studies

ADMISSION REQUIREMENTS

Same as for Classical Philology. Applications should be submitted directly to Classics with an indication that the student wishes to apply for the combined degree in Classics and Renaissance Studies.

REQUIREMENTS FOR THE PH.D. DEGREE IN CLASSICS AND RENAISSANCE STUDIES

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.
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 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).
6. Translation examinations in Greek and Latin, based on the Classics and Renaissance Studies Ph.D. reading list, 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. All students at the end of each term of dissertation research and writing will present their work in progress in a "chapter colloquium," which will mimic the prospectus defense in format (i.e., a discussion with interested faculty of a presubmitted chunk of written work). If no chapter or written work is presentable at the time of the colloquium, the student would have to justify this.

For information about the Ph.D. program in Graeco-Arabic Studies, please contact Professor Kevin van Bladel, Department of Near Eastern Languages and Civilizations.

ARCHAIA GRADUATE QUALIFICATION

The Yale Program for the Study of Ancient and Premodern Cultures and Societies (Archaia) offers a graduate qualification. 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 602b / MDVL 563b, Advanced Latin Paleography Barbara Shailor
The challenges of using hand-produced Latin manuscripts in research, with an emphasis on texts from the late Middle Ages. Gothic cursive scripts and book hands ca. 1200–ca. 1500; fragments of unidentified codices; complex or composite codices with heavy interlinear and marginal annotations. Manuscripts and fragments selected largely from collections in the Beinecke Library. Prerequisite: CLSS 601 or permission of the instructor.

CLSS 605a, Greek Papyrology Ann Hanson
Literary and documentary papyri of Greek and Roman Egypt, concentrating on documents housed in the Beinecke Library from the late Ptolemaic and Roman periods. Topics include using papyri as sources for social and other histories; gaining familiarity with the language of the papyri; and the reading of literary and documentary hands.

CLSS 645a / HIST 507a, Roman Numismatics Benjamin Hellings
An introduction to the history of ancient coinage and the modern methodology of numismatic study. Brief consideration of the Greek background is followed by detailed treatment of the Roman republic and empire, with particular attention to the Roman provinces.

CLSS 811a / ARCG 611a / NELC 611a / RLST 833a, The Ancient Egyptian Temple as Cosmos: Correlation of Architecture and Decoration Program Christina Geisen
The course focuses on the correlation of archaeology, iconography, and philology by analyzing ancient Egyptian temples under the specific consideration of the interplay of architecture and decoration program. The different types of temples and their developments over time are discussed. The main focus is the function of each temple type, which can only be understood by analyzing the architecture of the monument, its decoration program, related texts (such as rituals, myths, and festival description, but also historical texts), and its place in the cultic landscape of the specific location. The class also provides an overview of rituals performed and festivals celebrated in the temples, as well as of the administrative sphere of the temple. Optional field trip to the Metropolitan Museum of Art in New York to see the Temple of Dendur. No previous knowledge of ancient Egyptian culture or languages is necessary; all texts are read in translation.

CLSS 815b / ANTH 531b / ARCG 531b / EALL 773b / HIST 502b / HSAR 564b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual
Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China,

and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

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

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

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

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

CLSS 865b / PHIL 748b, Plato's *Theaetetus* Verity Harte and David Charles

The class reads and discusses the Greek text of Plato's *Theaetetus*, a central work of Plato's philosophy and an important work in the history of philosophy. Focused on the nature of knowledge, the dialogue is notable for a series of arguments involving central notions of Plato's philosophy: knowledge, definition, perception, false judgment. The class is a core course for the combined Ph.D. program in Classics and Philosophy. The course is 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 877a / CPLT 556a / RLST 613a, Rhetorics of the Ancient World Michal Beth Dinkler and Irene Peirano

This interdisciplinary course takes as its starting point Greco-Roman rhetoric as a codified system and explores its relevance for contemporary interpretation of ancient texts. Moving back and forth between rhetoric as a set of norms and rhetoric as a condition of discourse, we engage with contemporary rhetorical studies in Classics and Biblical studies. Topics include rhetoric and narrative, exemplarity and imitation across the literary and spiritual realms, "anti-rhetoricism," embedded rhetorical performances (e.g., speeches, oratory, etc.), and nonverbal forms of persuasion (e.g., visual, emotional, etc.).

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 886a / PHIL 741a, What Is Aristotelian Hylomorphism? David Charles

The aim of the seminar is to examine the extent to which Aristotle's version of hylomorphism as applied to psychological phenomena (such as the emotions, desire, perception, and thought) was modified and criticized by later philosophers. We assess the hypothesis that Aristotle's discussion of these issues was substantially modified by later philosophers and commentators in such a way as to set up (1) contemporary versions of hylomorphism and (2) the mind/body problem as formulated by Descartes.

CLSS 887b / PHIL 746b, Cicero and Ancient Ethics: The Dialogue *On Moral Ends* (*De finibus bonorum et malorum*) Brad Inwood

Cicero's most important and influential work on moral philosophy is the dialogue *On Moral Ends* (*De finibus bonorum et malorum*). Written within the general framework of eudaemonism, the dialogue expounds on and criticizes the ethical theory of three contemporary schools: Epicurean, Stoic, and Peripatetic. *On Moral Ends* presents important debates in ethics, gives us extensive evidence for Hellenistic philosophy in general, and had significant influence on moral theory in the early modern period. We read the entire dialogue, with more emphasis on the Stoic (books 3–4) and Peripatetic (book 5) debates than on the Epicurean (books 1–2). In class we work predominantly from the translation by Raphael Woolf, but Latin readers are expected to read key parts of the dialogue in Latin as well; there will be a separate meeting for discussion of issues that arise from the Latin text. Prerequisite: graduate enrollment in Philosophy or Classics, or permission of the instructor.

CLSS 889b, Greek Epigraphy François Gerardin

This course provides an introduction to Greek epigraphy—the study of inscriptions written in ancient Greek—its methods, scholarship, and aims. Key texts from the corpus are translated, analyzed, and discussed in class. We read some inscriptions in verse (“metric inscriptions”) along with prose texts. Themes for discussion are linguistic (literacy, dialects, multilingualism) and/or historical (education, law, mythography). The course also offers essential preparation for texts included in the Combined Program in Classics and History reading list.

CLSS 890a / ARCG 581a / HSAR 581a, Roman Painting: Achievement and Legacy
Diana Kleiner

Roman mural painting in all its aspects and innovations. Individual scenes and complete ensembles in palaces, villas, and houses in Rome and Pompeii are explored, as are their rediscovery and revival in the Renaissance and neoclassical period. Special attention is paid to the four architectural styles; history and mythological painting; the impact of the theater; the part played by landscape, genre, and still life; the accidental survival of painted portraiture; and the discovery and rejection of trompe l'oeil illusionism and linear perspective.

CLSS 892b, Narrative and Vision Kirk Freudenburg

This seminar explores the theory and practice of image production (*enargeia*, *descriptio*: the production of a full visual presence through verbal means) in ancient epic, with

special focus on the narratological ends to which the poet's special "visualizing effects" are the means. The main epic poet studied is Vergil, but accounting for his visual practices requires a much fuller accounting of *enargeia* in the various "visualizing" poetic traditions to which he refers (especially Homer, Lucretius, and Catullus); in rhetoric, both its theory and practice (Aristotle, Cicero, and Quintilian); in historiography (Livy and Tacitus); and in other "actual" visual media such as wall paintings, sculpture, and architecture. We look at the related topics of *ekphrasis*, Roman concepts of "nobility" and "spectacle," and to further developments in the production of visualization in the epics of Ovid, Statius, Lucan, and Valerius Flaccus, as well as to the basic practices, categories, and theorizations of film narratology (Bordwell, Mulvey, Verstraten).

CLSS 896a, History of Greek Literature I Egbert Bakker

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

CLSS 897b, History of Greek Literature II Emily Greenwood

A continuation of CLSS 896a.

CLSS 900a or b, Directed Reading Staff

By arrangement with faculty.

GREK 750a, Euripides's Late Tragedies Egbert Bakker

Close reading of three late plays of Euripides, *Helen*, *Ion*, and *Iphigenia in Tauris*. Class discussion focuses on Euripides's literary and dramatic technique and on the issues of myth, geography, as well as cultural and personal identity in these tragedies. We also consider how the plays (qualified as "romantic tragedies," "paratragedies," and "tragicomedies") question the identity of the tragic genre and open new dramatic possibilities at the end of the fifth century BCE.

GREK 754b, Greek Myth, Fiction, and Science Fiction Pauline LeVen

Relationships among ancient Greek myths, fiction, and speculative/science fiction, with attention to interpretive approaches and methodologies. Narrative modes of representing reality; distinguishing fiction from myth and science fiction; cultural uses of myth and fiction. Readings include works by Homer, Longus, Lucian, and Philostratus.

GREK 763b, Praxis and Theory of the Greek Symposium Egbert Bakker

This course is a study (reading in the original, interpretation, and discussion) of a selection of texts pertaining to the ancient Greek symposium (a wine-drinking event by elite males) as a central cultural institution. Readings include poetic texts ("songs") that were meant to be sung and performed by the participants ("symposiasts"); and prose representations of the symposium as an imagined event in which philosophical ideas were put forward.

LATN 714b, Roman Civil Wars Irene Peirano

An examination of the ways in which Romans constructed and represented their civil wars in literature across a variety of genres (epic, lyric, historiography), authors (Vergil, Lucan, Caesar, Sallust), and time periods (late republic, empire).

LATN 721a, Vergil's *Aeneid* Kirk Freudenburg

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

LATN 762a, The *Histories* of Tacitus Christina Kraus

Close reading of Tacitus's *Histories* and parallel passages from the other works, with attention to his syntax and style. The influence of Tacitus's background and experience on his narrative is focal throughout.

LATN 790b, Latin Syntax and Stylistics Joseph Solodow

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

Comparative Literature

451 College Street, Rm. 202, 203.432.2760

<http://complit.yale.edu>

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

Chair

Martin Hägglund

Director of Graduate Studies

David Quint

Professors Dudley Andrew, Rüdiger Campe, Katerina Clark, Roberto González Echevarría, Martin Hägglund, Hannan Hever, Pericles Lewis, David Quint, Katie Trumpener, Jing Tsu, Jane Tylus

Associate Professors Moira Fradinger, Ayesha Ramachandran

Assistant Professors Robyn Creswell, Marta Figlerowicz

Lecturers Peter Cole, Jan Hagens

Emeritus Peter Brooks, Peter Demetz, Carol Jacobs, Rainer Nägele

Affiliated Faculty Rolena Adorno (*Spanish & Portuguese*), R. Howard Bloch (*French*), Francesco Casetti (*Film & Media Studies*), Kang-I Sun Chang (*East Asian Languages & Literatures*), Michael Denning (*American Studies*), Wai Chee Dimock (*English*), Alice Kaplan (*French*), Tina Lu (*East Asian Languages & Literatures*), John MacKay (*Slavic Languages & Literatures*), Giuseppe Mazzotta (*Italian*), Christopher Miller (*French*), 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 ADMISSIONS REQUIREMENTS

Applicants must hold a B.A. or equivalent degree and should normally have majored in comparative literature, English, a classical or foreign literature, or in an interdepartmental major that includes literature. They must be ready to take advanced courses in two foreign literatures in addition to English upon admission. The GRE General Test is required. A ten- to twenty-page writing sample, written in English, should be submitted with the application.

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 208299, New Haven CT 06520-8299, or stacey.hampton@yale.edu.

COURSES

CPLT 515a, Proseminar in Comparative Literature Katie Trumpener

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

CPLT 554b / ENGL 827b, Novel Minds: The Representation of Consciousness from Austen to Woolf Ruth Yeazell

Close study of selected novels by Jane Austen, George Eliot, Henry James, and Virginia Woolf, with particular attention to the representation of consciousness and the development of the free indirect style. Our reading of fiction is supplemented by narrative theory drawn from James, Wayne Booth, Käte Hamburger, Ann Banfield, Gérard Genette, Dorrit Cohn, and others.

CPLT 556a / CLSS 877a / RLST 613a, Rhetorics of the Ancient World Michal Beth Dinkler and Irene Peirano

This interdisciplinary course takes as its starting point Greco-Roman rhetoric as a codified system and explores its relevance for contemporary interpretation of ancient texts. Moving back and forth between rhetoric as a set of norms and rhetoric as a condition of discourse, we engage with contemporary rhetorical studies in Classics and Biblical studies. Topics include rhetoric and narrative, exemplarity and imitation across the literary and spiritual realms, “anti-rhetoricism,” embedded rhetorical performances (e.g., speeches, oratory, etc.), and nonverbal forms of persuasion (e.g., visual, emotional, etc.).

CPLT 562b / GMAN 654b, Living Form: Organicism in Society and Aesthetics Kirk Wetters

Starting with Kant, the organic is defined as a processual relation of the part and the whole, thereby providing a new model of the individual as a self-contained totality. We explore the implications of this conception in Goethe’s writings on morphology (*The Metamorphosis of Plants*, “Orphic Primal Words”), the Romantics’ *Athenaeum*, Hanslick’s *On the Beautiful in Music*, Oswald Spengler’s cultural morphology, the concept of autopoiesis in Maturana and Varela, Luhmann’s systems theory, and Canguilhem’s critique of the analogy of organic life and society.

CPLT 622a / AMST 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. There are a small number of openings for second-year graduate students. Students interested in participating should contact michael.denning@yale.edu.

CPLT 672b / ENGL 672b, Milton David Quint

This course studies Milton's poetry and some of his controversial prose. We investigate the relation of the poetry to its historical contexts, focusing on the literary, religious, social, and political forces that shaped Milton's verse. We survey and assess some of the dominant issues in contemporary Milton studies, examining the types of readings that psychoanalytic, feminist, Marxist, and historicist critics have produced. A brief oral report and a term paper (as well as a prospectus and preliminary bibliography for the term paper) required.

CPLT 676a / SPAN 688a, Law and Literature in Modern Latin America Roberto González Echevarría

A study of major modern narrative works in Latin America from the independence and post-independence period in the nineteenth century to the age of drug trafficking and the AIDS epidemic today. The course begins with the Cuban Cirilo Villaverde's antislavery novel *Cecilia Valdés* (1880); moves on to the regionalist classic *Doña Bárbara* (1929) by the Venezuelan Rómulo Gallegos and the dictator novel *El señor presidente* (1946) by the Guatemalan Miguel Ángel Asturias; peaks with Gabriel García Márquez's total novel *Cien años de soledad* (1967); and ends with the Colombian Fernando Vallejo's *La virgen de los sicarios* (1994) and the Mexican Mario Bellatin's *Salón de belleza* (2009). The course follows the thematics of the law, particularly Roman Law, and the way in which the characters are controlled or driven by civil and criminal law issues that constitute the plots of the novels. In Spanish.

CPLT 677b / RUSS 699b, The Performing Arts in Twentieth-Century Russia Staff
Covers ballet, opera, theater, mass spectacle, and film. Theory of the performing arts, including selections from the writings of some of the most famous Russian directors, such as Stanislavsky, Meyerhold, Eisenstein, and Balanchine. Their major productions and some of the major Russian plays of the twentieth century (e.g., by Chekhov, Mayakovsky, Bulgakov, and contemporary dramatists). No knowledge of Russian required. Students taking the course for credit in Comparative Literature can write their papers on texts in other languages.

CPLT 679b / JDST 686b, Major Modern Jewish Poets Peter Cole

This course introduces students to a diverse group of modern Jewish poets, from Gertrude Stein, Moyshe-Leyb Halpern, and Adrienne Rich to Muriel Rukeyser, Yehuda Amichai, Paul Celan, Edmond Jabès, Leonard Cohen, and others. Writing in English, Yiddish, German, Hebrew, and French, these poets gave seminal expression to Jewish life in a variety of modes and permutations, and in the process produced poems of lasting and universal value. The class explores work as art and considers pressing questions of cultural, historical, and political context. All readings are in English. Permission of the instructor required.

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

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 *De bello civili*, Dante's *Purgatorio*, Tasso's *Gerusalemme liberata*, Camões's *Os Lusíadas*, and Spenser's *Faerie Queene*.

CPLT 688a / JDST 842a / RLST 775a, Political Theology Hannan Hever

This course investigates the theological aspects of modern political ideologies. Subjects include sovereignty, universalism, law, election, commandment, and messianism. Primary readings include Carl Schmitt, Martin Buber, Alain Badiou, Slavoj Žižek, Daniel Boyarin, and Giorgio Agamben.

CPLT 699a / GMAN 603a / PHIL 602a, Heidegger's *Being and Time* Martin
Hägglund

A systematic, chapter-by-chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy of the twentieth century. All the major themes of the book are addressed in detail, with a particular emphasis on care, time, death, and the meaning of being.

CPLT 708a / ITAL 560a, Age of Disenchantment Giuseppe Mazzotta

This course focuses on the literary debates, theological arguments, and scientific shifts taking place between the Council of Ferrara-Florence (1437–38) and the Council of Trent and beyond, by reading key texts by Valla, Cusa, Pulci, Luther, Erasmus, Ariosto, Campanella, Bruno, Galileo, and Bellarmine. It examines issues such as crisis of belief, the authority of the past, the emergence of freedom, new aesthetics, and the effort to create a new theological language for modern times.

**CPLT 715b / ITAL 940b, 1492: Before and After: Geographical and Linguistic
Itineraries** Jane Tylus

Not simply the date of Columbus's landing, 1492 also marks Lorenzo de' Medici's death, the banishment of Jews from Spain and Sicily, the election of a Borgia pope—Alexander VI, celebrated by Machiavelli—and the birth of Pietro Aretino. We briefly consider the shared cultural and religious history of Italy and Spain, even as most of our attention will be focused on Italy's role as precursor: the Florentine Vespucci was the first to use the phrase “nuovo mondo,” and Columbus was inspired by the stories of Marco Polo and travels of Italian pilgrims to the Holy Land. We start with Columbus and his contemporary Savonarola and move into the “new worlds” of the early sixteenth century as represented by four topics: the rise of print; the burgeoning pastoral genre; the (brief) reaffirmation of the Florentine republic with cameo appearances by Michelangelo, Leonardo, and Machiavelli; and the otherworldly (but also very much of this world) romance of Ariosto. We spend time in the Beinecke Library with maps, Savonarola's sermons, and early sixteenth-century Siennese pastoral plays, and also spend an afternoon at the Metropolitan Museum of Art with Renaissance paintings. In English.

CPLT 716b / FILM 729b / GMAN 730b, 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 782b / GMAN 742b, Being a Person Rüdiger Campe

In Western experience, the social and legal notion of a “person” has been deeply informed by how “persons” are formed and performed onstage and in narration, and vice versa. Readings focus on three areas: (1) basic texts on the history of the notion of “person” and “character” in legal, poetical, and philosophical contexts from Aristotle to modernity; (2) the performance of personhood in the rebirth of modern theater in early modern times; and (3) the narrative evocation of a new modern character in the rise of the modern novel. In order to bring into view the performative and aesthetic dimensions of personhood we discuss questions such as: What does it mean to appear as a person on a stage? What does it take to appear as a certain character (e.g., as reflected in *commedia dell'arte*, Shakespeare, Racine, Lessing)? What is a main and what is a supporting character (e.g., as reflected in Defoe, Richardson, Goethe, Kleist, Mary Shelley)? How can a protagonist of a novel be constituted, and how is the protagonist's identity defined and secured? Gender, race, and social class are of relevance throughout, as well as the question of being a nonperson (a madman, an animal, a monster, an outcast). None

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 872a, 1968@50: Latin American Languages of Liberation Moira Fradinger

On the occasion of the fiftieth anniversary of the upheavals of 1968, this seminar looks at the Latin American cultural and political discourses of liberation throughout the sixties, with an eye on assessing their aftermath and their legacy today. While the language that characterized the foundation of the nation-states in the nineteenth century was emancipation, in the second part of the twentieth century, and particularly around 1968, Latin America embraced the world discourse of liberation. This seminar looks at languages of liberation in an array of disciplines and artistic practices from South and Central America as well as the Caribbean. We explore regional debates that were also inserted in the larger discourse of the anticolonial struggles of the global South. Topics include philosophy of liberation (Dussel), theology of liberation (the 1968 Council of Bishops in Medellín, Colombia), theater of the oppressed (Boal), pedagogy of the oppressed (Freire), cinema of liberation (manifestos of third cinema), the New Song protest movements across the region (from Violeta Parra in Chile to Tropicalismo in Brazil), anticolonialism in the Caribbean (Fanon), anti-neocolonialism (dependency theory, internal colonialism), Indigenous liberation (from the Barbados declarations to the Lacandon Jungle declarations), experimental “boom” literature (Cortázar), etc.

CPLT 881a / ENGL 960a / WGSS 960a, Literary Theory Marta Figlerowicz and Jonathan Kramnick

What is literary theory today, and what is its history? The aim of the course is to introduce students to central concepts in theory and explore their relation to method. We examine the variety of approaches available within the field of literary studies, including older ones such as Russian formalism, New Criticism, deconstruction, Marxism, and psychoanalysis, as well as newer ones like actor-network theory and digital humanities research. We explore the basic tenets and histories of these theories in a way that is both critical and open-minded, and discuss their comparative advantages and pitfalls. The focus is on recurrent paradigms, arguments, and topics, and on transhistorical relations among our various schools of literary-theoretical thought. Readings might include work by René Wellek, Paul de Man, Jacques Derrida, Gayatri Spivak, Bruno Latour, Judith Butler, Northrop Frye, Fred Moten, and many others.

CPLT 898a / FREN 898a, Fin-de-siècle France Maurice Samuels

The course examines major French literary and artistic movements of the last decades of the nineteenth century (Naturalism, Decadence, Symbolism) in their cultural context. Weekly reading assignments pair literary texts with contemporary theoretical/medical/political discourse on such topics as disease, crime, sex, poverty, colonialism, nationalism, and technology. Literary authors include Barbey, Mallarmé, Maupassant, Rachilde, Villiers, and Zola. Theorists include Bergson, Freud, Krafft-Ebing, Le Bon, Nordau, Renan, and Simmel. Some attention also paid to the visual arts. Prerequisite: reading knowledge of French.

CPLT 900a, Directed Reading Staff**CPLT 905b / FILM 760b / GMAN 760b, Intermediality in Film** Brigitte Peucker

Film is a hybrid medium, the meeting point of several others. This course focuses on the relationship of film to theater and painting, suggesting that where two media are in evidence, there is usually a third. Topics include space, motion, color, theatricality, tableau vivant, *ekphrasis*, spectatorship, and new media. Readings feature art

historical and film theoretical texts as well as essays pertinent to specific films. Films by Fassbinder, Bergman, Murnau, von Trier, Rohmer, Godard, Kiarostami, and others, concluding with three films by Peter Greenaway.

CPLT 912b / EALL 801b, Media Theory, Capitalism, and Japanese Modernity Seth Jacobowitz

This course introduces students to key aspects of Western media theory and media history through readings by leading thinkers such as Gilles Deleuze and Félix Guattari, Friedrich Kittler, Lewis Mumford, Martin Heidegger, and Marshall McLuhan. It then brings these works into dialogue with recent critical studies of Japanese modernity, capitalism, and contemporary information society by Naoki Sakai, Karatani Kojin, Akira Lippit, Azuma Hiroki, and others. All readings are in English.

CPLT 916a / FILM 830a / ITAL 590a, Literature into Film Millicent Marcus

We study a series of written works and their cinematic adaptations, considering first the texts in autonomous, literary terms, and then their transformation into audiovisual spectacles. In most cases we screen the film on Tuesday evening and do a comparative study in the Thursday class period, making extensive use of video clips to do close visual analysis of scenes in the light of their corresponding textual sources. Rather than develop a general theory of adaptation, we construct methodological approaches on an ad hoc basis, taking each instance of adaptation as a case study amenable to a variety of methodologies—psychoanalytic, feminist, ideological, generic, semiotic, and so forth. The class is conducted as a seminar, and active student participation is expected. There are two papers—one shorter one of a critical nature at midterm and a final research paper (approximately 15–20 pages). Films examined include (tentatively) Pasolini's *Medea* and *Decameron*, the Tavianis' *Padre padrone*, Visconti's *Death in Venice*, Rosi's *Three Brothers*, Salvatores's *I'm Not Afraid*, and De Sica's *Two Women*. Writing assignments comprise 75 percent of the final grade and class participation 25 percent.

CPLT 921a / FILM 800a, Styles and Techniques in Recent Art Cinema Dudley Andrew

How much does the art of cinema in the twenty-first century resemble that of the previous half-century? Have massive changes visible in production, distribution, and exhibition also affected the goals and ambitions of film artists? Or do today's auteurs and cinematographers work as their counterparts did decades ago, deploying whatever techniques current technology permits in a quest for a style that may bring out something authentic about themselves, the world, or the medium? Analyzing films by such contemporary auteurs as Olivier Assayas, Claire Denis, Carlos Reygadas, Lav Diaz, David Lynch, and Hong Sang-soo, we measure new styles against techniques deployed by classic and modern auteurs like Mizoguchi, Welles, Cocteau, and Hitchcock. What new aesthetic (and practical) issues face filmmakers as they conceive their projects? We look at screen format, including 3-D; elastic temporality, especially slow motion; special effects, including forms of animation; superimposition, including multiple screens; long-takes and camera movement; montage and alternatives to cutting; advances in sound design. Have the new narrative forms and the new types of subject matter associated with our century's most difficult films (*L'Intrus*, *Werckmeister Harmonies*, *La Mort de Louis XIV*, *Twin Peaks*) given rise to the styles of major directors, or are they the by-product of these styles? Does style matter in the way it did during cinema's first century?

CPLT 925a, The Practice of Literary Translation Robyn Creswell

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

CPLT 942a / SPAN 912a, The Borges Effect Roberto González Echevarría

Since the publication of *Ficciones* in 1944 and especially since achieving worldwide acclaim after receiving *ex-aequo* with Samuel Beckett the Formentor Group's Prix International in 1961, Jorge Luis Borges has become one of the most influential modern writers. He is a recognizable and often acknowledged presence in the work of novelists and short-story writers, as well as in that of philosophers and literary theorists. A Borges "effect" can be perceived in John Barth, Julio Cortázar, Gabriel García Márquez, Italo Calvino, and Umberto Eco, and in Maurice Blanchot, Michel Foucault, Gérard Genette, and Jacques Derrida, among others. That effect is also projected retrospectively in Borges's particular way of reading classics like Homer, Dante, and Cervantes. An elegant, playfully ironic skepticism, together with a fondness for aporias, enigmas, puzzles, and labyrinths as well as for minor genres such as the detective story, are the most recognizable components of Borges's style and thought. Taken together these components suggest theories about writing and reading. We read closely Borges's most influential stories, such as "Tlön, Uqbar, Orbis Tertius," "Pierre Menard, Author of the *Quixote*," and "The Garden of Forking Paths," as well as his essays on Homer, Dante, and Cervantes. We then follow his track in the writers mentioned. Class discussions in English; readings in English or the French, Spanish, or Italian originals.

CPLT 949b / AFAM 723b / AMST 645b / WGSS 645b, Caribbean Diasporic

Intellectuals Hazel Carby

This course examines work by artists and writers of Caribbean descent from different regions of the transatlantic world. In response to contemporary interest in issues of globalization, the premise of the course is that in the world maps of these black intellectuals we can see the intertwined and interdependent histories and relations of the Americas, Europe, and Africa. Thinking globally is not a new experience for black peoples, and we need to understand that what is represented as "Caribbeanness" is a condition of movement. Literature and art are most frequently taught within the boundaries of a particular nation, but this course focuses on the work of writers and artists who shape the Caribbean identities of their characters as traveling black subjects and refuse to restrain their work within the limits of any one national identity. We practice a new and global type of cognitive mapping as we read and explore the meanings of terms like black transnationalism, migrancy, globalization, and empire. Diasporic practice embraces and represents the geopolitical realities of the modern, modernizing, and postmodern worlds in which multiple racialized histories are inscribed on modern bodies.

CPLT 952a / EALL 586a, Modern Novel in Japan and Brazil Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism.

CPLT 954a / GMAN 593a, Reading Theory Katrin Truedstedt

From the new form of literary theory taking shape in romanticism to recent German media studies, this course examines the relation of close readings of singular texts to larger theoretical claims. We reflect on the eminent status that literary readings have attained for broader theoretical and philosophical projects. We specifically focus on a certain theoretical milieu in which far-reaching theoretical claims were not merely exemplified or illustrated by, but in fact developed from distinct practices of (close) reading of particular literary texts. The aim is to analyze this distinct type of theory by investigating the scenes of reading that major theoretical endeavors depended upon, in order to trace the trajectory of theory and turn to more recent theoretical endeavors, to discuss the changed status that reading has for them. Among the authors read are Schlegel, Benjamin, de Man, Derrida, Blumenberg, Butler, Kittler, and Latour.

CPLT 958a and CPLT 959b, Dissertation Workshop Staff

Dissertation preparation course.

CPLT 965a / SPAN 904a, Latin American Thought Moira Fradinger

This seminar introduces students to two centuries of Latin American political thought in the form of social and literary essays produced since the times of independence. It studies how Latin American writers have thought of their identity and how they have theorized the political/cultural heritage of the colony. The seminar starts with the Haitian constitution and contemporary Haitian authors who assess the legacy of the Haitian revolution. It ends with writings on current indigenous movements across the region. The first unit engages nineteenth-century debates over “American identity” that were foundational to the newly constituted nation-states (authors include Bolívar, Lastarria, Alamán, Martí, Sarmiento, Echeverría, Montalvo). The second explores twentieth-century debates over cultural independence, the movement of “indigenismo,” mestizaje, transculturation and heterogeneity, the Caribbean movement of “negritude,” the metaphor of “cannibalism” to account for the cultural politics of the region, concepts such as “internal colonialism” and “motley society,” and the polemics over the region’s capitalist modernity and postmodernity (authors include Rodó, da Cunha, Ortiz, Moreno Fragnals, Lezama Lima, Vasconcelos, Reyes, de Andrade, González Prada, Mariátegui, Antenor Orrego, Zapata, J.L. Borges, J.M. Arguedas, Sérgio Buarque de Holanda, Caio Prado Júnior, Jean Price-Mars, Jacques Roumain, Aimé Césaire, George Lamming, C.L.R. James, Fanon, Léon Damas, Paulo Freire, Angel Rama, Retamar, Edmundo O’Gorman, Antonio Candido, Darcy Ribeiro). The third explores recent debates over indigenous cosmologies, coloniality, and other ways of knowing (authors include Pablo González Casanova, León-Portilla, R. Kusch, René Zavaleta Mercado, A. Quijano, Bolívar Echeverría, Silvia Rivera Cusicanqui, Viveiros de Castro). There is an extra session on the tradition of Latin American feminist thought depending on the interests of the group. Weekly sessions are conducted in Spanish, and most of the readings are Spanish, French, and Portuguese materials (with a few Anglo-Caribbean sources). Students will be provided with English translations if they prefer and will be allowed to write their papers in English.

CPLT 985a / AFST 969a / FREN 969a, Islands, Oceans, Deserts Jill Jarvis

This seminar brings together literary and theoretical works that chart planetary relations and connections beyond the paradigm of francophonie. Comparative focus on the poetics and politics of spaces shaped by intersecting routes of colonization and forced migrations: islands (Sri Lanka, Mauritius, Martinique), oceans (Indian,

Mediterranean, Atlantic), and deserts (Sahara, Sonoran). Prerequisite: reading knowledge of French; knowledge of Arabic and Spanish invited. Conducted in English.

Computational Biology and Bioinformatics

300 George Street, Suite 501, 203.737.6029

<http://cbb.yale.edu>

M.S., Ph.D.

Director of Graduate Studies

Hongyu Zhao (300 George St., Suite 503, 203.785.3613, hongyu.zhao@yale.edu)

Professors Marcus Bosenberg (*Dermatology; Pathology*), Cynthia Brandt (*Emergency Medicine; Anesthesiology*), Kei-Hoi Cheung (*Emergency Medicine*), Ronald Coifman (*Mathematics; Computer Science*), Stephen Dellaporta (*Molecular, Cellular, & Developmental Biology*), Richard Flavell (*Immunobiology*), Joel Gelernter (*Genetics; Neuroscience*), Mark Gerstein (*Biomedical Informatics; Molecular Biophysics & Biochemistry; Computer Science*), Antonio Giraldez (*Genetics*), Murat Gunel (*Neurosurgery; Genetics*), Jonathon Howard (*Molecular Biophysics & Biochemistry; Physics*), Amy Justice (*Internal Medicine; Public Health*), Naftali Kaminski (*Internal Medicine*), Douglas Kankel (*Molecular, Cellular, & Developmental Biology*), Harlan Krumholz (*Internal Medicine; Investigative Medicine; Public Health*), Haifan Lin (*Cell Biology; Genetics*), Shuangge Ma (*Public Health*), Corey O'Hern (*Mechanical Engineering & Materials Science; Applied Physics; Physics*), Lajos Pusztai (*Internal Medicine*), Anna Pyle (*Molecular Biophysics & Biochemistry*), Gordon Shepherd (*Neuroscience*), David Stern (*Pathology*), Günter Wagner (*Ecology & Evolutionary Biology*), Heping Zhang (*Public Health; Statistics & Data Science*), Hongyu Zhao (*Public Health; Genetics*), Steven Zucker (*Computer Science; Electrical Engineering; Biomedical Engineering*)

Associate Professors Murat Acar (*Molecular, Cellular, & Developmental Biology*), Damon Clark (*Molecular, Cellular, & Developmental Biology*), Chris Cotsapas (*Neurology*), Forrest Crawford (*Public Health*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology*), Farren Isaacs (*Molecular, Cellular, & Developmental Biology*), Steven Kleinstein (*Pathology*), Yuval Kluger (*Pathology*), Michael Krauthammer (*Pathology*), Jun Lu (*Genetics*), Kathryn Miller-Jensen (*Engineering & Applied Science*), James Noonan (*Genetics*), Jeffrey Townsend (*Public Health*), Zuoheng (Anita) Wang (*Public Health*)

Assistant Professors Julien Berro (*Molecular Biophysics & Biochemistry*), Smita Krishnaswamy (*Genetics*), Monkol Lek (*Genetics*), Morgan Levine (*Pathology*), Benjamin Machta (*Physics*)

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.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants are expected (1) to have a strong foundation in the basic sciences, such as biology, chemistry, and mathematics, and (2) to have training in computing/informatics, including significant computer programming experience. The Graduate Record Examination (GRE) General Test is required, and the GRE Subject Test in Biochemistry, Cell and Molecular Biology; Biology; Chemistry; Computer Science; or other relevant discipline is recommended. Alternatively, the Medical College Admission Test (MCAT) may be substituted for the GRE tests. Applicants for whom English is not their native language are required to submit results from the Test of English as a Foreign Language (TOEFL).

To enter the Ph.D. program, students apply to an interest-based track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), <http://bbs.yale.edu>.

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 or CB&B 561, and CB&B 752. A typical program will include ten courses. 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 courses. 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 courses 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, except that there are no requirements for fulfilling laboratory research rotations, serving as a teaching assistant, or completing a Ph.D. dissertation. 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 Simon Mochrie

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 / CPSC 553a / GENE 555a, Machine Learning for Biology Smita Krishnaswamy

This course introduces biology as a systems and data science through open computational problems in biology, the types of high-throughput data that are being produced by modern biological technologies, and computational approaches that may be used to tackle such problems. We cover applications of machine-learning methods in the analysis of high-throughput biological data, especially focusing on genomic and proteomic data, including denoising data; nonlinear dimensionality reduction for visualization and progression analysis; unsupervised clustering; and information

theoretic analysis of gene regulatory and signaling networks. Students' grades are based on programming assignments, a midterm, a paper presentation, and a final project.

CB&B 561a / MB&B 561a / MBIO 561a / MCDB 561a / PHYS 561a, Introduction to Dynamical Systems in Biology Damon Clark, Kathryn Miller-Jensen, and Jonathon Howard

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MATLAB in a series of in-class hackathons that illustrate biological examples discussed in lectures.

CB&B 562b / AMTH 765b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b / PHYS 562b, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or a 200-level biology course, or permission of the instructor.

CB&B 601b / IBIO 601b, Fundamentals of Research: Responsible Conduct of Research Carla Rothlin

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

CB&B 645b / BIS 692 / S&DS 645b, Statistical Methods in Computational Biology Hongyu Zhao

Introduction to problems, algorithms, and data analysis approaches in computational biology and bioinformatics. We discuss statistical issues arising in analyzing population genetics data, gene expression microarray data, next-generation sequencing data, microbiome data, and network data. Statistical methods include maximum likelihood, EM, Bayesian inference, Markov chain Monte Carlo, and methods of classification and clustering; models include hidden Markov models, Bayesian networks, and graphical models. Prerequisite: S&DS 538, S&DS 542, or S&DS 661. Prior knowledge of biology is not required, but some interest in the subject and a willingness to carry out calculations using R is assumed.

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

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

CB&B 740a, Clinical and Translational Informatics Richard Shiffman and Michael Krauthammer

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 745b / AMTH 745b / CPSC 745b, Advanced Topics in Machine Learning and Data Mining Smita Krishnaswamy and Guy Wolf

An overview of advances in the past decade in machine learning and automatic data-mining approaches for dealing with the broad scope of modern data-analysis challenges, including deep learning, kernel methods, dictionary learning, and bag of words/features. This year, the focus is on a broad scope of biomedical data-analysis tasks, such as single-cell RNA sequencing, single-cell signaling and proteomic analysis, health care assessment, and medical diagnosis and treatment recommendations. The seminar is based on student presentations and discussions of recent prominent publications from leading journals and conferences in the field. Prerequisite: basic concepts in data analysis (e.g., CPSC 545 or 563) or permission of the instructor.

CB&B 750b, Core Topics in Biomedical Informatics Kei-Hoi Cheung and Cynthia Brandt

The course focuses on providing an introduction to common unifying themes that serve as the foundation for different areas of biomedical informatics, including clinical, neuro-, and genome informatics. The course is designed for students with significant computer experience and course work who plan to build databases and computational tools for use in biomedical research. Emphasis is on understanding basic principles underlying informatics approaches to interoperability among biomedical databases and software tools, standardized biomedical vocabularies and ontologies, biomedical natural language processing, modeling of biological systems, high-performance computation in biomedicine, and other related topics.

CB&B 752b / CPSC 752b / MB&B 752b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein

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, 203.432.1283, vladimir.rokhlin@yale.edu)

Professors Dana Angluin, James Aspnes, Dirk Bergemann,* Ronald Coifman,* Julie Dorsey, Stanley Eisenstat, 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 Tassioulas,* Y. Richard Yang, Steven Zucker†

Associate Professor Mahesh Balakrishnan

Assistant Professors Wenjun Hu,* Julian Jara-Ettinger,* Amin Karbasi,* Smita Krishnaswamy,* Sahand Negahban,* Ruzica Piskac, Mariana Raykova, Jakub Szefer,* Marynel Vázquez

Senior Lecturer Stephen Slade

Lecturers Benedict Brown, James Glenn, Kyle Jensen,* Scott Petersen, Brad Rosen, Andrew Sherman, Xiyin Tang [Sp]

* 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 ADMISSIONS REQUIREMENTS

Applicants for admission should have strong preparation in mathematics, engineering, or science. They should be competent in programming but need no computer science beyond that basic level. The GRE General Test is required.

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 at a TF level 10; 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; e-mail, cs-admissions@cs.yale.edu.

COURSES

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 523b, Principles of Operating Systems Abraham Silberschatz

A survey of the underlying principles of modern operating systems. Topics include process management, memory management, storage management, protection and security, distributed systems, and virtual machines. Emphasis on fundamental concepts rather than implementation.

CPSC 524a, Parallel Programming Techniques Andrew Sherman

Practical introduction to parallel programming, emphasizing techniques and algorithms suitable for scientific and engineering computations. Aspects of processor and machine architecture. Techniques such as multithreading, message passing, and data parallel computing using graphics processing units. Performance measurement, tuning, and debugging of parallel programs. Parallel file systems and I/O.

CPSC 527a, Object-Oriented Programming Michael Fischer

Object-oriented programming as a means to efficient, reliable, modular, reusable code. Use of classes, derivation, templates, name-hiding, exceptions, polymorphic functions, and other features of C++.

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 533a, Computer Networks Yang Yang

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

CPSC 534b, Topics in Networked Systems Yang 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 Abraham 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 539b, Software Engineering Ruzica Piskac

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 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 553a / CB&B 555a / GENE 555a, Machine Learning for Biology Smita Krishnaswamy

This course introduces biology as a systems and data science through open computational problems in biology, the types of high-throughput data that are being produced by modern biological technologies, and computational approaches that may be used to tackle such problems. We cover applications of machine-learning methods in the analysis of high-throughput biological data, especially focusing on genomic and proteomic data, including denoising data; nonlinear dimensionality reduction for visualization and progression analysis; unsupervised clustering; and information theoretic analysis of gene regulatory and signaling networks. Students' grades are based on programming assignments, a midterm, a paper presentation, and a final project.

CPSC 554a, Software Analysis and Verification Ruzica Piskac

Introduction to concepts, tools, and techniques used in the formal verification of software. State-of-the-art tools used for program verification; detailed insights into algorithms and paradigms on which those tools are based, including model checking, abstract interpretation, decision procedures, and SMT solvers.

CPSC 556b / ENAS 951b, 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).

CPSC 565b, Theory of Distributed Systems James Aspnes

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

CPSC 567a, Cryptography and Computer Security Mariana Raykova

A survey of such private and public key cryptographic techniques as DES, RSA, and zero-knowledge proofs, and their application to problems of maintaining privacy and security in computer networks. Focus on technology, with consideration of such societal

issues as balancing individual privacy concerns against the needs of law enforcement, vulnerability of societal institutions to electronic attack, export regulations and international competitiveness, and development of secure information systems.

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 573a, Intelligent Robotics Laboratory Brian Scassellati

Students work in small teams to construct novel research projects using one of a variety of robot architectures. Project topics may include human-robot interaction, adaptive intelligent behavior, active perception, humanoid robotics, and socially assistive robotics.

CPSC 574a, Computational Intelligence for Games James Glenn

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

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

CPSC 577b, Natural Language Processing Dragomir Radev

Linguistic, mathematical, and computational fundamentals of natural language processing (NLP). Topics include part of speech tagging, Hidden Markov models, syntax and parsing, lexical semantics, compositional semantics, machine translation, text classification, discourse, and dialogue processing. Additional topics such as sentiment analysis, text generation, and deep learning for NLP.

CPSC 578a, Computer Graphics Holly Rushmeier

Introduction to the basic concepts of two- and three-dimensional computer graphics. Topics include affine and projective transformations, clipping and windowing, visual perception, scene modeling and animation, algorithms for visible surface determination, reflection models, illumination algorithms, and color theory.

CPSC 579b, Advanced Topics in Computer Graphics Julie Dorsey

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

CPSC 640b, Topics in Numerical Computation Vladimir Rokhlin

This course discusses several areas of numerical computing that often cause difficulties to non-numericists, from the ever-present issue of condition numbers and ill-posedness to the algorithms of numerical linear algebra to the reliability of numerical software.

The course also provides a brief introduction to “fast” algorithms and their interactions with modern hardware environments. The course is addressed to Computer Science graduate students who do not necessarily specialize in numerical computation; it assumes the understanding of calculus and linear algebra and familiarity with (or willingness to learn) either C or FORTRAN. Its purpose is to prepare students for using elementary numerical techniques when and if the need arises.

CPSC 663b / AMTH 663b, Deep Learning Theory and Applications Smita

Krishnaswamy

Deep neural networks have gained immense popularity in the past decade due to their outstanding 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 and a final project—either group or individual, depending on the total number enrolled—with both a written and oral (i.e., presentation) component.

CPSC 667b, Advanced Cryptography and Security Mariana Raykova

Recent developments in cryptography. Topics include secure multiparty computation, verifiable computation, cryptographic obfuscation, functional encryption, and more. We study the motivation for, applications of, and security requirements for each of these primitives. We then focus on a few different constructions that instantiate each primitive and the formal proofs of security for them. Another point of consideration is the efficiency properties for the constructions, both asymptotically and in concrete practical terms when implementations are available.

CPSC 690a or b, Independent Project I Staff

By arrangement with faculty.

CPSC 691a or b, Independent Project II Staff

By arrangement with faculty.

CPSC 692a or b, Independent Project Staff

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

CPSC 745b / AMTH 745b / CB&B 745b, Advanced Topics in Machine Learning and Data Mining Smita Krishnaswamy and Guy Wolf

An overview of advances in the past decade in machine learning and automatic data-mining approaches for dealing with the broad scope of modern data-analysis challenges, including deep learning, kernel methods, dictionary learning, and bag of words/features. This year, the focus is on a broad scope of biomedical data-analysis tasks, such as single-cell RNA sequencing, single-cell signaling and proteomic analysis, health care assessment, and medical diagnosis and treatment recommendations. The seminar is based on student presentations and discussions of recent prominent publications from leading journals and conferences in the field. Prerequisite: basic concepts in data analysis (e.g., CPSC 545 or 563) or permission of the instructor.

CPSC 752b / CB&B 752b / MB&B 752b / MCDB 752b, Biomedical Data Science:**Mining and Modeling** Mark Gerstein

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 800a or b, Directed Readings Staff

By arrangement with faculty.

CPSC 990a, Ethical Conduct of Research for Master's Students Holly Rushmeier

This course meets on four consecutive Fridays.

East Asian Languages and Literatures

143 Elm Street, Rm. 102, 203.432.2860

<http://eall.yale.edu>

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

Chair

Tina Lu

Director of Graduate Studies

Edward Kamens

Professors Kang-i Sun Chang, Aaron Gerow, Edward Kamens, Tina Lu, Jing Tsu

Associate Professor Michael Hunter

Assistant Professors Lucas Bender, Seth Jacobowitz

Senior Lecturer Pauline Lin

Lecturer Stephen Poland

Senior Lectors II Seungja Choi, Angela Lee-Smith

Senior Lectors Hsiu-hsien Chan, Min Chen, Koichi Hiroe, Rongzhen Li, Ninghui Liang, Fan Liu, Yoshiko Maruyama, Michiaki Murata, Hiroyo Nishimura, Masahiko Seto, Jianhua Shen, Mari Stever, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Peisong Xu, Yongtao Zhang, William Zhou

Lector Aoi Saito

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 ADMISSIONS REQUIREMENTS

The department requires entering students in Chinese or Japanese (and the Combined Program in Film and Media Studies) to have completed at least three years of study, or the equivalent, of either Chinese or Japanese. Students applying in Chinese are expected to have completed at least one year of literary Chinese. Students applying in premodern Japanese are expected to have completed at least one year of literary Japanese. This is a doctoral program; no students are admitted for terminal master's degrees.

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. Graduate courses taken for a grade of Satisfactory/Unsatisfactory in other departments in which those courses are counted toward that department's doctoral course 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 director of graduate studies (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, 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://call.yale.edu>.

COURSES

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

EALL 506b / HSAR 509b, Japanese Classics in Text and Image Edward Kamens and Mimi Yiengpruksawan

Fiction, poetry, and plays from the eighth century through the nineteenth, studied alongside related works of art and illustrated books housed in collections at Yale. An introduction to the Japanese classics as well as an example of interdisciplinary study in the humanities. No knowledge of Japanese required.

EALL 511a, Women and Literature in Traditional China Kang-i Sun Chang

This course focuses on major women writers in traditional China, as well as representations of women by male authors. Topics include the power of women's writing; women and material culture; women in exile; courtesans; Taoist and Buddhist nuns; widow poets; the cross-dressing women; the female body and its metaphors; foot binding and its implications; women's notion of love and death; the aesthetic of illness; women and revolution; women's poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no knowledge of Chinese required. Some Chinese texts provided for students who read Chinese.

EALL 530a, Poetry and Ethics Amidst Imperial Collapse Lucas Bender

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

EALL 552a, Japanese Cinema before 1960 Aaron Gerow

The history of Japanese cinema to 1960, including the social, cultural, and industrial backgrounds to its development. Periods covered include the silent era, the coming of sound and the wartime period, the occupation era, the golden age of the 1950s, and the new modernism of the late 1950s.

EALL 555b, Japanese Modernism Seth Jacobowitz

Japanese literature and art from the 1920s through the 1940s. The avant-garde and mass culture; popular genre fiction; the advent of new media technologies and techniques; effects of Japanese imperialism, militarism, and fascism on cultural production; experimental writers and artists and their resistance to, or complicity with, the state.

EALL 565b, Japanese Literature after 1970 Stephen Poland

Study of Japanese literature published between 1970 and the present. Writers may include Murakami Ryu, Maruya Saiichi, Shimada Masahiko, Nakagami Kenji, Yoshimoto Banana, Yamada Eimi, Murakami Haruki, and Medoruma Shun. No knowledge of Japanese required.

EALL 580a / FILM 872a, East Asian Martial Arts Cinema Aaron Gerow

An investigation of the martial arts films of East Asia (Japan, China, Hong Kong, Korea, Taiwan), including the samurai film, kung-fu and karate film, and wuxia film, and the roles they play in constructing nationalism and transnationalism, gender, stardom, spirituality, and mediality.

EALL 586a / CPLT 952a, Modern Novel in Japan and Brazil Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism.

EALL 599b, Decolonizing East Asia Stephen Poland

This course explores how literary and cinematic works engaged with, promoted, critiqued, and struggled with empire and colonization in East Asia from the late-nineteenth century to the present. We explore how the very ideas of “literature” and “cinema” in East Asia were entangled with the rise of the Japanese empire in the context of imperial rivalry with Europe, and how these categories were contested and transformed by writers and filmmakers in colonial and postcolonial contexts. The course also examines how discourses of empire and colonization continued to be relevant in post-WWII cultural works grappling with the neoimperialism of Soviet-American Cold War order. Finally, we consider questions of empire and colonization after the Cold War, especially in terms of the rise of China and continued relevance of past imperial formations in twenty-first-century cultural production.

EALL 600a, Sinological Methods Pauline Lin

A research course in Chinese studies, designed for students with background in modern and literary Chinese. Exploration and evaluation of the wealth of primary sources and research tools available in Chinese. 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 the compilation and development of Chinese bibliographies; bibliophiles’ notes; editions, censorship, and textual variation and reliability; specialized dictionaries; maps and geographical gazetteers; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias and compendia.

EALL 602a, Readings in Classical Chinese Prose Kang-i Sun Chang

Close reading of classical Chinese texts (wenyan) primarily from late Imperial China. A selection of formal and informal prose, including memoirs, sanwen essays, classical tales, biographies, and autobiographies. Focus on cultural and historical contexts, with attention to reception in China and in some cases in Korea and Japan. Questions concerning readership and governmental censorship, function of literature, history and fictionality, memory and writing, and the aesthetics of qing (emotion). Readings in Chinese; discussion in English. Prerequisite: CHNS 171 or equivalent, or permission of instructor.

EALL 657a, Meiji Literature and Visual Culture Seth Jacobowitz

Introduction to the literature and visual culture of Meiji Japan (1868–1912), including novels, poetry, calligraphy, woodblock prints, painting, photography, and cinema. The relationship between theories and practices of fine art and literature; changes in word

and image relations; transformations from woodblock to movable-type print culture; the invention of photography and early forms of cinematic practice.

EALL 700a / RLST 594a, The Three Teachings in Medieval China Lucas Bender and Eric Greene

This course explores intersections between the Three Teachings—Buddhism, Daoism, and Confucianism—in late medieval China, focusing on the seventh through the ninth century. Too often studied in isolation from one another, these religious and intellectual teachings were deeply intertwined throughout this period, and scholars aiming to understand the religious, intellectual, and literary history of the Tang need to be able to read broadly across their boundaries. All primary readings are in classical/literary Chinese. Open to undergraduates with sufficient language skills. Prerequisite: reading ability in classical/literary Chinese.

EALL 710a / HSAR 822a, Fragmentism and Assemblage in Traditional Japanese Culture Edward Kamens and Mimi Yiengpruksawan

A cross-disciplinary consideration of the phenomenon of disaggregation of texts and visual artworks and their reconfiguration in new forms. Focus on examples from the Japanese past in comparative and theoretical perspective. Students engage directly in the preparation of an installation on this theme in the Yale Art Gallery for spring 2019. Prerequisite: proficiency in literary and modern Japanese.

EALL 773b / ANTH 531b / ARCG 531b / CLSS 815b / HIST 502b / HSAR 564b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual
Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

EALL 801b / CPLT 912b, Media Theory, Capitalism, and Japanese Modernity Seth Jacobowitz

This course introduces students to key aspects of Western media theory and media history through readings by leading thinkers such as Gilles Deleuze and Félix Guattari, Friedrich Kittler, Lewis Mumford, Martin Heidegger, and Marshall McLuhan. It then brings these works into dialogue with recent critical studies of Japanese modernity, capitalism, and contemporary information society by Naoki Sakai, Karatani Kojin, Akira Lippit, Azuma Hiroki, and others. All readings are in English.

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

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

EALL 850b, Theory in/and East Asia Stephen Poland

This seminar engages with the question of what “Theory” might mean in the context of East Asian cultural studies. Many critiques have been made of the way “traveling theory” serves as a Euro-American universal applied to the “raw material” of East Asian texts, or as a transdisciplinary common language in the humanities and social sciences. We take this notion as a starting point to explore the intersections and interactions of “Theory” and “East Asia.” Questions include: What is Theory? Who gets to theorize? How have thinkers in East Asia engaged with Theory? How has Theory engaged with East Asia? What have been the major issues and debates in Theory, and how can they apply to scholarship on East Asian cultural production? How can the work of thinkers in/of East Asia offer critiques of Theory, and what problems arise from such challenges? These questions will also be situated in the historical context of disciplinary formation and the creation of Area Studies in universities in the United States. Readings are primarily in English, but may also include Japanese, Chinese, or Korean depending on student interest and language abilities.

EALL 873a / EAST 573a / HIST 873a, China and the World circa 1900 Peter Perdue and Jing Tsu

Reading and discussion of significant themes in China and world history in the first decade of the twentieth century. We concentrate on topics that contain international, transnational, and comparative implications, and include discussion of literary and historical material. Most readings are in English, but selected primary sources in Asian languages may be used. Open to all History, East Asian Studies, and East Asian Languages and Literatures students, and others by request. Includes research paper and weekly writing exercises. Prerequisite: knowledge of one foreign language, European or Asian.

EALL 900a or b, Directed Readings Pauline Lin

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

EALL 990a or b, Directed Research Pauline Lin

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

JAPN 510a or b, Japanese for Sinologists Masahiko Seto

Intensive Japanese reading course designed for Sinologists. Includes canonical texts from the nineteenth to the twentieth century by Japanese scholars of Chinese history, literature, cultural studies, and law. Reading comprehension and grammar as well as vocabulary are strengthened. The principal text is *Japanese for Sinologists* by Joshua A. Fogel and Fumiko Joo. Prerequisite: JAPN 150 or equivalent.

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.

JAPN 571b, Readings in Literary Japanese Staff

Close analytical reading of a selection of texts from the Nara through Tokugawa period: prose, poetry, and various genres. Introduction of *kanbun*. Prerequisite: JAPN 570 or equivalent.

East Asian Studies

The MacMillan Center
320 Luce Hall, 203.432.3426
<http://ceas.yale.edu>
M.A.

Chair

Jing Tsu (jing.tsu@yale.edu)

Director of Graduate Studies

Peter Perdue (RKZ 242, 617.905.3702, peter.c.perdue@yale.edu)

Professors Daniel Botsman (*History*), Kang-i Sun Chang (*East Asian Languages & Literatures*), 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*), Peter Perdue (*History*), Frances Rosenbluth (*Political Science*), Helen Siu (*Anthropology*), Jing Tsu (*East Asian Languages & Literatures; Comparative Literature*), Anne Underhill (*Anthropology*), Mimi Hall Yiengpruksawan (*History of Art*)

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

Assistant Professors Lucas Bender (*East Asian Languages & Literatures*), Eric Greene (*Religious Studies*), Denise Ho (*History*), Seth Jacobowitz (*East Asian Languages & Literatures*), Daniel Mattingly (*Political Science*)

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

Lecturers Charles Chang, Gabrielle Niu, Young Sun Park, Michael Thornton

Senior Lectors II Seungja Choi, Angela Lee-Smith

Senior Lectors Hsiu-hsien Chan, Min Chen, Koichi Hiroe, Rongzhen Li, Ninghui Liang, Fan Liu, Yoshiko Maruyama, Michiaki Murata, Hiroyo Nishimura, Masahiko Seto, Jianhua Shen, Mari Stever, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Peisong Xu, Yongtao Zhang, William Zhou

Lector Aoi Saito

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—Forestry & Environmental Studies, 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-graduate-school>; e-mail, graduate.admissions@yale.edu.

COURSES

Please consult the course information available online at <http://ceas.yale.edu/academics/courses> and <http://courses.yale.edu> for a complete list of East Asian-related courses offered at Yale University.

EAST 500a / HSAR 803a, Reflecting Truth: Meiji Photography between Performativity and Representation, Modernity and Empire Staff

Celebrating 150 years since the Meiji Restoration (1868) is an ideal opportunity to look back and ponder the engagement with an alternative history of photography, from a Japanese point of view. Photography arrived in Japan soon after its creation in the UK and France (1839), and first images were created as soon as 1848 in Kagoshima and Nagasaki. We consider the two paths photography developed in Japan, and their intersections: experimental approaches with performative modes of execution (i.e., direct light, opaque image, camera-less photographs, etc.), versus representations of Japan, a method that can be studied through two tracks—the creation of exotic, nonmodern images for the Western, consuming eye; and the documentation of Japan's rapid modernization and political developments into settlement, nationalism, colonialism, and militarism.

EAST 511b / RLST 598b, Modern Korean Buddhism in the Global Context 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 573a / EALL 873a / HIST 873a, China and the World circa 1900 Peter Perdue and Jing Tsu

Reading and discussion of significant themes in China and world history in the first decade of the twentieth century. We concentrate on topics that contain international, transnational, and comparative implications, and include discussion of literary and historical material. Most readings are in English, but selected primary sources in Asian languages may be used. Open to all History, East Asian Studies, and East Asian Languages and Literatures students, and others by request. Includes research paper and weekly writing exercises. Prerequisite: knowledge of one foreign language, European or Asian.

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

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

EAST 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

Erika Edwards

Professors Richard Bribiescas (*Anthropology*), Nicholas Christakis (*Sociology*), Michael Donoghue, Casey Dunn, Erika Edwards, Alison Galvani (*Public Health*), Vivian Irish (*Molecular, Cellular, & Developmental Biology*), Walter Jetz, Thomas Near, David Post, Jeffrey Powell, Richard Prum, Eric Sargis (*Anthropology*), Oswald Schmitz (*Forestry & Environmental Studies*), David Skelly (*Forestry & Environmental Studies*), Stephen Stearns, Paul Turner, J. Rimas Vaisnys (*Electrical Engineering*), Günter Wagner

Associate Professors Forrest Crawford (*Public Health*), James Noonan (*Genetics*), Jeffrey Townsend (*Public Health*), David Vasseur

Assistant Professors Craig Brodersen (*Forestry & Environmental Studies*), Liza Comita (*Forestry & Environmental Studies*), Alvaro Sanchez, Carla Staver

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, phylogeny, molecular population genetics, developmental evolution, and evolutionary theory.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants should have had training in one of the following fields: biology, mathematics, chemistry, physics, statistics, and/or geology. Candidates are selected, regardless of their major, based on overall preparation for a career in research in ecology and evolutionary biology. Some, planning for careers in applied fields, may have prepared with courses in public policy, economics, and agriculture.

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 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, normally at a level 20, typically during their first two years of study.

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 Center for Science and Social Science Information.

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 ten graduate-level courses. At least four courses must be taken for a grade, and students must earn Honors in two courses and maintain an overall average of High Pass. 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. A minimum of five additional graduate-level courses (four taken for a grade) are required.

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; e-mail, 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

David Vasseur

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 515a, Conservation Biology Linda Puth

An introduction to ecological and evolutionary principles underpinning efforts to conserve Earth's biodiversity. Efforts to halt the rapid increase in disappearance of both plants and animals. Discussion of sociological and economic issues.

E&EB 520a, General Ecology David Vasseur

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 523b, Laboratory for Principles of Evolution, Ecology, and Behavior Marta Wells

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

E&EB 525b, Evolutionary Biology Alvaro Sanchez De Andres and Jeffrey Powell

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

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 530a, Field Ecology Linda Puth

A field-based introduction to ecological research. Experimental and descriptive approaches, comparative analysis, and modeling are explored through field and small-group projects.

E&EB 535a, Evolution and Medicine Stephen Stearns

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.

E&EB 545b, Responsible Conduct of Research Staff

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

E&EB 546a, Plant Diversity and Evolution Michael Donoghue

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 Michael Donoghue

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. Must be taken concurrently with E&EB 556.

E&EB 556a, 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 564a, Ichthyology Richard Harrington

A survey of fish diversity, including jawless vertebrates, chimaeras and sharks, lungfishes, and ray-finned fishes. Topics include the evolutionary origin of vertebrates, the fossil record of fishes, evolutionary diversification of major extant fish lineages, biogeography, ecology, and reproductive strategies of fishes.

E&EB 565La, Laboratory for Ichthyology Richard Harrington**E&EB 626b, Plant Structure and Function** Erika Edwards

An examination of the relationship between the structure of plants and their physiological systems, and the role of the environment in shaping the evolution and diversity of vascular plants. Lectures focus on exploring the basics of plant morphology, and the anatomical and physiological adaptations of leaves, stems, and roots to different habitats. A comparative, phylogenetic approach is emphasized. This is a hybrid lecture/

lab course: the first two-thirds of the course consists of chalkboard lectures by the instructor and the last third is an intensive period of data collection and analysis, providing students with firsthand experience in measuring and interpreting plant functional traits. Students work on a set of group projects that are designed to test long-standing assumptions about the evolution and adaptive nature of certain plant traits. Projects differ from year to year, and although the general theme is chosen by the instructor, students are expected to play a large role in experimental design and focus. Students leave the class with a solid foundation both in plant anatomy and ecophysiology and in applying a phylogenetic comparative approach to studies of organismal biology; and they gain firsthand experience in data collection, experimental design, data analysis, and the collaborative presentation of a scientific study. Permission of the instructor required. Must be taken in conjunction with E&EB 627L.

E&EB 627Lb, Plant Structure and Function Lab Erika Edwards

An examination of the relationship between the structure of plants and their physiological systems, and the role of the environment in shaping the evolution and diversity of vascular plants. Lectures focus on exploring the basics of plant morphology, and the anatomical and physiological adaptations of leaves, stems, and roots to different habitats. A comparative, phylogenetic approach is emphasized. This is a hybrid lecture/lab course: the first two-thirds of the course consists of chalkboard lectures by the instructor and the last third is an intensive period of data collection and analysis, providing students with firsthand experience in measuring and interpreting plant functional traits. Students work on a set of group projects that are designed to test long-standing assumptions about the evolution and adaptive nature of certain plant traits. Projects differ from year to year, and although the general theme is chosen by the instructor, students are expected to play a large role in experimental design and focus. Students leave the class with a solid foundation both in plant anatomy and ecophysiology and in applying a phylogenetic comparative approach to studies of organismal biology; and they gain firsthand experience in data collection, experimental design, data analysis, and the collaborative presentation of a scientific study. Must be taken in conjunction with E&EB 626. ½ Course cr

E&EB 672b, Ornithology Richard Prum

An overview of avian biology and evolution, including the structure, function, behavior, and diversity of birds. The evolutionary origin of birds, avian phylogeny, anatomy, physiology, neurobiology, breeding systems, and biogeography.

E&EB 673Lb, Laboratory for Ornithology Richard Prum

Laboratory and field studies of avian morphology, diversity, phylogeny, classification, identification, and behavior. Must be taken concurrently with E&EB 672. ½ Course cr

E&EB 678a, Mathematical Models and Quantitative Methods in Evolution and

Ecology Alvaro Sanchez De Andres

In this course, we focus on how quantitative approaches are used to allow scientific inference. We discuss general principles for generating hypotheses that are testable (i.e., quantifiable). The course also examines a variety of approaches used to model population-level processes in evolution and ecology, including an overview of population genetics, quantitative genetics, optimality models, game theory, and population dynamic equations. We also discuss experimental design, statistical analyses, inference, and other quantitative methods. The course assumes a basic

background in algebra, calculus, probability theory, and statistics. Please address any questions regarding the course to alvaro.sanchez@yale.edu.

E&EB 680b, Life History Evolution Stephen Stearns

Life history evolution studies how the phenotypic traits directly involved in reproductive success are shaped by evolution to solve ecological problems. The intimate interplay between evolution and ecology.

E&EB 705b, Plant Ecology Ann Staver

Plant ecology is the study of plant interactions with their environment, at the level of individuals, and of how plant-plant interactions mediate environmental interactions at the level of populations, communities, and ecosystems. The course incorporates empirical and theoretical perspectives, emphasizing the empirical origins of concepts in plant ecology and effective empirical tests of conceptual and mathematical predictions. Students read the primary scientific literature extensively, both for content and to build familiarity with methodological standards and the scientific writing.

E&EB 713b, Concepts and Methods in Global Biodiversity Change Research in the Age of Big Data Walter Jetz

Biodiversity and the many functions it provides are changing worldwide, creating a critical need for a better understanding of mechanisms underpinning this change and the development of new information products to help monitoring and mitigation. New technologies, data, and methods, as well as conceptual advances, increasingly enable work addressing this challenge for species and communities at a global scale. We discuss these new opportunities and familiarize ourselves with recent research and new approaches to global biodiversity change. The course combines in-depth discussion of recent empirical work and hands-on examples of biodiversity change analysis workflows. On the technical front, we explore the use of remote sensing through Google Earth Engine (GEE) and work through R-based scripted examples of species distribution and community change modeling. The course is offered in collaboration with the Yale Center for Biodiversity and Global Change (<https://bgc.yale.edu>) and includes seminars and discussions with guest speakers.

E&EB 725a, Scientific Writing for Ecology and Evolutionary Biology Ann Staver

This course provides guidance and practice for graduate students in grant and manuscript writing in the fields of ecology and evolutionary biology. Students produce one grant application (NSF GRFP/DDIG or similar) and one manuscript for publication (on a topic of their choice, to contribute to their thesis or other ongoing work).

E&EB 810b, Dynamics of Evolving Systems J. Rimas Vaišnys

An introduction to the ways evolving biological systems can be described, modeled, and analyzed by using a dynamical systems approach. To use currently fashionable terminology, we develop an individual-based model of the behavior of biological populations, which leads to evolution as an emergent property. In this approach it is possible to construct populations of varying individuals, which can then be combined into larger assemblages, and to modify both the overall environment and the environments at the lower levels, so that aspects often neglected in modeling evolution can be explored and related to any available observational data. Extensive use of the software package Mathematica, but prior experience with the program is not required.

E&EB 842b / ANTH 835b, Primate Diversity and Evolution Eric Sargis

The diversity and evolutionary history of living and extinct primates. Focus on major controversies in primate systematics and evolution, including the origins and relationships of several groups. Consideration of both morphological and molecular studies. Morphological diversity and adaptations explored through museum specimens and fossil casts.

E&EB 900a or b, First-Year Introduction to Research and Rotations Erika Edwards

E&EB 901a, Research Rotation I Erika Edwards

E&EB 902b, Research Rotation II Erika Edwards

E&EB 903b, Independent Study Erika Edwards

By arrangement with faculty. Approval of DGS required.

E&EB 930a or b / G&G 703a or b, Seminar in Systematics Jacques Gauthier

A seminar on using molecular evolutionary models in Bayesian phylogenetic analyses. Topics are chosen by the participants but may include “models” in phylogenetics, understanding and comparison of model selection criteria, effects of model under- and overparameterization on parameter value estimates and phylogenetic inferences, and accommodating model uncertainty and model-averaging.

E&EB 950a or b, Second-Year Research Erika Edwards

By arrangement with faculty.

Economics

28 Hillhouse Avenue, 203.432.3575

<http://economics.yale.edu>

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

Chair

Dirk Bergemann (28 Hillhouse, 203.432.3571)

Director of Graduate Studies

Truman Bewley (30 Hillhouse, Rm. 30, 203.432.3719, truman.bewley@yale.edu)

Professors Joseph Altonji, Donald Andrews, Konstantinos Arkolakis, Dirk Bergemann, Steven Berry, Truman Bewley, Xiaohong Chen, Zhiwu Chen (*Management*), Ray Fair, Howard Forman (*Public Health*), John Geanakoplos, Pinelopi Goldberg, Timothy Guinnane, Philip Haile, Marina Halac, Johannes Hörner, Jonathan Ingersoll (*Management*), Gerald Jaynes, Yuichi Kitamura, Alvin Klevorick, Samuel Kortum, Naomi Lamoreaux, Giovanni Maggi, Costas Meghir, Robert Mendelsohn (*Forestry & Environmental Studies*), Giuseppe Moscarini, William Nordhaus, Gerard Padró i Miquel, Peter Phillips, Benjamin Polak, Mark Rosenzweig, Larry Samuelson, Robert Shiller, Anthony Smith, Aleh Tsyvinski, Edward Vytlačil, Ebonya Washington, Fabrizio Zilibotti

Associate Professors Timothy Armstrong, Mitsuru Igami, Joseph Shapiro

Assistant Professors José-Antonio Espín-Sánchez, Mira Frick, John Eric Humphries, Zhen Huo, Ryota Iijima, Ilse Lindenlaub, Yusuke Narita, Cormac O'Dea, Michael Peters, Nicholas Ryan

FIELDS OF STUDY

Fields include economic theory, including microeconomics, macroeconomics, mathematical economics; econometrics; economic history; labor economics; industrial organization; financial economics; behavioral finance; public economics; public finance; international trade; international finance; economic development; behavioral economics; law and economics.

SPECIAL ADMISSIONS REQUIREMENTS

Please see <http://economics.yale.edu/graduate/application-info>.

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. (Courses in the International and Development Economics master's program do not satisfy this requirement.) (1.2) Students must pass written comprehensive examinations in microeconomics and macroeconomics. These are given in May and late August each year. One or both may be taken in the August just prior to the first year of study with permission of the director of graduate studies (DGS). Examinations

not passed prior to the first year of study must be taken in the spring term of the first year. In the event of failure, the failed exam must be retaken the next time it is offered. Students may take each comprehensive exam no more than two times. Students who have not passed both 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 M.A. degree. The microeconomics and macroeconomics comprehensive exams will be given on two different days for at least three hours. The examinations scheduled in the spring term will occur approximately a week after the end of course exams. The questions on the comprehensive exams will be on topics taught in the first-year microeconomic and macroeconomic courses of the immediately preceding year. Each exam will be graded separately. In the event of failure, students will retake only the exam they did not pass. Comprehensive exams taken by students prior to their first year will be graded as a pass only if they are a "solid" pass rather than a "minimal" pass.

Students considering a combined degree with Economics and another department or program should consult the Economics department website: <https://economics.yale.edu/graduate/combined-doctoral-degrees>. The proposal for a combined degree should be submitted during the summer after the first year of study.

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 applied econometrics paper, discussed under (3.3) below. (2.5) All students must make their first attempt at each of two oral 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. At least one of the fields must have substantial empirical and institutional content. Such applied fields are drawn from a departmental list that includes labor economics, market organization, macroeconomics, financial economics, behavioral economics, economics of the public sector and of the environment, international trade and finance, economic development, economic history, and comparative economic systems. Students may also choose as one of their fields mathematical economics, advanced micro- or macroeconomic theory, or econometric theory. 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 take the oral examination in one field no more than twice. An oral examination that was failed on the first attempt must be retaken in the fall of the third year, and the retake must be in the same field. 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. Students are required to provide field sheets for each exam which list the literature and topics or subfields on which they wish to be examined. Students should consult faculty members as they prepare this list. Students are expected both to have command of the general field of the exam and to know in depth the material in the areas they specify. The examinations are normally question-and-answer on this material, but examiners are not required to restrict questioning to it. The broader the topics listed, the more likely examiners are to confine questioning to them.

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 applied econometrics paper, which is evaluated by a faculty adviser of the paper and another faculty member. 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 Applied Econometrics 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 oral qualifying examinations given by committees of faculty members. These exams are discussed under (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. (4) Third-year students who have not yet satisfied the econometrics paper requirement must submit an econometrics 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 on the Dissertation

The Economic 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. A substantial part of a dissertation must present work done and written solely by the student. 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 Courses

The following 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), and an economic history class that would satisfy the economic history requirement, (3.4) above, if a grade of at least HP- were obtained. In the following spring, they usually take ECON 501 (General Economic Theory: Microeconomics), ECON 511 (General Economic Theory: Macroeconomics), ECON 551 (Econometrics II), and a fourth course in economics or related subjects, such as probability theory, mathematics, finance, or political science. 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.

During the second year, students normally take economics courses in specialized fields, such as industrial organization, mathematical economics, international trade, or public finance. These courses serve as preparation for the oral qualifying examinations. Students may also take courses related to economics from other departments. It is a good idea to satisfy the econometrics paper requirement in the second year and to locate a faculty adviser to advise them about their studies.

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 can expect to take the initiative in making such contact.

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. Students admitted to this program pay three years of tuition to the Law School and one year of tuition to the Graduate School. The Graduate School does not offer fellowship support to J.D./M.A. candidates.

The M.A. in International and Development Economics is described under International and Development Economics.

COURSES

ECON 500a, General Economic Theory: Microeconomics Truman Bewley and Larry Samuelson

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 501b, General Economic Theory: Microeconomics Johannes Horner
General equilibrium and welfare economics. Allocation involving time. Public sector economics. Uncertainty and the economics of information. Introduction to social choice.

ECON 510a, General Economic Theory: Macroeconomics Michael Peters and Fabrizio Zilibotti

Analysis of short-run determination of aggregate employment, income, prices, and interest rates in closed and open economies. Stabilization policies.

ECON 511b, General Economic Theory: Macroeconomics Giuseppe Moscarini
Theories of saving, investment, portfolio choice, and financial markets. Longer-run developments; economic growth, capital accumulation, income distribution.

ECON 520a, Advanced Microeconomic Theory I Larry Samuelson
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 Juuso Valimäki
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 Giuseppe Moscarini and Ilse Lindenlaub
Heterogeneous agent economics, investment, scrapping and firing, nonquadratic adjustment costs, financial constraints, financial intermediation, psychology of decision making under risk, optimal risk management, financial markets, consumption behavior, monetary policy, term structure of interest rates.

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

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

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

ECON 531b, Mathematical Economics II Nicolas Werquin

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 fiat 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, Microeconomic Theory Workshop Staff

Presentations by research scholars and participating students.

ECON 540a, Student Workshop in Macroeconomics Staff

A course that gives third- and fourth-year students doing research in macroeconomics an opportunity to prepare their prospectuses and to present their dissertation work. Each student is required to make at least two presentations per term. For third-year students and beyond, at least one of the presentations in the first term should be a mock job talk.

ECON 542a, Macroeconomics Workshop Staff

A forum for presentation and discussion of state-of-the-art research in macroeconomics. Presentations by research scholars and participating students of papers in closed economy and open economy macroeconomics and monetary economics.

ECON 545a, Microeconomics Michael Boozer

A survey of the main features of current economic analysis and of the application of the theory to a number of important economic questions, covering microeconomics and demand theory, the theory of the firm, and market structures. For IDE students.

ECON 546a, Growth and Macroeconomics Fabrizio Zilibotti

This course presents a basic framework to understand macroeconomic behavior and the effects of macroeconomic policies. Topics include consumption and investment, labor market, short-run income determinations, unemployment, inflation, growth, and the effects of monetary and fiscal policies. The emphasis is on the relation between the underlying assumptions of macroeconomic framework and policy implications derived from it.

ECON 550a, Econometrics I Donald Andrews

Probability: concepts and axiomatic development. Data: tools of descriptive statistics and data reduction. Random variables and probability distributions; univariate distributions (continuous and discrete); multivariate distributions; functions of random variables and transformations; the notion of statistical inference; sampling concepts and distributions; asymptotic theory; point and interval estimation; hypothesis testing.

ECON 551b, Econometrics II Staff

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

ECON 552b, Econometrics III Xiaohong Chen

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 556a, Topics in Empirical Economics and Public Policy Yuichi Kitamura, Edward Vytlačil, and Yusuke Narita

Methods and approaches to empirical economic analysis are reviewed, illustrated, and discussed with reference to specific empirical studies. The emphasis is on learning to use methods and on understanding how specific empirical questions determine the empirical approach to be used. We review a broad range of approaches including program evaluation methods and structural modeling, including estimation approaches, computational issues, and problems with inference. Open only to doctoral students in the Department of Economics. Exceptionally, doctoral students from other departments may take the course for credit if a faculty member, normally from their department, can supervise and grade their term paper.

ECON 558a, Econometrics Michael Boozer

Application of statistical analysis to economic data. Basic probability theory, linear regression, specification and estimation of economic models, time series analysis, and forecasting. The computer is used. For IDE students.

ECON 559b, Development Econometrics (IDE) Michael Boozer**ECON 561b, Computational Methods in Economics** Anthony Smith

How to use computational methods to solve and analyze dynamic economic models. The first part of the course covers standard tools of numerical analysis that are useful in economics (minimization of functions, root-finding, interpolation, approximation of functions, integration, simulation). The second shows how to use these tools to study dynamic economic problems in macroeconomics, finance, labor economics, public finance, and industrial organization, paying special attention to methods for solving

stochastic dynamic programming problems and for computing equilibria in economic models with heterogeneous actors.

ECON 567a and ECON 568a, Econometrics Workshop Staff

A forum for state-of-the-art research in econometrics. Its primary purpose is to disseminate the results and the technical machinery of ongoing research in theoretical and applied fields.

ECON 570a 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 588a, 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 Steven Berry

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, Industrial Organization Seminar Staff

For advanced graduate students in applied microeconomics, serving as a forum for presentation and discussion of work in progress of students, Yale faculty members, and invited speakers.

ECON 630a, Labor Economics Konstantinos Meghir

Topics include static and dynamic approaches to demand, human capital and wage determination, wage income inequality, unemployment and minimum wages, matching and job turnover, immigration and international trade, unions, implicit contract theory, and efficiency wage hypothesis.

ECON 631b, Labor Economics Joseph Altonji and Yusuke Narita

Topics include static and dynamic models of labor supply, human capital wage function estimation, firm-specific training, compensating wage differentials, discrimination, household production, bargaining models of household behavior, intergenerational transfers, and mobility.

ECON 638a, Labor and Population Workshop Staff

A forum primarily for graduate students to present their research plans and findings. Discussions encompass empirical microeconomic research relating to both high- and low-income countries.

ECON 640a 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 Jonathan Ingersoll and 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 680a, Public Finance I Cormac O'Dea

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 681b, Public Finance II Joseph Shapiro

This course covers social insurance, health care, charitable giving, externalities, crime, and an introduction to political economy. Students are expected to participate actively in class discussion and to write and present a short empirical research paper.

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 Konstantinos Arkolakis and Giovanni Maggi

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 Samuel Kortum 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 Konstantinos Arkolakis

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, Workshop: International Trade Staff

ECON 730a, Economic Development I Mark Rosenzweig and Nicholas Ryan

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 Staff

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 737b, 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, 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 776a, Economics of Population Aleh Tsyvinski and Nicolas Werquin

The course investigates issues such as the causes and consequences of declining fertility rates, gender discrimination, disease, famine, and wars in the context of developing countries as well as historically in countries that are developed today. The class uses

economic methods, and students are expected to solve simple models and replicate empirical studies using STATA. Readings are mainly based on journal articles, while textbooks are mainly used as a reference. The course is graded on problem sets and two in-class exams. Prerequisites: statistics and intermediate microeconomics.

ECON 790b, Political Economy I Ebonya Washington

An overview of the field of empirical political economy. While students are expected to familiarize themselves with the most prevalent models in the field, the emphasis in this course is on the applied work. Students attain a working knowledge of the literature, learn to critically evaluate the literature, and most importantly develop the skills to come up with interesting, workable, and theoretically grounded research questions that will push that literature forward.

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

Dunham Laboratory, 203.432.4252

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

Chair

Leandros Tassioulas

Director of Graduate Studies

Hong Tang (hong.tang@yale.edu)

Professors James Duncan, Jung Han, Roman Kuc, Tso-Ping Ma, Rajit Manohar, A. Stephen Morse, Kumpati Narendra, Daniel Prober, Mark Reed, Peter Schultheiss (*Emeritus*), Lawrence Staib, Hong Tang, Leandros Tassioulas, J. Rimas Vaisnys, Y. Richard Yang

Associate Professors Richard Lethin (*Adjunct*), Fengnian Xia

Assistant Professors Wenjun Hu, Amin Karbasi, Jakub Szefer

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, and VLSI design and testing.

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

For course listings, see Engineering & Applied Science.

Engineering & Applied Science

Dunham Laboratory, 203.432.4252

<http://seas.yale.edu>

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

Interim Dean

Mitchell Smooke

Deputy Dean

Vincent Wilczynski

BIOMEDICAL ENGINEERING

Chair

Jay Humphrey

Director of Graduate Studies

Richard Carson (richard.carson@yale.edu)

Professors Richard Carson, Nicholas Christakis, Robin de Graaf, James Duncan, Karen Hirschi, Jay Humphrey, Fahmeed Hyder, Andre Levchenko, Evan Morris, Laura Niklason, Xenophon Papademetris, Douglas Rothman, W. Mark Saltzman, Martin Schwartz, Fred Sigworth, Brian Smith, Lawrence Staib, Hemant Tagare, Paul Van Tassel, Steven Zucker (*Computer Science*)

Associate Professors Joerg Bewersdorf (*Cell Biology*), Stuart Campbell, Michael Choma, Tarek Fahmy, Rong Fan, Anjelica Gonzalez, Themis Kyriakides (*Pathology*), Chi Liu, Kathryn Miller-Jensen

Assistant Professors Michael Mak, Michael Murrell, Steven Tommasini, Jiangbing Zhou

CHEMICAL & ENVIRONMENTAL ENGINEERING

Chair

Jaehong Kim

Director of Graduate Studies

Paul Van Tassel (paul.vantassel@yale.edu (paulvantassel@yale.edu))

Professors Eric Altman, Paul Anastas, Michelle Bell, Ruth Blake, Menachem Elimelech, Gary Haller (*Emeritus*), Edgar Hertwich, Edward Kaplan, Jaehong Kim, Michael Loewenberg, Andrew Miranker, Jordan Peccia, Lisa Pfefferle, Daniel Rosner (*Emeritus*), W. Mark Saltzman, Udo Schwarz, T. Kyle Vanderlick, Paul Van Tassel, Julie Zimmerman

Assistant Professors Drew Gentner, Amir Haji-Akbari, Shu Hu, Mingjiang Zhong

Lecturers Aniko Bezur, Katherine Schilling, Paul Whitmore

COMPUTER SCIENCE

Chair

Zhong Shao

Director of Graduate Studies

Vladimir Rokhlin (108 AKW, 203.432.1283, vladimir.rokhlin@yale.edu)

Professors Dana Angluin, James Aspnes, Dirk Bergemann,* Ronald Coifman,* Julie Dorsey, Stanley Eisenstat, 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 Tassioulas,* Y. Richard Yang, Steven Zucker†

Associate Professor Mahesh Balakrishnan

Assistant Professors Wenjun Hu,* Julian Jara-Ettinger,* Amin Karbasi,* Smita Krishnaswamy,* Sahand Negahban,* Ruzica Piskac, Mariana Raykova, Jakub Szefer,* Marynel Vázquez

Senior Lecturer Stephen Slade

Lecturers Benedict Brown, James Glenn, Kyle Jensen,* Scott Petersen, Brad Rosen, Andrew Sherman, Xiyin Tang [Sp]

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

† A joint appointment with another department.

ELECTRICAL ENGINEERING**Chair**

Leandros Tassioulas

Director of Graduate Studies

Hong Tang (hong.tang@yale.edu)

Professors James Duncan, Jung Han, Roman Kuc, Tso-Ping Ma, Rajit Manohar, A. Stephen Morse, Kumpati Narendra, Daniel Prober, Mark Reed, Peter Schultheiss (*Emeritus*), Lawrence Staib, Hong Tang, Leandros Tassioulas, J. Rimas Vaisnys, Y. Richard Yang

Associate Professors Richard Lethin (*Adjunct*), Fengnian Xia

Assistant Professors Wenjun Hu, Amin Karbasi, Jakub Szefer

MECHANICAL ENGINEERING & MATERIALS SCIENCE**Chair**

Udo Schwarz

Director of Graduate Studies

Jan Schroers (jan.schroers@yale.edu)

Professors Charles Ahn, Ira Bernstein (*Emeritus*), Juan Fernández de la Mora, Alessandro Gomez, Sohrab Ismail-Beigi, Shun-Ichiro Karato, Marshall Long, Corey O'Hern, Brian Scassellati, Jan Schroers, Udo Schwarz, Mitchell Smooke

Associate Professor Aaron Dollar

Assistant Professors Eric Brown, Judy Cha, Rebecca Kramer-Bottiglio, Madhusudhan Venkadesan

Lecturers Beth Anne Bennett, Kailasnath Purushothaman, Joseph Zinter

Programs of study are offered in the areas of applied mechanics, 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.

BIOMEDICAL ENGINEERING

Fields of Study

Biological and medical devices, biological signals and sensors, biomaterials, biomechanics, biophotonics, computational medicine, computer vision, digital image analysis and processing, drug delivery, energy metabolism, gene therapy, modeling in mechanobiology, MRI, MRS, PET and tracer kinetic modeling, nanomedicine, network analysis, the physics of image formation (MRI, optics, ultrasound, nuclear medicine, and X-ray), physiology and human factors engineering, signaling pathways, systems biology, systems medicine, tissue engineering and regenerative medicine, and vascular biology.

CHEMICAL & ENVIRONMENTAL ENGINEERING

Fields of Study

Fields include nanomaterials, soft matter, interfacial phenomena, biomolecular engineering, 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, and VLSI design and testing.

MECHANICAL ENGINEERING & MATERIALS SCIENCE

Fields of Study

Fluids and thermal sciences Suspensions; electrospray theory and characterization; electrical propulsion applications; electrified and magnetized interfaces of electrically

conducting liquids and ferrofluids; combustion and flames; computational methods for fluid dynamics and reacting flows; turbulence; laser diagnostics of reacting and nonreacting flows; and magnetohydrodynamics.

Soft matter/complex fluids Jamming and slow dynamics in gels, glasses, and granular materials; mechanical properties of soft and biological materials; and structure and dynamics of proteins and other macromolecules. Several faculty in Mechanical Engineering are also affiliated with the Integrated Graduate Program in Physical and Engineering Biology (<http://peb.yale.edu>).

Materials science Studies of thin films; nanoscale effects on electronic properties of two-dimensional layered materials; 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; nanotribology; nanostructured energy applications; nanoparticle synthesis for energy applications; combinatorial materials science; and in situ transmission electron and scanning probe microscopy.

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; soft-bodied control; electromechanical energy conversion; biomechanics of human movement; mechanics of biological muscle; and human-powered vehicles.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to the Ph.D. program in 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 a Teaching Fellow for one term, 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 the 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 semester 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

Biomedical Engineering Physiological Systems (ENAS 550), Physical and Chemical Basis of Bioimaging and Biosensing (ENAS 510). One of these courses may be taken in the second year. In addition, there is a math requirement that must be met by taking Biomedical Data Analysis (ENAS 549), Mathematical Methods I (ENAS 500), or Advanced Engineering Mathematics (ENAS 505) in the first year.

Chemical & Environmental Engineering (Chemical track) Mathematical Methods I (ENAS 500), Classical and Statistical Thermodynamics (ENAS 521), Energy, Mass, and Momentum Processes (ENAS 603), Chemical Reaction Engineering (ENAS 602).

Chemical & Environmental Engineering (Environmental track) Biological Processes in Environmental Engineering (ENAS 641), Environmental Physicochemical Processes (ENAS 642), and either Water Chemistry (ENAS 638) or Aquatic Chemistry (ENAS 640). In addition, there is a math requirement that must be met by taking one of the following courses in the first year: Mathematical Methods I (ENAS 500), Applied Spatial Statistics (F&ES 781), Multivariate Data Analysis in the Environmental Sciences (F&ES 758), Data Exploration and Analysis (S&DS 530), or Multivariate Statistical Methods for the Social Sciences (S&DS 563).

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

Electrical Engineering (Computer Engineering track) Two of the following three courses: Introduction to VLSI System Design (ENAS 875), Computer Architectures for Cognitive Processing and Machine Learning (ENAS 907), Computer Organization and Architecture (ENAS 967).

Electrical Engineering (Microelectronics track) Two of the following four courses: Physics and Devices of Optical Communication (ENAS 511), Heterojunction Devices (ENAS 718), Solid State Physics I (ENAS 850), Semiconductor Silicon Devices and Technology (ENAS 986).

Electrical Engineering (System and Signals track) Linear Systems (ENAS 902), Stochastic Processes (ENAS 502).

Mechanical Engineering & Materials Science Students must demonstrate competence in one of four areas: Fluid and Thermal Sciences, Soft Matter/Complex Fluids, Materials Science, or Robotics/Mechatronics. As a minimum requirement, students must take at least one of the following courses in the first year of study: Intelligent Robotics (CPSC 572), Intelligent Robotics Laboratory (CPSC 573), Classical and Statistical Thermodynamics (ENAS 521), Biological Physics (ENAS 541), Polymer Physics (ENAS 606), Synthesis of Nanomaterials (ENAS 615), Statistical Physics II (PHYS 628), Introduction to Nanomaterials and Nanotechnology (ENAS 703), Theoretical Fluid Dynamics (ENAS 704), Fundamentals of Combustion (ENAS 708), Solidification and Phase Transformations (ENAS 752), Introduction to Robot Analysis (ENAS 777), Forces on the Nanoscale (ENAS 787), Soft Condensed Matter Physics (ENAS 848), Solid State Physics I (ENAS 850), Solid State Physics II (ENAS 851), Linear Systems (ENAS 902; if not used to satisfy the math requirement), Systems and Control (ENAS 936), and Mechatronics Laboratory (ENAS 994). In addition, there is a math requirement that must be met by taking Mathematical Methods I (ENAS 500), Mathematical Methods of Physics (PHYS 506), or Linear Systems (ENAS 902), depending on the research area.

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.

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 Office of Graduate Studies, School of Engineering & Applied Science, Yale University, PO Box 208267, New Haven CT 06520-8267; e-mail, engineering@yale.edu; website, <http://seas.yale.edu>.

COURSES

The list of courses may be slightly modified by the time term begins. Please visit <http://courses.yale.edu> for the most updated course listing.

ENAS 500a / APHY 500a, Mathematical Methods I J. Rimas Vaišnys

A beginning, graduate-level introduction to ordinary and partial differential equations, vector analysis, linear algebra, and complex functions. Laplace transform, series expansion, Fourier transform, and matrix methods are given particular attention. Applications to problems frequently encountered in engineering practice are stressed throughout.

ENAS 502b, Stochastic Processes Yihong Wu

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 Evan Morris

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

ENAS 509a, Electronic Materials: Fundamentals and Applications Jung Han

Survey and review of fundamental issues associated with modern microelectronic and optoelectronic materials. Topics include band theory, electronic transport, surface kinetics, diffusion, materials defects, elasticity in thin films, epitaxy, and Si integrated circuits.

ENAS 510a, Physical and Chemical Basis of Bioimaging and Biosensing Douglas Rothman

Basic principles and technologies for imaging and sensing the chemical, electrical, and structural properties of living tissues and biological macromolecules. Topics include magnetic resonance spectroscopy, MRI, positron emission tomography, and molecular imaging with MRI and fluorescent probes.

ENAS 511b, Physics and Devices of Optical Communication 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. Permission of the instructor required.

ENAS 518a / MB&B 635a, Quantitative Approaches in Biophysics and Biochemistry

Julien Berro, Yong Xiong, and Jonathon Howard

The course offers an introduction to quantitative methods relevant to analysis and interpretation of biophysical and biochemical data. Topics covered include statistical testing, data presentation, and error analysis; introduction to dynamical systems;

analysis of large datasets; and Fourier analysis in signal/image processing and macromolecular structural studies. The course also includes an introduction to basic programming skills and data analysis using MATLAB. Real data from research groups in MB&B are used for practice. Prerequisites: MATH 120 and MB&B 600 or equivalents, or permission of the instructors.

ENAS 519b, Responsible Conduct of Research Vincent Wilczynski

Required of first-year students in Chemical & Environmental Engineering, Electrical Engineering, and Mechanical Engineering & Materials Science. Presentation and discussion of topics and best practices relevant to responsible conduct of research including academic fraud and misconduct, conflict of interest and conflict of commitment, data acquisition and human subjects, use and care of animals, publication practices and responsible authorship, mentor/trainee responsibilities and peer review, and collaborative science. o Course cr

ENAS 521a, Classical and Statistical Thermodynamics Michael Loewenberg

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 530a, Optimization Techniques Sekhar Tatikonda

Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton's method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the sciences.

ENAS 534a, Biomaterials Anjelica Gonzalez

Introduction to materials, classes of materials from atomic structure to physical properties. Major classes of materials: metals, ceramics and glasses, and polymers, addressing their specific characteristics, properties, and biological applications. Throughout the presentation of the synthesis, characterization, and properties of the classes of materials, a connection is made to the selection of materials for use in specific biological applications by matching the material's properties to those necessary for success in the application. Case studies address the successes and failures of particular materials from each of the classes in biological applications.

ENAS 541b / CB&B 523b / MB&B 523b / PHYS 523b, Biological Physics Simon Mochrie

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 Mark Saltzman and Stuart Campbell

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

ENAS 551b, Biotransport and Kinetics Kathryn Miller-Jensen

Creation and critical analysis of models of biological transport and reaction processes. Topics include mass and heat transport, biochemical interactions and reactions, and thermodynamics. Examples from diverse applications, including drug delivery, biomedical imaging, and tissue engineering.

ENAS 553a, Immuno-Engineering 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 558a, Introduction to Biomechanics Michael Murrell

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

ENAS 559a, Neuromuscular Biomechanics Madhusudhan Venkadesan

Mechanics and control of animal movement, including skeletal muscle mechanics, systems-level neural and sensory physiology, elements of feedback control, and optimal control. Deriving equations of motion for multibody mechanical systems that are actuated by muscles or muscle-like motors; incorporating sensory feedback; analyzing system properties such as stability and energetics.

ENAS 561b / AMTH 765b / CB&B 562b / INP 562b / MB&B 562b / MCDB 562b / PHYS 562b, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or 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 570b / C&MP 560b / MCDB 560b / PHAR 560b, Cellular and Molecular Physiology: Molecular Machines in Human Disease Frederick Sigworth

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

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

ENAS 600a, Computer-Aided Engineering Marshall Long

Aspects of computer-aided design and manufacture (CAD/CAM). The computer's role in the mechanical design and manufacturing process; commercial tools for two- and three-dimensional drafting and assembly modeling; finite-element analysis software for modeling mechanical, thermal, and fluid systems.

ENAS 602a, Chemical Reaction Engineering Lisa Pfefferle

Applications of physical-chemical and chemical-engineering principles to the design of chemical process reactors. Ideal reactors treated in detail in the first half of the course, practical homogeneous and catalytic reactors in the second.

ENAS 603a, Energy, Mass, and Momentum Processes Amir Haji Akbari Balou

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

ENAS 606a, Polymer 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 609b, Nanotechnology for Energy Shu Hu

This is a comprehensive course with content at the intersection of nanoscale science, engineering, and technology, including application areas and nanofabrication technique. Topics include nanoscaled photovoltaic cells, hydrogen storage, fuel cells, and nanoelectronics; layer-by-layer assembly; organic-inorganic mesostructures;

colloidal crystals, organic monolayers, proteins, DNA and abalone shells; synthesis of carbon nanotubes, nanowire, and nanocrystals; microelectromechanical systems (MEMs) devices; photolithography, electron beam lithography, and scanning probe lithography; lithium-based batteries; and nanomanufacturing (roll to roll, nanoimprint lithography, inkjet printing).

ENAS 611a, Separation Processes Paul Van Tassel

Theory and design of separation processes for multicomputer and/or multiphase mixtures via equilibrium and rate phenomena. Included are single-stage and cascaded absorption, adsorption, extraction, distillation, filtration, and crystallization processes.

ENAS 615b, 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 626a, Chemical Engineering Process Control Eric Altman

Transient regime modeling and simulations of chemical processes. Conventional and state-space methods of analysis and control design. Applications of modern control methods in chemical engineering. Course work includes a design project.

ENAS 640a, Aquatic Chemistry Gaboury Benoit

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

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

ENAS 718b, Heterojunction Devices Mark Reed
Advanced course in semiconductor heterojunction physics and devices. Topics include compound semiconductor material properties and growth techniques; high speed and millimeter-wave devices; quantum well and superlattice devices; device modeling; and a small laboratory component involving device fabrication and measurements.

ENAS 725b / APHY 725b, Advanced Synchrotron Techniques and Electron Spectroscopy of Materials Charles Ahn
This course provides descriptions of advanced concepts in synchrotron X-ray and electron-based methodologies for studies of a wide range of materials at atomic and nano-scales. Topics include X-ray and electron interactions with matter, X-ray scattering and diffraction, X-ray spectroscopy and inelastic methods, time-resolved applications, X-ray imaging and microscopy, photo-electron spectroscopy, electron microscopy and spectroscopy, among others. Emphasis is on applying the fundamental knowledge of these advanced methodologies to real-world materials studies in a variety of scientific disciplines.

ENAS 747a, Applied Numerical Methods for Algebraic Systems, Eigensystems, and Function Approximation Beth Anne Bennett
The derivation, analysis, and implementation of various numerical methods. Topics include root-finding methods, numerical solution of systems of linear and nonlinear equations, eigenvalue/eigenvector approximation, polynomial-based interpolation, and numerical integration. Additional topics such as computational cost, error analysis, and convergence are addressed in a variety of contexts.

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 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 848a or b / PHYS 528a or b, Soft Condensed Matter Physics Staff

An introduction to the physics and phenomenology of soft condensed matter: classical systems with mesoscale structure where thermal fluctuations and interfacial forces play essential roles. Discussion of applications to materials science/engineering, nanotechnology, and molecular/cellular biology. Essential concepts from statistical thermodynamics, classical mechanics, and electricity and magnetism are reviewed/developed as needed.

ENAS 850a / APHY 548a / PHYS 548a, Solid State Physics I Sohrab Ismail-Beigi

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 / APHY 549b / PHYS 549b, 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 866a, CMOS Devices and Beyond Tso-Ping Ma

The science and technology of modern CMOS devices and circuits, as well as emerging technologies. Topics may include basic CMOS device physics; interface properties of MOS structures; hot-carrier effects; experimental techniques to probe MOS parameters; and scaling of CMOS devices. In addition to weekly lectures, students are expected to make an in-depth study of a relevant topic (to be determined jointly with the instructor), write a term paper, and make an associated oral presentation to the class.

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 880a / INP 523a, Imaging Drugs in the Brain Evan Morris

Seminar course to explore the uses of functional imaging (PET and fMRI) to study the mechanisms of action and long-term effects of drugs (legal and illegal) on brain function. Basic research findings are the main topics, augmented by some discussion of imaging in drug development by Pharma. The central theme of the course is experiment design. How to design the proper imaging experiment to ask the question. What are the endpoints of the experiment? What are the limitations of interpretation? What are the proper controls and what are the proper analyses to ensure reliable, interpretable results? Syllabus is comprised primarily of classic journal articles, in addition to the occasional book chapter or review article. Most class periods begin with a short lecture to cover methodological concepts, followed by discussion of reading material. A number of class periods are organized as games, contests, or other in-class exercises. The emphasis is on formulating the question and designing the experiment. Topics include basic understanding of imaging technology (brief physics, biochemistry, and mathematics) as it relates to imaging of drugs, receptors, neurotransmitters; understanding the primary outcomes of imaging experiments; imaging experiment design; recent findings related to drug abuse; common neurophysiological pathways of addictive drugs (how to image reward); and uses of imaging in drug development (what do drug companies want to measure?). Weekly homework: concise written synopses of assigned articles (students routinely endorse the synopses as the best way to learn the material!)

ENAS 902a, Linear Systems A. Stephen Morse

Background linear algebra; finite-dimensional, linear-continuous, and discrete dynamical systems; state equations, pulse and impulse response matrices, weighting patterns, transfer matrices. Stability, Lyapunov's equation, controllability, observability, system reduction, minimal realizations, equivalent systems, McMillan degree, Markov matrices. Recommended for all students interested in feedback control, signal and image processing, robotics, econometrics, and social and biological networks.

ENAS 905a, Applied Digital Signal Process J. Rimas Vaišnys

ENAS 907a, Computer Architectures for Cognitive Processing and Machine Learning
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 912a, Biomedical Image Processing and Analysis James Duncan and Lawrence Staib

A study of the basic computational principles related to processing and analysis of biomedical images (e.g., magnetic resonance, computed X-ray tomography, fluorescence microscopy). Basic concepts and techniques related to discrete image representation, multidimensional frequency transforms, image enhancement/restoration, image segmentation, and image registration.

ENAS 936a, Systems and Control Kumpati Narendra

Design of feedback control systems with applications to engineering, biological, and economic systems. Topics include state-space representation, stability, controllability, and observability of discrete-time systems; system identification; optimal control of systems with multiple outputs.

ENAS 951b / CPSC 556b, 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 Tassioulas**ENAS 954b, 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.

ENAS 986b, Semiconductor Silicon Devices and Technology Tso-Ping Ma

Introduction to integrated circuit technology, theory of solid state devices, and principles of device design and fabrication. Laboratory involves the fabrication and analysis of semiconductor devices, including Ohmic contacts, Schottky diodes, p-n junctions, MOS capacitors, MOSFETS, and integrated circuits.

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, Mark Gerstein, Scott Holley, Marcus Bosenberg, Madhusudhan Venkadesan, Michael Murrell, and Nikhil Malvankar

This required course for students in PEB involves hands-on laboratory modules with students working in pairs. A biology student is paired with a physics or engineering student; a computation/theory student is paired with an experimental student. The modules are devised so that a range of skills is acquired, and students learn from each other. Modules are hosted in faculty laboratories.

English Language and Literature

Linsly-Chittenden Hall, 203.432.2233

<http://english.yale.edu>

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

Chair

Langdon Hammer

Director of Graduate Studies

Caleb Smith (106a LC, 203.432.2226)

Professors Jessica Brantley, Leslie Brisman, David Bromwich, Ardis Butterfield, Jill Campbell, Joe Cleary, Michael Denning, Wai Chee Dimock, Jacqueline Goldsby, Langdon Hammer, Margaret Homans, Amy Hungerford, David Scott Kastan, Jonathan Kramnick, Lawrence Manley, Stefanie Markovits, Stephanie Newell, John Durham Peters, Caryl Phillips, David Quint, Marc Robinson, John Rogers, Caleb Smith, Robert Stepto, Katie Trumpener, Michael Warner, Ruth Bernard Yeazel

Associate Professors Catherine Nicholson, Anthony Reed, Emily Thornbury, R. John Williams

Assistant Professors Anastasia Eccles, Marta Figlerowicz, Ben Glaser, Alanna Hickey, Naomi Levine, 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 ADMISSIONS REQUIREMENTS

Application should be accompanied by scores from the GRE and the GRE “Literature in English” subject test, a personal statement of purpose, and a writing sample of up to twenty pages.

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.
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 (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.

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.

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 Ph.D. Requirements, above).

COURSES

For expanded course descriptions, please visit the English department website: <http://english.yale.edu/courses>.

ENGL 500a / LING 500a, Old English I Staff

The essentials of the language, some prose readings, and close study of several celebrated Old English poems.

ENGL 502b, Old English II Staff

Readings in a variety of pre-Conquest vernacular genres, varying regularly, with supplementary reading in current scholarship. Current topic: late antique romance in Anglo-Saxon England, with readings including *Apollonius of Tyre*, *Legend of the Seven Sleepers*, and *Andreas*.

ENGL 537a, The Gawain Poet Jessica Brantley

The course offers a contextual study of four of the greatest (and most enigmatic) Middle English poems—*Pearl*, *Patience*, *Cleanness*, and *Sir Gawain and the Green Knight*. At its center is British Library MS Cotton Nero A.x, the single medieval book that contains them all. In addition to reading the poems closely in their manuscript context, we examine associated artworks, from the twelve illustrations in the Cotton MS that constitute a medieval reading of the poems, to *St. Erkenwald*, a poem preserved elsewhere that some argue was written by the same author. Finally, we think about the modern reception of the poems through a serious engagement with scholarly debate surrounding them, and also through comparative work with translations.

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

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 *De bello civili*, Dante's *Purgatorio*, Tasso's *Gerusalemme liberata*, Camões's *Os Lusíadas*, and Spenser's *Faerie Queene*.

ENGL 588b, Material Texts Peter Stallybrass

This course focuses on the material culture of reading, writing, and printing from 1400 to 1900 in England and America, although students are welcome to develop their own topics based upon the Beinecke's collections. We do hands-on research, drawing on the extraordinary collections of manuscripts and printed texts in the Beinecke. The course offers students an opportunity to explore archives and develop publishable projects relevant to their future research. Topics include theories of materiality; fetishism and relics; "persons" and "things"; the bible and the body; authorship and anonymity; writing as a material practice; the manuscript production and circulation of poetry from John Donne to Emily Dickinson; graffiti; letter-writing.

ENGL 592a / HIST 613a, English Paleography and Manuscript Culture, 1500–1750 Kathryn James

This course provides a detailed introduction to early modern English paleography and manuscript cultures. The primary objective is for students to acquire fluency in

reading the main English hands encountered in the early modern archive. Students become familiar with the documentary forms and methods of production of early modern British manuscripts and with the techniques and terms by which these are understood and described. Topics include Anglicana, secretary, chancery, and italic hands; alphabets; writing techniques; abbreviations; numbers; shorthand and cipher; transcription; the forms and vocabulary associated with early modern letters, sermon-notes, diaries, annotations, inventories, and other documentary forms. The course meets in the Beinecke Library and is based on the library's early modern English manuscript collections.

ENGL 603b, Shakespeare and Religion David Kastan

This course is about how various understandings of religion (and religions) circulate through Shakespeare's plays, as they were written, performed, and read, and as they have continued to be sometimes rewritten, performed, and read. We are not much interested in biography (there isn't much biography to be interested in), and the course is not much interested in Shakespeare's own religious beliefs (which seem to us unknowable). What is clear however is that religion is central in the plays; it haunts them (think *Hamlet*) and was in so many ways inescapable in Shakespeare's England. Sometimes the plays register this fact in fundamental encounters of characters and ideas and sometimes in the sheer ordinariness in the dialogue (for example, the reflexive "God b'wi' you" in leave taking). We read a number of plays (including *Hamlet*, *Measure for Measure*, and *Othello*), various historical sources, and theological and philosophical texts, as we try to understand how religion functions in these plays as an essential, but often perplexing dimension of early modern identity (and perhaps of our own).

ENGL 606a, History and Historical Drama in the Age of Shakespeare Lawrence Manley

A study of the representation of history on the English stage in the reigns of Elizabeth I and James I. Plays by Shakespeare, Marlowe, Peele, Heywood, Ford, and others in relation to both nondramatic forms of historical writing and contemporary affairs.

ENGL 670b, Religion, Literature, and Politics in Early Modern Britain Bruce Gordon and John Rogers

This course explores the protean expressions of religious belief, satire, and polemic in the literary cultures of early modern Britain by attending to the contested political and physical cultures in which they flourished. Through engagement with prose, theater, and music, students explore the diverse interrelationships of texts, images, and sacred architecture. On our visits to significant sites, we consider the ways in which literary and religious imaginations were woven together. We engage with and learn from some of the most creative and thoughtful literary, historical, and cultural scholars working on early modern Britain, who will help us to think in expansive and interdisciplinary ways about language, faith, and authority.

ENGL 672b / CPLT 672b, Milton David Quint

This course studies Milton's poetry and some of his controversial prose. We investigate the relation of the poetry to its historical contexts, focusing on the literary, religious, social, and political forces that shaped Milton's verse. We survey and assess some of the dominant issues in contemporary Milton studies, examining the types of readings that psychoanalytic, feminist, Marxist, and historicist critics have produced. A brief oral

report and a term paper (as well as a prospectus and preliminary bibliography for the term paper) required.

ENGL 774a, Romantic Poetry Leslie Brisman

An introduction to the work of Blake, Coleridge, Wordsworth, Shelley, and Keats, with some attention to Byron and the minor poets of this rich period of poetic innovation and revolutionary spirit.

ENGL 827b / CPLT 554b, Novel Minds: The Representation of Consciousness from Austen to Woolf Ruth Yeazell

Close study of selected novels by Jane Austen, George Eliot, Henry James, and Virginia Woolf, with particular attention to the representation of consciousness and the development of the free indirect style. Our reading of fiction is supplemented by narrative theory drawn from James, Wayne Booth, Käte Hamburger, Ann Banfield, Gérard Genette, Dorrit Cohn, and others.

ENGL 838b / AMST 775b, Performing American Literature Wai Chee Dimock

A broad selection of short stories, poems, and novels, accompanied by class performances, culminating in a term project with a significant writing component. “Performance” includes a wide range of activities including: staging; making digital films and videos; building websites; game design; and creative use of social media. Readings include poetry by Walt Whitman, Emily Dickinson, Yusef Komunyakaa, and Claudia Rankine; fiction by Herman Melville, F. Scott Fitzgerald, Jhumpa Lahiri, and Junot Díaz.

ENGL 853b / AMST 848b, Inventing the Environment in the Anthropocene Michael Warner

Although the concept of the Anthropocene can be dated in various ways, two of the most important benchmarks seem to be the beginning of industrial production in the late eighteenth century and the uptick in carbon dioxide emissions from the mid-nineteenth century (petroleum came into use during the Civil War). The period between these two moments is also that in which the modern language of the environment took shape, from Cuvier’s discovery of extinction and Humboldt’s holistic earth science to the transformative work of Thoreau and George P. Marsh. This course shuttles between the contemporary debate about the significance and consequences of the Anthropocene and a reexamination of that environmental legacy. We look at the complexity of “nature,” beginning with the Bartrams, Jefferson, Cuvier, and the transatlantic literatures of natural history; georgics and other genres of nature writing; natural theology; ambiguities of pastoral in American romantic writing (Bryant, mainly); the impact of Humboldt (Emerson, Thoreau, Whitman); westward expansion and Native American writing about land; Hudson School painting and landscape architecture. We also think about the country/city polarity and the development of “grid” consciousness in places like New York City. One aim is to assess the formation and legacy of key ideas in environmentalism, some of which may now be a hindrance as much as a foundation. Secondary readings from Leo Marx, Henry Nash Smith, and William Cronon, as well as more recent attempts to reconceive environmental history (Joachim Radkau), ecocriticism (Lawrence Buell), and related fields, as well as science journalism (Elizabeth Kolbert). Students are invited to explore a wide range of research projects; and one assignment is to devise a teaching unit for an undergraduate class on the same topic.

ENGL 902b, Elizabeth Bishop Langdon Hammer

An experiment in intensive author-centered reading, this course studies the life, writing, and visual art of Elizabeth Bishop using tools from biography, gender studies, queer theory, object relations psychoanalysis, and phenomenology. Topics for discussion include the shape of a woman poet's career in the mid-twentieth-century United States; the relations between poetry and painting, verse and prose, and private and public writing; the idea of minor literature, and the figure of the minor; Bishop as a hemispheric poet; epistolarity; the role of objects and the senses in subject formation; the ordinary, perverse, and fantastic; tourism, cosmopolitanism, and the local; the place of literature in the postwar world order; the poetics of description. In addition to Bishop, readings include, among others, Svetlana Alpers, Christopher Bollas, Judith Butler, Lee Edelman, Melanie Klein, Maurice Merleau-Ponty, Marion Milner, and D.W. Winnicott.

ENGL 948b / AFAM 588b / AMST 710b, Autobiography in America Robert Stepto

A study of autobiographical writings from Mary Rowlandson's Indian captivity narrative (1682) to the present. Classic forms such as immigrant, education, and cause narratives; prevailing autobiographical strategies involving place, work, and photographs. Authors include Franklin, Douglass, Jacobs, Antin, Kingston, Uchida, Balakian, Als, and Karr.

ENGL 959b / RLST 892b, Interdisciplinary Philosophy Noreen Khawaja

Seminar for humanities doctoral students who have theoretical interests and who are seeking to explore and strengthen the philosophical dimension of their work. Part I of the course is reading and discussion, including philosophical works and works of recent scholarship across disciplines which have something to teach scholars in literary studies, cultural studies, religious studies, and science studies about how to link, for example, the ethnographic and ontological, history and theory of mind, close reading and phenomenology, affect and aesthetics. Part II centers on students' own research projects. Collaborative development, discussion, critique.

ENGL 960a / CPLT 881a / WGSS 960a, Literary Theory Marta Figlerowicz and Jonathan Kramnick

What is literary theory today, and what is its history? The aim of the course is to introduce students to central concepts in theory and explore their relation to method. We examine the variety of approaches available within the field of literary studies, including older ones such as Russian formalism, New Criticism, deconstruction, Marxism, and psychoanalysis, as well as newer ones like actor-network theory and digital humanities research. We explore the basic tenets and histories of these theories in a way that is both critical and open-minded, and discuss their comparative advantages and pitfalls. The focus is on recurrent paradigms, arguments, and topics, and on transhistorical relations among our various schools of literary-theoretical thought. Readings might include work by René Wellek, Paul de Man, Jacques Derrida, Gayatri Spivak, Bruno Latour, Judith Butler, Northrop Frye, Fred Moten, and many others.

ENGL 961b, Transformations of the Confession: Secularism, Slavery, Sexuality

Caleb Smith

The confession is a paradoxical speech act. Confessors are supposed to reveal the inmost secrets of themselves, but at the same time they are known to be performing, according to an established script, for an audience endowed with the capacity to judge and punish

them. This seminar takes up the genre of the public confession. We sketch its genealogy from ancient religious styles of truth-telling (*The Confessions of St. Augustine*) to modern forms of evidence in criminal justice (*The Confessions of Nat Turner*) while giving special attention to its literary adaptations (*The Confessions of an English Opium-Eater*). We then explore the transformation of the confession during the nineteenth century under the pressures of secularization, the slavery crisis, and the emerging science of sexuality. Readings may include works by Augustine, Rousseau, De Quincey, Hogg, Poe, Jacobs, Douglass, Plath, Lorde, and Nabokov. Critical and theoretical sources include Nietzsche, Freud, Foucault, Butler, Brooks, Hartman, and Felski. We pursue some of the themes introduced during the annual conference of the English Institute at Yale in 2018, on the theme of “truth-telling.”

ENGL 972a, Modern Poetry and Poetics Benjamin Glaser

This course explores current debates in poetics, historicism, and formalism through study of the poetry and criticism of the past century. We trace a history of the discipline by way of the poets and readers who helped make literary study what it is and isn't. Special attention is paid to contemporary debates surrounding lyric theory, historical poetics, and recent models of “New Formalism” as they each converge with and diverge from earlier formalisms (e.g., New Criticism) and react against historicisms (e.g., cultural studies). We also explore the racial formations at work within the logic of poetic genres and the canons of twentieth-century poetry.

ENGL 976a / AMST 840a, Asian Inhumanities Sunny Xiang

What might it mean to think from a position other to the “Western humanities”? This course takes the “Asian inhumanities” as neither a direct opposite nor even a direct challenge to the “Western humanities,” but as a heuristic device for self-conscious reflection about critical method, racial formation, knowledge production, and political action. The aim is not necessarily to decenter the human or the humanities—I suspect that we will talk a good deal about both. Rather, we juxtapose “Asia” to “human” with an openness to contemplating the idiosyncrasies that each reveals about the other. We start by surveying how scholars have posited “Asia as method” (to borrow Kuan-Hsing Chen’s formulation). From there, we pursue the “Asian inhumanities” in two movements. The first examines historically specific “inhuman” typologies (that is, stereotypes) arising from U.S.-Asian encounters: the yellow peril during the era of Asian exclusion, the model minority during the era of Asian inclusion, and the flexible citizen during the era of Asian globalization. The second tracks the relation between “Asian” and “human” at especially fraught scenes of contact: law, war, gender, biology, and technology. Finally, we approach the “Asian inhumanities” as a question of race-based politics, both within and beyond the university. What is at stake in taking the human as a political, ethical, and literary reference point—for example, in desiring well developed and emotionally nuanced characters or even in reading for character at all? How does race figure into alternative critical approaches circulating within the humanities—for example, surface reading, distant reading, new formalism, and weak theory? How does an attention to what is “Asian” impact our received critical frameworks for analyzing race?

ENGL 990b, The Teaching of English Jill Campbell and Margaret Homans

An introduction to the teaching of literature and of writing with attention to the history of the profession and to current issues in higher education such as the corporatization of the university, the role of the state in higher education, and the precarity of the

humanities at the present time. Weekly seminars address a series of issues about teaching: guiding classroom discussion; introducing students to various literary genres; addressing race, class, and gender in the teaching of literature; formulating aims and assignments; grading and commenting on written work; lecturing and serving as a teaching assistant; preparing syllabuses and lesson plans.

ENGL 992a, Advanced Pedagogy Heather Klemann

Training for graduate students teaching introductory expository writing. Students plan a course of their own design on a topic of their own choosing, and they then put theories of writing instruction into practice by teaching a writing seminar. Prerequisite: open only to graduate students teaching ENGL 114.

ENGL 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.

European and Russian Studies

The MacMillan Center

332 Luce Hall, 203.432.3423

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

M.A.

Chair

Edyta Bojanowska (*Slavic Languages & Literatures*)

Acting Chair [F]

Julia Adams (*Sociology*)

Director of Graduate Studies

Bruce Gordon (*Divinity; History*; 334 Luce, 203.432.3423)

Professors Bruce Ackerman (*Law*), Julia Adams (*Sociology*), Rolena Adorno (*Spanish & Portuguese*), Dudley Andrew (*Film & Media Studies*), Seyla Benhabib (*Political Science*), Dirk Bergemann (*Economics*), R. Howard Bloch (*French*), Edyta Bojanowska (*Slavic Languages & Literatures*), Paul Bracken (*Management*), David Bromwich (*English*), Paul Bushkovitch (*History*), David Cameron (*Political Science*), Francesco Casetti (*Humanities; Film & Media Studies*), Katerina Clark (*Slavic Languages & Literatures*), Mirjan Damaška (*Emeritus, Law*), Carolyn Dean (*History*), Carlos Eire (*History*), Paul Franks (*Philosophy*), Paul Freedman (*History*), Bryan Garsten (*Political Science*), John Geanakoplos (*Economics*), Harvey Goldblatt (*Slavic Languages & Literatures*), Bruce Gordon (*Divinity; History*), Philip Gorski (*Sociology*), Timothy Guinnane (*Economics*), Alice Kaplan (*French*), David Scott Kastan (*English*), Paul Kennedy (*History*), John MacKay (*Slavic Languages & Literatures*), Lawrence Manley (*English*), Ivan Marcus (*History*), Millicent Marcus (*Italian*), Stefanie Markovits (*English*), Samuel Moyn (*Law*), Robert Nelson (*History of Art*), Paul North (*German*), David Quint (*English*), Douglas Rogers (*Anthropology*), Pierre Saint-Amand (*French*), Maurice Samuels (*French*), Timothy Snyder (*History*), Alec Stone Sweet (*Law*), Peter Swenson (*Political Science*), Katie Trumpener (*Comparative Literature*), Miroslav Volf (*Divinity*), Kirk Wetters (*German*), James Whitman (*History*), Keith Wrightson (*History*), Fabrizio Zilibotti (*International & Development Economics*)

Associate Professors Molly Brunson (*Slavic Languages & Literatures*), Emily Erikson (*Sociology*), Karuna Mantena (*Political Science*), Ayesha Ramachandran (*Comparative Literature*), Marci Shore (*History*)

Assistant Professors Jennifer Allen (*History*), Sergei Antonov (*History*), Marijeta Bozovic (*Slavic Languages & Literatures*), José-Antonio Espín-Sánchez (*Economics*), Isaac Nakhimovsky (*History*), Giulia Oskian (*Political Science*)

Lecturer Paris Aslanidis (*Hellenic 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*), George Syrimis (*Hellenic Studies*), Julia Titus (*Slavic Languages & Literatures*), Karen von Kunes (*Slavic Languages & Literatures*)

The European Studies Council promotes research programs about Europe's culture, history, and current affairs. 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. This M.A. program is unusual in its embrace of the entire spectrum of European nations and cultures. Its requirements allow students to choose a particular national or thematic focus, geared to their individual interests and language skills, but also ensure that students acquaint themselves with the traditions and issues associated with the other parts of Europe. Students specializing in Russia and Eastern Europe, for example, will concentrate their efforts in that area, but will also take courses that address Europe-wide problems or the countries of Central or Western Europe. The program is suited both to students who wish to pursue further academic studies and to students whose interests are policy-oriented.

FIELDS OF STUDY

European languages and literatures; economics; history; political science; law; music; 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 Eastern Europe, or (2) Central and Western Europe. All students must complete sixteen graduate-level term courses (or their equivalent) in the various fields related to European and Russian studies. E&RS 900, *Europe: Who, What, When, Where?*, is required in addition to the sixteen courses and should be taken in the first year of the program. E&RS 900 is taken as Satisfactory/Unsatisfactory and may not be taken for audit.

Students are required to take at least one course in at least three of the four fields relevant to the program, that is, 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. One of the sixteen graduate-level term courses may be taken for audit. Except for E&RS 900, any other courses graded Satisfactory/Unsatisfactory may not be counted toward the sixteen-course requirement. For students focusing on Russia and Eastern Europe, two of the sixteen required courses (excluding language courses) must concern the nations of Central and Western Europe. Conversely, for those focusing on Central and Western Europe, two courses must concern Russia and Eastern 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 may not 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 Eastern Europe will need to demonstrate knowledge of Russian or an Eastern European language; those focusing on Central and Western Europe will need to demonstrate knowledge of one of the appropriate 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, Spanish, or other West European languages should register for a complete 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 Forestry & Environmental Studies, 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 900a, Europe: Who, What, When, Where? Bruce Gordon

An interdisciplinary seminar designed to provide broad exposure to key topics in modern European studies. Special attention is given to Eastern and Western Europe as well as the humanities and social science disciplines. The seminar is framed by some key theoretical questions, including: What are Europe's boundaries? When and where is "Europe"? Is there a narrative to European history? If so, what is it? What makes a European? The seminar also focuses on developing academic writing skills and examining research methodologies. Seminar meetings are combined with the Modern Europe in/and the World Colloquia and feature speakers from the Yale faculty and from other academic institutions. The course is required of all first-year European and Russian Studies M.A. students but is open to all graduate and professional students.

E&RS 940a or b, Independent Study Staff

By arrangement with faculty.

E&RS 950a or b, Master's Thesis Staff

By arrangement with faculty.

Experimental Pathology

140 Brady Memorial Laboratory, 203.785.3624

<https://medicine.yale.edu/pathology/training/graduateprogram>

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

Chair

Jon Morrow

Director of Graduate Studies

Themis Kyriakides (10 Amistad St., Rm. 301C, 203.737.2214)

Professors Richard Bucala,* Sandy Chang,* Young Choi (*Emeritus*), José Costa (*Emeritus*), Gary Friedlaender,* Patrick Gallagher,* Earl Glusac, Robert Homer, S. David Hudnall, Pei Hui, Peter Humphrey, Dhanpat Jain, Michael Kashgarian (*Emeritus*), Jung Kim (*Emeritus*), Diane Krause,* Gary Kupfer,* Francis Lee,* Patty Lee,* Janina Longtine, Joseph Madri (*Emeritus*), Vincent Marchesi, Jennifer McNiff,* Wang Min, Gilbert Moeckel, Mark Mooseker,* Raffaella Morotti, Jon Morrow, Jordan Pober,* Manju Prasad, David Rimm, Marie Robert, John Rose, Marcus Rosenberg,* John Sinard, Jeffrey Sklar, David Stern, A. Brian West (*Emeritus*), Wendall Yarbrough*

Associate Professors Adebowale Adeniran, Marcus Bosenberg, Demetrios Braddock, Natalia Buza, Guoping Cai, Keith Adam Choate,* Hyung Joon Chun,* Shawn Cowper,* Carlos Fernandez-Hernando,* Liming Hao, Malini Harigopal, Erica Herzog,* Anita Huttner, Steven Kleinstein, Yuval Kluger, Christine Ko,* Diane Kowalski, Michael Krauthammer, Themis Kyriakides, Angelique Levi, Ruth Montgomery,* Don Nguyen, Vinita Parkash, Katerina Politi, Yibing Qyang,* Antonio Subtil-Deoliveira, Mary Tomayko,* Narendra Wajapeyee, Zenta Walther, Mina Xu, Qin Yan, Xuchen Zhang

Assistant Professors Rita Abi Raad, Rebecca Baldassarri, Andrea Barbieri, Ranjit Bindra,* Veerle Bossuyt, Romulo Celli, Paul Cohen, Oscar Rene Colegio,* Susan Fernandez, Karin Finberg, Alexander Finkelstein, Jackie Fretz,* Anjela Galan,* Joanna Gibson, Pallavi Gopal, Bonnie Gould Rothberg, Shilpa Hattangadi,* Michael Hurwitz, Ryan Jensen, Anita Kamath, Samuel Katz, Morgan Levine, Declan McGuone, Peggy Myung,* Marguerite Pinto, Emily Reisenbichler, Kurt Schalper, Alexa Siddon,* Yajaira Suarez,* Silvia Vilarinho,* Serena Wong

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

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.

SPECIAL ADMISSIONS REQUIREMENTS

A strong background in basic sciences is recommended for applicants to the program, including biology, chemistry through organic and physical chemistry, mathematics through calculus, biochemistry, genetics, or immunology. GRE General Test or MCAT is required.

To enter the Ph.D. program, students apply to an interest-based track, usually the Molecular Medicine, Pharmacology, and Physiology track, within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), <http://bbs.yale.edu>.

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. 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, Laboratory Rotations in Experimental Pathology Staff

Laboratory rotations for first-year graduate students.

PATH 640a / B&BS 640a, Developing and Writing a Scientific Research Proposal

Katarina Politi

The course covers the intricacies of scientific writing and guides students in the development of a scientific research proposal on the topic of their research. All elements of an NIH fellowship application are covered, and eligible students submit their applications for funding. Enrollment limited to fifteen. Required of second-year graduate students in Experimental Pathology. Registration allowed by prior authorization from course directors only.

PATH 680a / C&MP 630a / PHAR 502a, Seminar in Molecular Medicine, Pharmacology, and Physiology Don Nguyen

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

PATH 681a / B&BS 681a, Advanced Topics in Cancer Biology Ryan Jensen

This advanced course focuses on readings and discussion on three or four major topics in cancer biology, such as targeted therapy, tumor immunology, tumor metabolism, and genomic evolution of cancer. For each topic, the class starts with an interactive lecture, followed by critical analysis of primary research literature. Recent research articles are assigned, and a student leads discussions with input from faculty who are experts in the topic area. Prerequisite: PATH 650 or permission of the instructor. Open to all Ph.D., M.D./Ph.D., and M.P.H. students and to advanced undergraduates at the discretion of the instructor.

Film and Media Studies

53 Wall Street, Rm. 216, 203.436.4668

<http://filmstudies.yale.edu>

M.Phil., Ph.D.

Chair

Francesco Casetti

Director of Graduate Studies

Brigitte Peucker (100 Wall St., Rm. 308, brigitte.peucker@yale.edu)

Professors Dudley Andrew, Francesco Casetti, Katerina Clark, Aaron Gerow, Brian Kane, John MacKay, Millicent Marcus, Charles Musser, John Durham Peters, Brigitte Peucker, Katie Trumpener, Jing Tsu

Associate Professor R. John Williams

Assistant Professors Marijeta Bozovic, Rizvana Bradley, Marta Figlerowicz

Senior Lecturer Marc Lapadula

Lecturers Oksana Chefranova, 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, 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.

SPECIAL ADMISSIONS REQUIREMENTS

Combined-program applicants should familiarize themselves fully not only with the Film and Media Studies entrance requirements but with those of the other graduate program as well. Since combined-program applicants must be admitted both by Film and Media Studies and by the other department, candidates should make sure that the material they submit with the application clearly addresses the requirements and mission of both graduate programs.

The application for Film and Media Studies is administered by the Office of Graduate Admissions. All applications are to be completed online and can be accessed by visiting its website at <http://gsas.yale.edu/admission-graduate-school>. In the “Program of Study” section of the application, the applicant should choose Film and Media Studies as well as another department, since all students in the program must select a second program to combine with Film and Media Studies. All applications, including writing samples, are read by the admissions committees in both programs.

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 circulated to the entire Film and Media Studies Executive Committee for their information and ratification.
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 almost certainly be Introduction to Film.

MASTER'S DEGREE

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

COURSES

FILM 603a / AMST 814a, Historical Methods in Film Study Charles Musser

A range of historiographic issues in film studies, including the roles of technology, exhibition, and spectatorship. Topics include intermediality and intertextuality. Consideration of a range of methodological approaches through a focus on international early cinema and American race cinema of the silent period. Particular attention to the interaction between scholars and archives.

FILM 630b / RUSS 714b, Soviet Cinema and the Distribution of Perception John MacKay

Soviet filmmakers and theorists in the 1920s were preoccupied with the way that the established cinema harnessed perception in socially determined, class-specific ways, and sought a variety of alternatives. This course examines those alternatives and their limitations, as postulated in theory and realized on film, as well as their long-term, global influence on theoretical and moving image practice. We examine films and writings by such figures as Vertov, Eisenstein, Shub, Pudovkin, Kuleshov, Rottmunn, Liu Na'ou, Grierson, Buñuel, Cavalcanti, Peixoto, Deren, Jacobs, Dorsky, Godard, Farocki, Burnett, Akerman, and Wang Bing.

FILM 710b / AFAM 537b, Contemporary Art, Race, and the Philosophy of Media Rizvana Bradley

This course draws from a diverse range of writing in philosophy (especially the philosophy of media), contemporary critical theory (phenomenology, new materialism), contemporary feminist thought, queer theory, and black studies in order to question underlying assumptions about the body and embodied spaces in contemporary art and culture. Drawing from film, literature, performance, and contemporary art, students think about a range of philosophical and critical themes, including the role of the body, the virtual construction of time and space, questions of affect, and sensation, all of which inform concerns over representation, embodiment, and materiality.

FILM 729b / CPLT 716b / GMAN 730b, 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 and FILM 736b / AMST 832a and AMST 833b, Documentary Film**Workshop** Charles Musser

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

FILM 760b / CPLT 905b / GMAN 760b, Intermediality in Film Brigitte Peucker

Film is a hybrid medium, the meeting point of several others. This course focuses on the relationship of film to theater and painting, suggesting that where two media are in evidence, there is usually a third. Topics include space, motion, color, theatricality, tableau vivant, *ekphrasis*, spectatorship, and new media. Readings feature art historical and film theoretical texts as well as essays pertinent to specific films. Films by Fassbinder, Bergman, Murnau, von Trier, Rohmer, Godard, Kiarostami, and others, concluding with three films by Peter Greenaway.

FILM 775a / RUSS 696a, Post-Stalin Literature and Film Katerina Clark

The main developments in Russian and Soviet literature and film from Stalin's death in 1953 to the present.

FILM 800a / CPLT 921a, Styles and Techniques in Recent Art Cinema Dudley

Andrew

How much does the art of cinema in the twenty-first century resemble that of the previous half-century? Have massive changes visible in production, distribution, and exhibition also affected the goals and ambitions of film artists? Or do today's auteurs and cinematographers work as their counterparts did decades ago, deploying whatever techniques current technology permits in a quest for a style that may bring out something authentic about themselves, the world, or the medium? Analyzing films by such contemporary auteurs as Olivier Assayas, Claire Denis, Carlos Reygadas, Lav Diaz, David Lynch, and Hong Sang-soo, we measure new styles against techniques deployed by classic and modern auteurs like Mizoguchi, Welles, Cocteau, and Hitchcock. What new aesthetic (and practical) issues face filmmakers as they conceive their projects? We look at screen format, including 3-D; elastic temporality, especially slow motion; special effects, including forms of animation; superimposition, including multiple screens; long-takes and camera movement; montage and alternatives to cutting; advances in sound design. Have the new narrative forms and the new types of subject matter associated with our century's most difficult films (*L'Intrus*, *Werckmeister Harmonies*, *La Mort de Louis XIV*, *Twin Peaks*) given rise to the styles of major directors, or are they the by-product of these styles? Does style matter in the way it did during cinema's first century?

FILM 804a / MUSI 837a, Opera: Explorations of a Technical Medium Gundula

Kreuzer

Opera has been assigned—and might yet assume—various roles in genealogies of technical media. This seminar explores both what media archaeology and other recent approaches in media studies and science and technology studies hold for an understanding of the nature of opera, and what opera might in turn contribute to a historically expanded perspective on modern and digital multimedia. In addition to such theoretical topics as the role of architecture, strategies of acoustic immersion, the development of illusionist devices, the orchestra as technology, and Wagner's theories, we examine the medial configurations in select operatic scenes and their

renditions, from the illusionist picture-frame stage to present-day mobile or site-specific conceptions. Projects are tailored to students' interests and disciplines. Reading knowledge of Western musical notation is helpful but not required of students from outside the Music department.

FILM 806a / WGSS 853a, Archives: Histories, Practices, Theories, and Formations

Laura Wexler

This seminar studies the co-constitution of objects-with-documents and undocumented people. We explore theoretical, historical, material, practical, methodological, and curatorial questions related to the operation and status of the archive in this migration of objects and people. Students are asked to work collaboratively in and with archives as sources and tools, and to experiment with creating archives of their own. The seminar involves some travel to Brown and some irregular hours that are mentioned in the syllabus.

FILM 810b / AMST 729b / WGSS 746b, Visual Kinship, Families, and Photography

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 830a / CPLT 916a / ITAL 590a, Literature into Film Millicent Marcus

We study a series of written works and their cinematic adaptations, considering first the texts in autonomous, literary terms, and then their transformation into audiovisual spectacles. In most cases we screen the film on Tuesday evening and do a comparative study in the Thursday class period, making extensive use of video clips to do close visual analysis of scenes in the light of their corresponding textual sources. Rather than develop a general theory of adaptation, we construct methodological approaches on an ad hoc basis, taking each instance of adaptation as a case study amenable to a variety of methodologies—psychoanalytic, feminist, ideological, generic, semiotic, and so forth. The class is conducted as a seminar, and active student participation is expected. There are two papers—one shorter one of a critical nature at midterm and a final research paper (approximately 15–20 pages). Films examined include (tentatively) Pasolini's *Medea* and *Decameron*, the Taviani's *Padre padrone*, Visconti's *Death in Venice*, Rosi's *Three Brothers*, Salvatores's *I'm Not Afraid*, and De Sica's *Two Women*. Writing assignments comprise 75 percent of the final grade and class participation 25 percent.

FILM 833a, Semiotics Francesco Casetti

The seminar discusses the most relevant concepts and categories elaborated by semiotics in order to provide analytical tools for “close readings” of verbal or visual texts, narrative forms, cultural objects, artifacts, and social situations. Semiotics's foundational goal consisted in retracing how meaning emerges and circulates in connection with a variety of objects, from literary works to social rituals, from natural phenomena to artificial languages. In an attempt to revamp semiotics's main task, we begin from the opposed conceptualization of “sign” in the Saussurean and Peircean traditions and from the opposed ideas of “semiosis” that they elicit. Then, moving from “sign” to “text,” we analyze the structures and the dynamics of discourses—whether verbal, visual, musical, etc. A particular stress is put on the semantic and syntactic structures of narrative texts in an attempt to draw from them a model of human and

nonhuman action. The third section retraces the way enunciation produces subjectivity and deixis, in order to gain a better understanding of the context-bound nature of discourses and some tools for the analysis of context itself as a semiotic entity. We end by discussing the complex strategies that allow a discourse to tackle “reality” and “truth” – in the hope of dismantling the current use of naive epistemologies. Analytical tools are tested in class through close readings of a great variety of texts and situations, from Melania Trump’s depictions to Genesis, from short novels to social encounters.

FILM 872a / EALL 580a, East Asian Martial Arts Cinema Aaron Gerow

An investigation of the martial arts films of East Asia (Japan, China, Hong Kong, Korea, Taiwan), including the samurai film, kung-fu and karate film, and wuxia film, and the roles they play in constructing nationalism and transnationalism, gender, stardom, spirituality, and mediality.

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

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

Forestry & Environmental Studies

Kroon Hall, 203.432.5100
<http://environment.yale.edu>
M.S., M.Phil., Ph.D.

Dean

Ingrid Burke (Kroon, 203.432.5109)

Directors of Doctoral Studies

Karen Seto [F] (380 Edwards St., Rm. 102, 203.432.9784, karen.seto@yale.edu)
Oswald Schmitz [F/Sp] (oswald.schmitz@yale.edu)

Professors Mark Ashton, Michelle Bell, Gaboury Benoit, Graeme Berlyn, Mark Bradford, Benjamin Cashore, Michael Dove, Daniel Esty, Timothy Gregoire, Edgar Hertwich, Matthew Kotchen, Xuhui Lee, Robert Mendelsohn, Chadwick Oliver, Peter Raymond, James Saiers, Oswald Schmitz, Karen Seto, David Skelly, John Wargo, Julie Zimmerman

Associate Professors Marian Chertow, Kenneth Gillingham

Assistant Professors Craig Brodersen, Liza Comita, Justin Farrell, Eli Fenichel

FIELDS OF STUDY

Fields include agroforestry; biodiversity conservation; biostatistics and biometry; climate science; community ecology; ecosystems ecology; ecosystems management; environmental anthropology; environmental biophysics and meteorology; environmental chemistry; environmental ethics; environmental governance; environmental health risk assessment; environmental history; environmental law and politics; environmental and resource policy; forest ecology; hydrology; industrial ecology; industrial environmental management; plant physiology and anatomy; pollution management; population ecology; resource economics; energy and the environment, silviculture, social ecology; stand development, tropical ecology and conservation; urban planning; water resource management; environmental management and social ecology in developing countries; urban ecology.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants should hold a bachelor's or master's degree in a field related to natural resources, such as forestry, or in a relevant discipline of the natural or social sciences, such as biology, chemistry, economics, or mathematics. The GRE General Test is required but Subject Tests are optional.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to take F&ES 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 graduate training program in Forestry & Environmental Studies. 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.

MASTER'S DEGREES

M.Phil. (en route to the Ph.D.) Students may petition for this degree after they have passed the qualifying exam and advanced to candidacy. Applications for this master's degree are not accepted.

M.S. (en route to the Ph.D.) This degree is normally granted only to students who are withdrawing from the Ph.D. program. Applications for this master's degree are not accepted. Requirements that must be met for award of the M.S. are (1) successful completion of two years of course work in residence with two grades of Honors; (2) a written prospectus; (3) fulfillment of one term of the teaching requirement. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.

For information on the terminal master's degrees offered by the Yale School of Forestry & Environmental Studies (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 Forestry & Environmental Studies, 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 F&ES courses, see the School of Forestry & Environmental Studies bulletin, available online at <http://bulletin.yale.edu>; and Yale Course Search at <https://courses.yale.edu>.

F&ES 900a, Doctoral Student Seminar and Responsible Conduct of Research Karen Seto

This course provides an introduction to doctoral study at the School of Forestry & Environmental Studies. Students attend the F&ES Wednesday seminar each week and then meet with the seminar speakers after their presentations. Weekly assigned readings support these discussions, which are used as a foundation to explore diverse approaches to formulating and addressing research questions. Students also work with their advisers to design an assignment to be completed during the term. Students may choose to write and submit a fellowship application (e.g., NSF, NASA, EPA), carry out a literature review, or develop a collaborative research project. Students present their embryonic research ideas in class and use feedback from the group to further develop their ideas. The course also introduces the topic of research misconduct with examples of specific cases. Concepts and resources for responsible conduct of research are discussed in the areas of data acquisition and management, authorship and publication, peer review, conflicts of interest, mentoring, collaborative research, and animal and human subjects research. Required of all doctoral students in their first term.

French

82-90 Wall Street, 3d floor, 203.432.4900

<http://french.yale.edu>

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

Chair

Maurice Samuels

Acting Chair [F]

Alice Kaplan

Director of Graduate Studies

Pierre Saint-Amand (82-90 Wall St., Rm. 336, 203.432.4997)

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

Assistant Professors Morgane Cadieu, Thomas Connolly, Jill Jarvis, Christophe Schuwey

Affiliated Faculty Dudley Andrew (*Film & Media Studies*), 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 ADMISSIONS REQUIREMENTS

A thorough command of French is expected, as well as a good preparation in all fields of French literature. Applicants should submit a twenty-page writing sample in French. This can consist of one twenty-page paper or several shorter papers that total twenty pages.

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. (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 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 624a / AFAM 624a, Slavery and Its Aftermath in French and Francophone

Literature Christopher Miller

The practices, effects, and culture of both slavery and emancipation in the French empire and the postcolonial francophone world, as seen through literary writings. Readings on New France, the Code Noir, the *Encyclopédie*, the Haitian Revolution. Literary authors include Olympe de Gouges, Claire de Duras, Victor Séjour, Alfred Mercier, Aimé and Suzanne Césaire, Edouard Glissant, Maryse Condé, Ousmane Sembène, Gisèle Pineau.

FREN 700a, Readings in 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 812b, The Old French Fable and Fables R. Howard Bloch

A study of Marie de France's 103 animal tales and some of the anonymous "Ysopets" as well as of the 170 comic verse tales whose veins of satire, parody, comedy of language, situation, character, and farce are at the root of the European comic tradition. We read the fables and the fables against the background of twelfth- and thirteenth-century social, religious, and literary culture. Fables to be read in the bilingual (Old French and English) edition of Harriet Spiegel and fables in the recently published bilingual edition, with translations by Ned Dubin. Conducted in English.

FREN 829a, François Rabelais et Marguerite de Navarre Edwin Duval

An in-depth study of two authors who defined the early Renaissance in France. Closely allied in many respects but diametrically opposed in others, Rabelais and Marguerite de Navarre are equally representative of a complex, turbulent age. Readings include Rabelais's four "Books of Pantagruel" and the most important works of Marguerite's abundant and varied oeuvre: songs, farces, first-person allegorical narratives, and the so-called Heptameron. Conducted in French.

FREN 861b, Margins of the Enlightenment Pierre Saint-Amand

This course proposes a critical examination of the French Enlightenment, with a focus on issues of progress, universalism, and race. We confront these notions with approaches that have emerged in the postcolonial field of studies as well as gender studies. Authors from the clandestine and underground philosophical milieu are also studied. We are assisted by contemporary historians and critics of the Enlightenment, principally Foucault, Hunt, and Darnton. Readings are in Mme de Graffigny, Mme de Duras, Boyer d'Argens, Mairobert, Diderot, and Rousseau. Conducted in French.

FREN 868b, Guerres de papier [Printing Wars] Staff

Seventeenth-century France brought about a new relationship to writing, information, and media that transformed the style and the purpose of literature. In this course we explore various kinds of disputes in which writing and printing played a part. We examine literary quarrels and the way they created success and stars; delve into questions about propaganda, early modern fake news, and innovative strategies the government developed to control public opinion; and explore competition between the printed book and digital humanities, thinking about the way digital humanities have changed the way literature is studied and approached. Students create their own digital edition as an initiation to digital humanities. To become more familiar with book history, we also visit the Beinecke Library and try the Sterling Library's printing press. Main authors are Boileau, Boursault, Corneille, Donneau de Visé, Guéret, La Bruyère, Molière, Racine, Scudéry, Segrais, Sévigné.

FREN 885b, Modern French Poetry in the Maghreb Thomas Connolly

A survey of twentieth- and twenty-first-century poetry written in French by authors from North Africa, including works by Amrouche, Sénac, Khaïr-Eddine, Laâbi, Nissaboury, Djaout, Jabès, Farès, Ben Jelloun, Meddeb, Acherchour, Negrouche, Dib, and Bekri. Readings in French, discussion in English. Prerequisite: reading knowledge of French.

FREN 898a / CPLT 898a, Fin-de-siècle France Maurice Samuels

The course examines major French literary and artistic movements of the last decades of the nineteenth century (Naturalism, Decadence, Symbolism) in their cultural context. Weekly reading assignments pair literary texts with contemporary theoretical/medical/political discourse on such topics as disease, crime, sex, poverty, colonialism, nationalism, and technology. Literary authors include Barbey, Mallarmé, Maupassant, Rachilde, Villiers, and Zola. Theorists include Bergson, Freud, Krafft-Ebing, Le Bon, Nordau, Renan, and Simmel. Some attention also paid to the visual arts. Prerequisite: reading knowledge of French.

FREN 900b / HIST 667b / WGSS 667b, History of Sexuality in Modern Europe

Carolyn Dean

An introduction to the various lines of inquiry informing the history of sexuality. The course asks how historians and others constitute sexuality as an object of inquiry and addresses different arguments about the evolution of sexuality in Europe, including the relationship between sexuality and the state and sexuality and gender.

FREN 918a, May 68: Building a Corpus Alice Kaplan and Morgane Cadieu

Now that fifty years have passed, how can we assemble a corpus to represent May 68? Would it include posters and flyers, novels and narratives, films and documentaries, theoretical interventions and political discourses? What mark did May 68 make on

works of art and literature, and what is the best way to access the uprisings: through a document written at the time, a retrospective narrative, a film shot before 1968? Is there such a thing as an aesthetics of May 68? Topics include education; feminism and sexuality; family and heritage; social class; imperialism and decolonization; consumerism; factories; political organizations. Works by Akerman, Barthes, Certeau, Debord, Deleuze, Delphy, Ernaux, Foucault, Godard, Goupil, Houellebecq, L. Kaplan, Linhart, Marker, Perec, Rancière, Rochefort, Rolin, Ross, Wittig.

FREN 949b / AFAM 805b, Novel, Film, and History in French Africa Christopher Miller

African history as represented in historiography, novels, and films. Limited to French and Francophone Africa. Themes include empire and epic; orality and literacy; the slave trade; contact, conquest, and resistance; the Congo Free State; the role of colonial intermediaries; the two world wars; decolonization and neocolonialism; and the 1994 genocide in Rwanda.

FREN 969a / AFST 969a / CPLT 985a, Islands, Oceans, Deserts Jill Jarvis

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

Genetics

Sterling Hall of Medicine I313, 203.785.5846

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

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

Chair

Antonio Giraldez

Director of Graduate Studies

Marc Hammarlund

Professors Allen Bale, Susan Baserga (*Molecular Biophysics & Biochemistry*), W. Roy Breg, Jr. (*Emeritus*), Lynn Cooley, Daniel DiMaio, Patrick Gallagher (*Pediatrics*), Joel Gelernter (*Psychiatry; Neuroscience*), Antonio Giraldez, Peter Glazer (*Therapeutic Radiology*), Jeffrey Gruen (*Pediatrics*), Murat Gunel (*Neurosurgery*), Karen Hirschi (*Internal Medicine/Cardiology*), Arthur Horwich, Kenneth Kidd (*Emeritus*), Haifan Lin (*Cell Biology*), Maurice Mahoney (*Emeritus*), Shrikant Mane, Michael Nitabach (*Cellular & Molecular Physiology*), Charles Radding (*Emeritus*), Valerie Reinke, Margretta Seashore (*Emerita*), Nenad Sestan (*Neuroscience*), Stefan Somlo (*Internal Medicine/Nephrology*), Joann Sweasy (*Therapeutic Radiology*), Peter Tattersall (*Laboratory Medicine*), Sherman Weissman, Hongyu Zhao (*Public Health; Biostatistics*)

Associate Professors Martina Brueckner (*Pediatrics/Cardiology*), Keith Choate (*Dermatology*), Chris Cotsapas (*Neurology*), Valentina Greco, Daniel Greif (*Internal Medicine/Cardiology*), Marc Hammarlund, Natalia Ivanova, Mustafa Khokha (*Pediatrics*), Peining Li, Janghoo Lim, Jun Lu, Arya Mani (*Internal Medicine*), James Noonan, In-Hyun Park, Curt Scharfe, Zhaoxia Sun, Andrew Xiao

Assistant Professors Kaya Bilguvar, Sidi Chen, Smita Krishnaswamy, Monkol Lek, Bluma Lesch, Mandar Muzumdar, Stefania Nicoli (*Internal Medicine/Cardiology*), Michele Spencer-Manzon, 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.

SPECIAL ADMISSIONS REQUIREMENTS

The department welcomes applicants who have a bachelor's or master's degree in biology, chemistry, or a related field, with experience (from course work and/or research) in the field of genetics. GRE General Test scores are required. A pertinent Subject Test in Biochemistry and Molecular Biology, Biology, or Chemistry is recommended.

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), <http://bbs.yale.edu>.

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 at the TF-10 level. 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 901, First-Year Introduction to Research—Ethics: Scientific Integrity in Biomedical Research, 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 is 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: Genomic Methods for Genetic Analysis (GENE 760); Graduate Student Seminar: Critical Analysis and Presentation of Scientific Literature (2 terms; GENE 675 and GENE 676, graded Satisfactory/Unsatisfactory); Ethics: Scientific Integrity in Biomedical Research (as part of GENE 901, graded Satisfactory/Unsatisfactory).

Recommended courses: Advanced Eukaryotic Molecular Biology (GENE 743); Biochemical and Biophysical Approaches in Molecular and Cellular Biology (MCDB 630); Molecules to Systems (CBIO 502); Frontiers (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 (<http://bbs.yale.edu>), MCGD Track.

COURSES

GENE 555a / CB&B 555a / CPSC 553a, Machine Learning for Biology Smita Krishnaswamy

This course introduces biology as a systems and data science through open computational problems in biology, the types of high-throughput data that are being produced by modern biological technologies, and computational approaches that may be used to tackle such problems. We cover applications of machine-learning methods in the analysis of high-throughput biological data, especially focusing on genomic and proteomic data, including denoising data; nonlinear dimensionality reduction for visualization and progression analysis; unsupervised clustering; and information theoretic analysis of gene regulatory and signaling networks. Students' grades are based on programming assignments, a midterm, a paper presentation, and a final project.

GENE 625a / MB&B 625a / MCDB 625a, Basic Concepts of Genetic Analysis Jun Lu
The universal principles of genetic analysis in eukaryotes are discussed in lectures. Students also read a small selection of primary papers illustrating the very best of genetic analysis and dissect them in detail in the discussion sections. While other Yale graduate molecular genetics courses emphasize molecular biology, this course focuses on the concepts and logic underlying modern genetic analysis.

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

GENE 675a and GENE 676b, Graduate Student Seminar: Critical Analysis and Presentation of Scientific Literature Valentina Greco

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 743b / MB&B 743b / MCDB 743b, Advanced Eukaryotic Molecular Biology

Mark Hochstrasser and Wendy Gilbert

Selected topics in transcriptional control, regulation of chromatin structure, mRNA processing, mRNA stability, RNA interference, translation, protein degradation, DNA replication, DNA repair, site-specific DNA recombination, somatic hypermutation. Prerequisite: biochemistry or permission of the instructor.

GENE 749a, Medical Impact of Basic Science Joan Steitz, Thomas Steitz, I. George Miller, David Schatz, Daniel DiMaio, Karla Neugebauer, and Wendy Gilbert

Consideration of examples of recent discoveries in basic science that have elucidated the molecular origins of disease or that have suggested new therapies for disease. Emphasis is placed on the fundamental principles on which these advances rely. Reading is from the primary scientific and medical literature, with emphasis on developing the ability to read this literature critically. Aimed primarily at undergraduates. Prerequisite: biochemistry or permission of the instructor.

GENE 760b, Genomic Methods for Genetic Analysis James Noonan

Introduction to the analysis and interpretation of genomic datasets. The focus is on next-generation sequencing (NGS) applications including RNA-seq, ChIP-seq, and exome and whole genome sequencing. By the end of the course, each student will be able to process and analyze large-scale NGS datasets and interpret the results. This course is intended only for graduate students who are interested in applying genomic approaches in their thesis research. At a minimum, students must have basic familiarity with working in a UNIX/Linux computing environment. Prior experience with shell scripting or a scripting language such as Perl, Python, or Ruby is strongly recommended. Interested students must contact the instructor early in the fall term to discuss their prior experience and expectations for the course. Enrollment limited to twenty. Prerequisite: permission of the instructor.

GENE 777b / MCDB 677b, Mechanisms of Development Zhaoxia Sun

An advanced course on mechanisms of animal development focusing on the genetic specification of cell organization and identity during embryogenesis and somatic differentiation. The use of evolutionarily conserved signaling pathways to carry out developmental decisions in a range of animals is highlighted. Course work includes student participation in critical analysis of primary literature and a research proposal term paper.

GENE 900a / CBIO 900a / MCDB 900a, First-Year Introduction to Research – Grant Writing and Scientific Communication Valerie Horsley

Grant writing, scientific communication, and laboratory rotation talks for Molecular Cell Biology, Genetics, and Development track students.

GENE 901b / CBIO 901b / MCDB 901b, First-Year Introduction to Research – Ethics: Scientific Integrity in Biomedical Research Joerg Bewersdorf

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

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

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

GENE 913b / CBIO 913b / MCDB 913b, Third Laboratory Rotation Valerie Horsley
Third laboratory rotation for Molecular Cell Biology, Genetics, and Development track students.

Geology and Geophysics

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, Danny Rye, James Saiers, Ronald Smith, Mary-Louise Timmermans, John Wettlaufer

Associate Professor Kanani Lee

Assistant Professors Bhart-Anjan Bhullar, Pincelli Hull, Noah Planavsky, Alan Rooney

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.

SPECIAL ADMISSIONS REQUIREMENTS

The department welcomes applicants oriented toward the earth sciences who have a bachelor's or master's degree in such fields as biology, chemistry, engineering, mathematics, meteorology, or physics, as well as those trained in geological, geophysical, and geochemical sciences. Scores from a pertinent GRE Subject Test are desirable but not required. The TOEFL or IELTS exam is required of all applicants for whom English is a second language.

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 Geology and Geophysics. For that reason all students are required to serve as teaching fellows (5 hours per week) for two terms during the course of their predoctoral training.

In addition to all other requirements, students must successfully complete G&G 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 Geology and Geophysics, Yale University, PO Box 208109, New Haven CT 06520-8109; e-mail, dgs@geology.yale.edu.

COURSES

G&G 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.

G&G 512b, 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.

G&G 520a, Physics and Chemistry of Earth Materials II Shun-ichiro Karato

Basic principles that control the transport properties of Earth materials. Chemical reactions, anelasticity, diffusion, kinetics of reaction, and mass/energy transport.

G&G 521b, Geophysical Fluid Dynamics David Bercovici

Examination of the equations governing rotating stratified flows with application to planetary atmospheres and oceans. Mathematical models are used to illustrate the dynamical principles of geophysical fluid phenomena such as waves, boundary layers, flow stability, turbulence, and large-scale flows. Concepts are investigated through laboratory experiments in a rotating water tank. Prerequisite: a course in fluid mechanics (MENG 361 or equivalent) or permission of the instructor.

G&G 522a, Physics of Weather and Climate Alexey Fedorov

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.

G&G 525a, Introduction to Continuum Mechanics 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 to the evolution of vertebrate feeding, locomotor, and sensory systems.

G&G 526a, Introduction to Earth and Planetary Physics Kanani Lee

An introduction to the structure and dynamics of Earth and other planets in the context of cosmic evolution. Review of basic physical principles and their applications to geophysics and planetary physics. Star formation and nucleosynthesis; planetary accretion and the birth of the solar system; heat flow, plate tectonics, and mantle dynamics; seismology and geodesy; core dynamics, geomagnetism, and planetary magnetism. Prerequisites: PHYS 181 and MATH 120 or equivalents.

G&G 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.

G&G 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.

G&G 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.

G&G 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.

G&G 562b / ARCG 762b / EMD 548b / F&ES 726, Observing Earth from Space

Ronald Smith

A practical introduction to satellite image analysis of Earth's surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and

applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management.

G&G 614a, Biogeochemical Cycles through Time Noah Planavsky

In this class we will explore the role that biological innovation and changes in tectonic process have played in shaping global biogeochemical cycles through time. The class will focus on extensively investigated elements (C, S) nutrients (N, P) and redox-sensitive metals (e.g., Fe, Mo, Cr, Zn, Cd). The aim of the class is twofold: 1) we will do a survey of key historical papers that provide the foundation for our understanding of geochemical cycles, basic modeling approaches, and widely utilized geochemical tracers; 2) we will explore recent literature with the goal of discussing major uncertainties and key unanswered questions concerning the co-evolution of life and Earth surface processes. Students will be expected to actively participate and help steer discussions, as well as to individually explore a specific aspect of the evolution of global biogeochemical cycling in detail over the course of the class.

G&G 632b, Evolution of Lizards Jacques Gauthier

G&G 655a, Extraordinary Glimpses of Past Life Derek Briggs

Study of exceptionally well preserved fossil deposits (*lagerstaetten*) that contain nonmineralized animal skeletons and casts of the soft parts of organisms. Examples such as the Burgess Shale and Solnhofen limestones; what they can reveal about the history and evolution of life, ancient lifestyles and environments, and preservational processes.

G&G 703a or b / E&EB 930a or b, Seminar in Systematics Jacques Gauthier

A seminar on using molecular evolutionary models in Bayesian phylogenetic analyses. Topics are chosen by the participants but may include “models” in phylogenetics, understanding and comparison of model selection criteria, effects of model under- and overparameterization on parameter value estimates and phylogenetic inferences, and accommodating model uncertainty and model-averaging.

G&G 710a, Responsible and Ethical Conduct of Research Staff

A 5-to-6-week lecture course (1 hour) that is required of all graduate students and must be completed within the first year. Course topics include record keeping and data management/retention; plagiarism and fraud; collaboration, coauthorship, and ownership of research materials and intellectual property; laboratory dynamics and sexual harassment. G&G 710 is in addition to the existing online ethics module, The Yale Guide to Professional Ethics, that must be completed by all GSAS students within the first term of study, regardless of source of financial support. o Course cr

G&G 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.

G&G 810a, Tutorial in Structural Geology and Tectonics or Solid Earth Geophysics
Staff

G&G 820a or b, Tutorial in Meteorology, Oceanography, or Fluid Dynamics Staff

G&G 830a or b, The Geochemistry of Earth's Past Climates Staff

This seminar focuses on advanced topics in climate science from a geochemical perspective. We cover intervals from Deep Time to the Anthropocene. Meetings are for

two hours, once a week, and are organized around readings from the primary research literature. Undergraduates require permission from the instructor. Enrollment limited to twelve.

G&G 840a or b, Tutorial in Sedimentology Staff

G&G 860a or b, Tutorial in Remote Sensing Staff

Germanic Languages and Literatures

W. L. Harkness Hall, 203.432.0788

<http://german.yale.edu>

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

Chair

Kirk Wetters

Director of Graduate Studies

Rüdiger Campe

Professors Rüdiger Campe, Carol Jacobs (*Emerita*), Rainer Nägele (*Emeritus*), Paul North, Brigitte Peucker, Kirk Wetters

Assistant Professor Katrin Truedstedt

Affiliated Faculty Jeffrey Alexander (*Sociology*), Jennifer Allen (*History*), Seyla Benhabib (*Political Science; Philosophy*), Thomas Connolly (*French*), Paul Franks (*Philosophy*), Gundula Kreuzer (*Music*), Patrick McCreless (*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; visibility and German cinema.

SPECIAL ADMISSIONS REQUIREMENT

All students must provide evidence of mastery of German upon application.

REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to demonstrate, besides proficiency in German, a reading knowledge of one other foreign language in the third term of study. French is recommended, although occasionally, on consultation with the director of graduate studies (DGS), other relevant languages may be substituted. The faculty in German considers teaching to be essential to the professional preparation of graduate students. Four terms of teaching are required 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.

In the first two years of study, students take four courses per term. Three of these sixteen courses in the first four terms may be audited.

Oral examinations must be passed in the fifth and sixth terms of study, and 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 an informal discussion with the faculty. The defense will take place before the prospectus is officially approved, usually in 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 moment of 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, 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 in either French or another 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; e-mail, german@yale.edu.

COURSES

GMAN 571a, Robert Musil's *Man without Qualities*: The End of the Novel Rüdiger Campe

Musil's unfinished, gigantic novel *Man without Qualities* (published 1930–33) is one of the quintessential modernist (interwar) European novels. Close (i.e., selective) reading of the novel is introduced by examples from Musil's earlier highly experimental narratives (*Unions*; *The Blackbird*), and it is accompanied by looking into Musil's widespread scientific and sociolegal interests, which are relevant for the novel (statistics and probability; the Vienna Circle and the modern science of philosophy; theories of accountability and the case study; Wagner and Romantic music; the theory of the image in the age of cinema). Taking as its point of departure the intertwining of essayistic writing and narration that characterizes *Man without Qualities*, the reading centers on the self-theorization of the novel and, even more fundamental, the question of prose as literary form and method of notation. Readings in English or German. Discussions in English.

GMAN 593a / CPLT 954a, Reading Theory Katrin Truedstedt

From the new form of literary theory taking shape in romanticism to recent German media studies, this course examines the relation of close readings of singular texts to larger theoretical claims. We reflect on the eminent status that literary readings have attained for broader theoretical and philosophical projects. We specifically focus on a certain theoretical milieu in which far-reaching theoretical claims were not merely exemplified or illustrated by, but in fact developed from distinct practices of (close) reading of particular literary texts. The aim is to analyze this distinct type of theory by investigating the scenes of reading that major theoretical endeavors depended upon, in order to trace the trajectory of theory and turn to more recent theoretical endeavors, to discuss the changed status that reading has for them. Among the authors read are Schlegel, Benjamin, de Man, Derrida, Blumenberg, Butler, Kittler, and Latour.

GMAN 603a / CPLT 699a / PHIL 602a, Heidegger's *Being and Time* Martin Hägglund

A systematic, chapter-by-chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy of the twentieth century. All the major themes of the book are addressed in detail, with a particular emphasis on care, time, death, and the meaning of being.

GMAN 651a / PHIL 734a / PLSC 583a, Contemporary Critical Theory Seyla Benhabib

An examination of the themes of statelessness, migration, and exile in the works of Arendt, Benjamin, Adorno, Shklar, and Berlin.

GMAN 654b / CPLT 562b, Living Form: Organicism in Society and Aesthetics Kirk Wetters

Starting with Kant, the organic is defined as a processual relation of the part and the whole, thereby providing a new model of the individual as a self-contained totality. We explore the implications of this conception in Goethe's writings on morphology (*The Metamorphosis of Plants*, "Orphic Primal Words"), the Romantics' *Athenaeum*, Hanslick's *On the Beautiful in Music*, Oswald Spengler's cultural morphology, the concept of

autopoiesis in Maturana and Varela, Luhmann's systems theory, and Canguilhem's critique of the analogy of organic life and society.

GMAN 730b / CPLT 716b / FILM 729b, 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 742b / CPLT 782b, Being a Person Rüdiger Campe

In Western experience, the social and legal notion of a "person" has been deeply informed by how "persons" are formed and performed onstage and in narration, and vice versa. Readings focus on three areas: (1) basic texts on the history of the notion of "person" and "character" in legal, poetical, and philosophical contexts from Aristotle to modernity; (2) the performance of personhood in the rebirth of modern theater in early modern times; and (3) the narrative evocation of a new modern character in the rise of the modern novel. In order to bring into view the performative and aesthetic dimensions of personhood we discuss questions such as: What does it mean to appear as a person on a stage? What does it take to appear as a certain character (e.g., as reflected in *commedia dell'arte*, Shakespeare, Racine, Lessing)? What is a main and what is a supporting character (e.g., as reflected in Defoe, Richardson, Goethe, Kleist, Mary Shelley)? How can a protagonist of a novel be constituted, and how is the protagonist's identity defined and secured? Gender, race, and social class are of relevance throughout, as well as the question of being a nonperson (a madman, an animal, a monster, an outcast). None

GMAN 760b / CPLT 905b / FILM 760b, Intermediality in Film Brigitte Peucker

Film is a hybrid medium, the meeting point of several others. This course focuses on the relationship of film to theater and painting, suggesting that where two media are in evidence, there is usually a third. Topics include space, motion, color, theatricality, *tableau vivant*, *ekphrasis*, spectatorship, and new media. Readings feature art historical and film theoretical texts as well as essays pertinent to specific films. Films by Fassbinder, Bergman, Murnau, von Trier, Rohmer, Godard, Kiarostami, and others, concluding with three films by Peter Greenaway.

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*)

Director of Graduate Studies

Lloyd Grieger (*Sociology*)

Director of Student Affairs

Lily Sutton (lily.sutton@yale.edu)

Professors Konstantinos Arkolakis (*Economics*), David Engerman (*History*), John Gaddis (*History*), Jacob Hacker (*Political Science*), Oona Hathaway (*Law*), Paul Kennedy (*History*), James Levinsohn (*School of Management*), A. Mushfiq Mobarak (*School of Management*), Samuel Moyn (*Law*), Catherine Panter-Brick (*Anthropology*), Peter Schott (*Economics; School of Management*), Ian Shapiro (*Political Science*), Timothy Snyder (*History*), Jing Tsu (*East Asian Languages & Literatures*), Aleh Tsyvinski (*Economics*), Steven Wilkinson (*Political Science*), Ernesto Zedillo (*International Economics & Politics*)

Associate Professors Alexandre Debs (*Political Science*), Kaveh Khoshnood (*Public Health*), Jason Lyall (*Political Science*), Nuno Monteiro (*Political Science*), Marci Shore (*History*), Jonathan Wyrzten (*Sociology; International Affairs*)

Assistant Professors Katharine Baldwin (*Political Science*), Lorenzo Caliendo (*Economics; School of Management*), Zack Cooper (*Public Health*), Lloyd Grieger (*Sociology*), Thania Sanchez (*Political Science*)

Senior Lecturers Marnix Amand, Sigga Benediktsdottir, Charles Hill (*International Security Studies*), Asha Rangappa, Justin Thomas, Isaiah Wilson

Lecturers Jeff Bandman, Michael Boozer (*Economics*), Michael Brenes, Elaine Dezenski (*Ethics, Politics, & Economics*), Christopher Fussell, Robert Hecht, William Casey King, Nicholas Lotito (*Political Science*), Alice Miller (*Public Health; Law*), Julie O'Brien, Daniel Steinmetz-Jenkins, Kristina Talbert-Slagle (*Global Health*), Catherine Tejeda, John Weigold, Edward Wittenstein, Lauren Young

Senior Fellows Susan Biniaz, Eric Braverman, David Brooks, Ryan Crocker, Howard Dean, Janine di Giovanni, Robert Ford, Clare Lockhart, Stanley McChrystal, George Packer, David Rank, Bill Richardson, Stephen Roach, Emma Sky, Harry Thomas, Margaret Warner

Visiting Assistant Professor Raphael Dix-Carneiro (*Economics*)

The Jackson Institute for Global Affairs nurtures degree programs and 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 fifty to sixty 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.

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 Forestry & Environmental Studies, the Law School, the School of Management, and the School of Public Health. The M.A.S. program is aimed at midcareer professionals with extensive experience in a field of global affairs such as, but not limited to, international security, diplomacy, and development.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants to either program must take the GRE General Test; students whose native language is not English and who did not earn their undergraduate degree at an English-language university must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). The minimum score on the TOEFL is 610 on the paper-based test or 102 on the Internet-based test. Entering M.A. students are strongly encouraged to have taken introductory courses in microeconomics and macroeconomics prior to matriculation.

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 term 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 also be fulfilled by completing language study, other relevant course work, or independent research on an approved topic.

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

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 M.A. JOINT-DEGREE 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 in Arts and Sciences departments or in 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.

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>, e-mail jackson.institute@yale.edu, or call 203.432.3418.

COURSES

GLBL 504b, International Economics Peter Schott

Introduction to conceptual tools useful for understanding the strategic choices made by countries, firms, and unions in a globalized world. Prerequisite: two terms of introductory economics.

GLBL 529a / CDE 585 / WGSS 529a, Sexuality, Gender, Health, and Human Rights

Alice 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 536b, Human Rights: Theories and Practices Thania Sanchez

The aim of this seminar is to engage in the normative and empirical evaluation of human rights promotion efforts by NGOs, international organizations, and states. We discuss current theories and debates about how human rights work. On the empirical front we discuss the efficacy of tools used to promote human rights, such as advocacy campaigns, naming and shaming, mass mobilization, sanctions, aid and development, and law and courts. Some of the areas of human rights under discussion include civil and political rights, genocide and crimes against humanity, refugee rights, and women's rights.

GLBL 537a, Reporting and Writing on War and Humanitarian Disasters Staff

This course examines how to identify, interview, and document human rights violations in the field. It is aimed at students who want to work as journalists, advocates, or policy makers, and at those who want to work as practitioners during a conflict or humanitarian crisis or under extreme circumstances. The instructor brings twenty-five years as a field reporter in war zones into the classroom: the goal is to make the learning functional. The course teaches students how to compile their findings in the form of reports and articles for newspapers and magazines as well as advocacy letters, op-eds, and blogs. We develop skills for “crunching” talking points for presentations and briefing papers. Each week focuses on a theme and links it to a geographical conflict. Students emerge with practical research, writing, and presentation skills when dealing with sensitive human rights material – for instance, victims' evidence.

GLBL 543b, Practicum in Data Analysis Using Stata Justin Thomas

This course provides students with practical hands-on instruction in the analysis of survey data using the statistical package Stata. It serves as a bridge between the theory of statistics/econometrics and the practice of social science research. Throughout the term students learn to investigate a variety of policy and management issues using data from the United States as well as several developing countries. The course assumes no prior knowledge of the statistical package Stata. Prerequisites: graduate course in statistics and permission of the instructor.

GLBL 552a, 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 558a, History and Theories of Global Development Daniel Steinmetz Jenkins

This course offers a history of development thought from its origins in the Enlightenment to our present neoliberal age. It also provides a thematic approach to key concepts that have come to play a defining role in theories of global development. Topics to be discussed include globalization, postindustrialism, sustainability, security, etc.

GLBL 559a, Evolution of Central Banking Rakesh Mohan

Changes in the contours of policy making by central banks since the turn of the twentieth century. Theoretical and policy perspectives as well as empirical debates in central banking. The recurrence of financial crises in market economies. Monetary policies that led to economic stability in the period prior to the collapse of 2007–2008. Changes in monetary policies since the great financial crisis.

GLBL 560a, Religion and Global Politics since 1989 Daniel Steinmetz Jenkins

This course examines the increasing influence that religion has had on global politics since the end of the Cold War. It attempts to narrate the rise and the fall of secular governance since 1989 in such places as central Europe, Russia, India, Turkey, and elsewhere. Concepts to be discussed include populism, traditionalism, post-secularism, religious freedom, etc.

GLBL 570a, Negotiating International Agreements: The Case of Climate Change

Susan Biniaz

This seminar is a practical introduction to the negotiation of international agreements, with a focus on climate change. Through the climate lens, students explore the crosscutting 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 the 1992 UN Framework Convention on Climate Change, the 1997 Kyoto Protocol, the 2009 Copenhagen Accord, and the 2015 Paris Agreement. The seminar ends with a mock climate-related negotiation.

GLBL 573a, Global Resources and the Environment Staff

Students first learn the global distribution of resources—the amounts, importance, and causes of distribution, and potential changes of soils, water, biodiversity, human societies, energy sources, climates, agriculture, forests and forest products, minerals, and disturbances. They also learn how to analyze and interpret data on global resource distributions. Secondly, they gain an understanding of the value of multiple-country trading of resources. Thirdly, they gain an understanding of the many mechanisms that facilitate such exchanges, including policies and treaties; business, markets, trading partners, and economics; “good will”; social “taboos”; force; news media; philanthropy; skillful negotiations; cultural/social affiliation; technologies; shared infrastructures; and others. Four teaching methods are used: lectures on the different resources and policy mechanisms; analytical exercises for understanding how to use

and interpret international data—and its limitations; a class negotiation exercise for learning the uses of international trade; and guest lectures by faculty and meetings with practitioners for learning the facilitation mechanisms. Three hours lecture; possible field trips.

GLBL 579a / PLSC 656a, Global Governance Yuriy Sergeyev

Examination of global policy problems, the acceleration of interdependence, and the role, potential, and limits of the institutions of global governance to articulate collective interests and to work out cooperative problem-solving arrangements. Consideration of gaps in global governance and controversies between globalization and state sovereignty, universality, and tradition.

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. 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 and impact. Using Russia's efforts in the 2016 election as an example, students examine the legal limitations on the FBI and intelligence community's ability to counter such operations in the United States and explore potential policy solutions in the realm of intelligence tools, privacy laws, Internet regulation, and human "social capital." Guest speakers include information warfare expert Molly McKew, Russian CIA officer John Sipher, producers of the recent documentary *Active Measures*, and others.

GLBL 590b, Cybersecurity, Cyberwar, and International Relations Edward Wittenstein

Analysis of international cyberrelations. Topics include cybercrime, cyberespionage, cyberwar, and cybergovernance. Readings from academic and government sources in the fields of history, law, political science, and sociology.

GLBL 592a, Intelligence, Espionage, and American Foreign Policy Edward 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 601a, International Financial Economics, Analysis, and Application Sigridur Benediktsdottir

This course deals with the application of basic international economics analysis to public policy issues. The objective is for students to gain a broad understanding of international economics analysis and important policies issues connected to that. International economics is broadly divided into international trade and international finance. This course will focus more on international finance, while trade theory and policy will be introduced. The course starts with financial theory and asset pricing, which forms an important basis for international finance. Then international trade theory and policies is introduced. Next is international finance which connects with the first part of the course. Emphasis will be on exchange rates, capital flows and effects of integrated capital markets on long term growth. Risks associated with integrated

capital markets will be explored and policy decision spill over in particular from large economies to emerging economies.

GLBL 603a, Terrorism and Global Development Staff

This course explores the interaction of two central global challenges: terrorism and development. It interrogates the causal cycle of development and terrorism. 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 Staff

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 618a, The Next China Stephen Roach

Born out of necessity in the post-Cultural Revolution chaos of the late 1970s, modern China is about reforms, opening up, and transition. The Next China will be driven by the transition from an export- and investment-led development model to a pro-consumption model. China’s new model could unmask a dual identity crisis—underscored by China’s need to embrace political reform and the West’s long-standing misperceptions about China. Prerequisite: basic undergraduate macroeconomics.

GLBL 633b, Strategies for Economic Development Rakesh Mohan

How strategies for economic development have changed over time and how dominant strands in development theory and practice have evolved. Students trace the influence of the evolution in thinking on actual changes that have taken place in successful development strategies, as practiced in fast-growing developing countries, and as illustrated in case studies of fast growth periods in Japan, South Korea, Brazil, China, and India. Prerequisites: introductory microeconomics and macroeconomics.

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 712a, Insurgency and Counterinsurgency Isaiah Wilson

This course examines the dynamics of insurgency (a distinct variant of guerrilla warfare) and counterinsurgency (the government response), and has been crafted with America's recent and current involvement in both Afghanistan and Iraq in mind. This course seeks to acquaint students with the nature, dimensions, and history of insurgency and counterinsurgency both past and present and establish a solid foundation upon which expertise and analytical capabilities can be developed for future application. The course also considers a wide range of questions to provide students with a deeper understanding of the evolution of insurgent strategy and tactics over time and the development of government counterinsurgency doctrine. Questions include: What is insurgency and how does it differ from guerrilla warfare and terrorism? Why and how do insurgencies develop? How have strategies and tactics of insurgents changed over time? Who are the foremost ideological and doctrinal proponents of insurgency and why? Who are the foremost counterinsurgency practitioner-theorists? Why does insurgency succeed or fail? How can insurgency best be fought? Why the wheel is seemingly always "reinvented" in counterinsurgency? Finally, the course aims to analyze both the effectiveness of insurgency as a means to achieve political change and the challenges faced by the liberal democratic state in responding to insurgent campaigns and challenges.

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 715a, Economic and Trade Challenges and Opportunities in Southern Africa
Staff

How can the Southern African Development Community (SADC) member states (Angola, Botswana, Democratic Republic of the Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe) achieve sustainable economic development and integrate trade? In this course, we discuss structural and institutional challenges to sustainable economic development and trade and how SADC can overcome these obstacles. We examine SADC in comparative perspective. Students research the critical issues in SADC politics and governance that prevent improved economic output. This course also highlights the economic and trade successes SADC has experienced.

GLBL 725a, Diplomatic Crises and Statecraft Staff

Hands-on case studies of diplomatic crises and statecraft that include the North Korean crisis; the Iran nuclear deal; the Rohingya crisis; the effectiveness of the un-trade wars between the United States, China, the EU, and NAFTA; OPEC and the geopolitics of oil diplomacy; crises in the Congo and the Sudan; Latin America, the forgotten hemisphere (U.S.-Mexico and Venezuela relations and Trump immigration policy). The course also includes sessions on hostages and political prisoners as well as a primer on how to get elected to office.

GLBL 750b, American Power in the Twenty-First Century: Lessons in Diplomacy

John Kerry

Led by former Secretary of State John Kerry '66, this seminar examines U.S. foreign policy in the twenty-first century. It takes an interdisciplinary approach to understanding diplomacy both in theory and practice, and it examines the core subjects on which the Kerry Initiative is focused: failed and failing states, the challenge of authoritarian populism, rising sectarianism and violent extremism, climate change and other environmental threats, capacity building and anti-corruption, and global economic opportunity and development. Students focus on a series of case studies from the perspective of those who make and implement U.S. foreign policy. Application and course dates at <http://jackson.yale.edu/apply/american-power-21st-century-lessons-diplomacy>.

GLBL 752a, American Power in Transition: Providing an Uncommon Defense and the Search for Strategic Stability Isaiah Wilson

The years since the end of the Cold War have marked two big world-system-impacting consequences: the end of more than forty years of relatively stable bipolarity and the beginning of America's "unipolar moment" of preeminent power dominance. Today's tumultuous global security environment is perhaps best characterized as contagious with converging, transregional compound security dilemmas and a growing pathological weakening of nation-states and, arguably, of the Western-Liberal system. For the United States and the world-system at-large, these times mark a moment of significant, and perhaps historic, strategic inflection. The hard choices the United States makes today and in the coming years impacting whether or not it intervenes in world affairs – and if so, *how it chooses to intervene* – will matter most. These choices will (re)define the new American national security and, consequently, the future stability of the international system and community of nation-states. As such, they demand a reconsideration of American global leadership since its rise to unipolar primacy in the early 1990s. This course explores and examines questions revolving around power in transition, in general terms, and more pointedly with critical focus on American power and uses of force over the past three to four decades. We adopt a theory-history-practice analytical approach, incorporating mixed methods, including case examinations. The seminar is organized around five "crisis arenas": crisis in American grand strategy; crisis in American commitment to assuring global system order; crisis in humanitarianism; crisis of law, ethics, and intervention; and crisis in American identity.

GLBL 771b, Effective States, Weak States, and Citizens in the Twenty-First Century

Clare Lockhart

Analysis of the role of the state and the social compact in the twenty-first century. Consideration of the changing dynamics (including digital, demographics, globalization), and the challenges and opportunities this presents for the role of the state in meeting citizen expectations. Analysis of the functions the state is expected to perform. Examination of cases of success and setbacks in responding to these challenges. Review of perspectives of and policy options for domestic actors and international actors. This is a graduate seminar, but undergraduates may also apply. Enrollment limited to sixteen. Given the limited space available, students may e-mail the instructor to discuss enrollment.

GLBL 789a and GLBL 790b, Leadership Stanley McChrystal and Christopher Fussell

This course 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. This is an application-only course offered over two terms (fall and spring); credit is granted only upon completion of both terms (GLBL 789 and 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. 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 <http://jackson.yale.edu/apply/glbl-792>. Attendance at first session is mandatory.

GLBL 801a, Economics: Principles and Applications James 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 Lloyd Grieger

The course focuses on useful analytical approaches in public policy and the social sciences. The first part of the course focuses on mathematical skills. The second part focuses on methods for analyzing empirical data and builds on the mathematical skills from the first part of the course. Special focus is devoted to developing the skills necessary to synthesize and evaluate empirical evidence from the social sciences. Students leave the class with an applied understanding of how quantitative methods are used as tools for analysis in public affairs.

GLBL 803b, History of the Present Daniel Steinmetz Jenkins

The first half of the course presents some of the major diplomatic (and sometimes military) confrontations of the twentieth century, beginning with the First Balkan War, including the breakdowns of the late 1930s and progressing through the end of the Cold War. The second half introduces the history of Ukraine and closes with a case study of the Russian invasion of Ukraine's south and east as the end of the post-cold

war order. In both parts emphasis is placed upon a close reading of primary documents and upon the reconstruction of possible alternatives.

GLBL 833a, Anti-Money Laundering and Counterterrorist Financing William King

For more than a decade, the international community has attempted to disrupt, debilitate, and destroy illegal financial networks of those who would finance terror. This course provides an introduction to anti-money laundering (AML) and counterterrorist financing (CTF). The approach is interdisciplinary, as understanding the financial tools to combat terrorism necessitates a consideration of law, policy, and intelligence. Additionally, AML and CTF focus on the overlapping realms of crime, corruption, and terrorism. Guest speakers join the class for select discussions. Students gain a better understanding of the fundamentals of AML/CTF, the approaches and limitations of combating current terrorist threats, particularly ISIL, and the challenges and opportunities of using financial tools in the war against terror.

GLBL 840b, Macroeconomics Marnix Amand

This course develops a framework for understanding the causes and consequences of macroeconomic events in real time. We begin by defining basic national accounting identities and using these identities to compare countries' economic structure and performance over time. We then consider models in which the choices of private and public agents interact to produce aggregate outcomes in response to policy or economic shocks. In developing and using these models, we will rely on numerous historical and contemporary examples.

GLBL 883b, Challenges to Security and Stability in Central and Eastern Europe

Yuriy Sergeyev

This course examines the geopolitical, political, military, socioeconomic, and ideological factors that are challenging security and stability in the region of Central and Eastern Europe after collapse of the USSR. The goal is to give students a broad understanding of the reasons for the worsening security and stability in the region, particularly the Baltic states, Visegrad states, and GUAM member states, and to model further potential developments. The influence of the global players—United States, European Union, Russia—on the security situation in the region is considered.

GLBL 885b, World Order in Liberal Arts Charles Hill

International peace and security as humanity's primary moral-philosophical problem, reflected in works beyond the policy realm, from Confucius to Kant, Hegel, Wittgenstein, and Niebuhr. Early writings of Kissinger and his diplomatic papers now at Yale provide case studies. Prerequisite: permission of the instructor.

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 Nuno Monteiro

This course covers the main theories and problems in international security. After analyzing the main theoretical traditions devoted to understanding international security and world order, we discuss a variety of topics such as: the causes of war; the

role of nuclear weapons and the problems with their proliferation; coercion, signaling, and crisis bargaining; military effectiveness; and U.S. grand strategy. Students acquire broad familiarity with the canonical literature in these fields, understand how to apply scholarship to analyze contemporary international security problems, and learn to identify opportunities for new research. The course is designed for master's and Ph.D. students who plan to pursue either policy or scholarly work in international security. Seminar sessions may feature outside guest scholars. Besides the weekly seminar sessions, students are strongly encouraged to attend weekly reading group sessions in which we dissect recent scholarship on the same topics for which we have read the canonical works.

GLBL 929a and GLBL 930b, GSE India: Global Social Entrepreneurship Tony Sheldon

Launched in 2008 at the Yale School of Management, the Global Social Entrepreneurship (GSE) course links teams of Yale students with social enterprises based in India. GSE is committed to channeling the skills of Yale students to help Indian organizations expand their reach and impact on “bottom of the pyramid” communities. Yale students partner with mission-driven social entrepreneurs (SEs) to focus on a specific management challenge that the student/SE teams work together to address during the term. GSE has worked with thirty leading and emerging Indian social enterprises engaged in economic development, sustainable energy, women's empowerment, education, environmental conservation, and affordable housing. The course covers both theoretical and practical issues, including case studies and discussions on social enterprise, developing a theory of change and related social metrics, financing social businesses, the role of civil society in India, framing a consulting engagement, managing team dynamics, etc. Enrollment is by application only. *Also* MGT 529. ½ Course cr per term

GLBL 944b, Macroprudential Policy Sigridur Benediktsdottir

This course focuses on current macroprudential theory and the application and experience of macroprudential policies, which address risks and vulnerabilities of financial systems in an effort to manage systemic risk and promote financial stability.

History

McClellan Hall, 203.432.1366

<http://history.yale.edu>

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

Chair

Alan Mikhail

Director of Graduate Studies

Paul Sabin (203.432.1361)

Professors Abbas Amanat, Ned Blackhawk, David Blight, Daniel Botsman, Paul Bushkovitch, Deborah Coen, Stephen Davis, Carolyn Dean, Fabian Drixler, Carlos Eire, David Engerman, Paul Freedman, Joanne Freeman, John Gaddis, Beverly Gage, Bruce Gordon, Valerie Hansen, Robert Harms, Matthew Jacobson, Gilbert Joseph, Paul Kennedy, Benedict Kiernan, Jennifer Klein, Naomi Lamoreaux, Noel Lenski, Kathryn Lofton, Mary Lui, Daniel Magaziner, J.G. Manning, Ivan Marcus, John Merriman, Joanne Meyerowitz, Alan Mikhail, Samuel Moyn, Peter Perdue, Mark Peterson, Stephen Pitti, Naomi Rogers, Paul Sabin, Lamin Sanneh, Stuart Schwartz, Timothy Snyder, David Sorkin, Harry Stout, John Harley Warner, Anders Winroth, John Witt, Keith Wrightson

Associate Professors Paola Bertucci, Anne Eller, Crystal Feimster, Andrew Johnston, William Rankin, Edward Rugemer, Marci Shore, Eliyahu Stern

Assistant Professors Jennifer Allen, Sergei Antonov, Rosie Bsheer, Rohit De, Marcela Echeverri, Denise Ho, Isaac Nakhimovsky, Joanna Radin, Carolyn Roberts

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 ADMISSIONS REQUIREMENTS

The deadline for submission of the application for the History graduate program is December 15.

The department requires a short book review (maximum 1,000 words) to accompany the application. It should cover the book that has most shaped the applicant's understanding of the kind of work the applicant would like to do as a historian.

In addition, the department requires submission of an academic writing sample of not more than 25 pages, double spaced. Normally, the writing sample should be based on research in primary source materials.

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 French or German; Chinese may be necessary for certain fields of Japanese history.

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.

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

These new regulations will be observed by students admitted in 2013 and following years. Students admitted earlier may opt to observe either the new or the old regulations.

During the first year of study, students normally take six term courses, including Approaching History (HIST 500). 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, at the latest, students are expected 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 on a definite, uniform date toward the end of the students' fifth term, typically on the Friday before Thanksgiving break (or on a corresponding date in the spring term). 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. If the student selects the four-field option, the major field will be examined for thirty minutes. If the student selects

the three-field option, the major field will be examined for sixty minutes and each minor field for thirty minutes.

By the end of their sixth term, at the latest, students are expected to hold a prospectus colloquium, but those who took the Prospectus Tutorial (HIST 995) during their second year are encouraged to hold the colloquium at the beginning of their third year. 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.

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 Center for Teaching and Learning and work with the associate director of graduate studies to discuss any matters of concern. Students may teach, normally in their fourth term of teaching, as seminar fellows, teaching an undergraduate seminar in conjunction with a faculty member, if such positions are available.

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 Classics

The Department of History also 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 African American Studies

The Department of History also 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 Renaissance Studies

The Department of History also 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 American Studies program who wishes to obtain an M.A. 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.

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 Daniel Botsman
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 all first-year doctoral students.

HIST 502b / ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HSAR 564b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual
Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China,

and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

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

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

HIST 507a / CLSS 645a, Roman Numismatics Benjamin Hellings

An introduction to the history of ancient coinage and the modern methodology of numismatic study. Brief consideration of the Greek background is followed by detailed treatment of the Roman republic and empire, with particular attention to the Roman provinces.

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

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

HIST 536a / MDVL 536a, Charters, Cartularies, and Archives Paul Freedman and N. Raymond Clemens

An examination of medieval documentation and how to use it to answer questions about medieval politics, society, and religion. Charters are single documents representing transactions, ranging from wills to grants of rights to sales contracts. Cartularies are collections of documents that show how an institution (usually an ecclesiastical institution) acquired property; and they back up and prove rights over those properties. The course looks at archives and ways in which documents end up in archives, how they are organized, and what that can tell us about the issues they focus on.

HIST 540b, Introduction to Research in Medieval History Anders Winroth

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 582b / AMST 705b / RLST 705b, Readings in Religion in American Society, 1600–2018 Tisa Wenger

This seminar explores intersections of religion and society in American history from the colonial period to the present as well as methodological problems important to their study. It is designed to give graduate students a working knowledge of the field, ranging from major recent studies to bibliographical tools. In short, the seminar is a broad readings course surveying religion in American history from colonization

to the present. It is not a specialized research seminar, but it does require a basic understanding of historiography.

HIST 597a / JDST 861a / RLST 797a, Twentieth-Century Jewish Politics: Holocaust, Israel, and American History David Sorkin

This course explores the changing nature of Jewish politics in relationship to three of the twentieth century's major events. First we examine Jewish political behavior during the Holocaust, especially the notion of "resistance" vis-à-vis the so-called Jewish councils and the controversy surrounding Hannah Arendt's book *Eichmann in Jerusalem*. Second, we probe the continuities and discontinuities in the establishment of the State of Israel, focusing on the politics of the "Yishuv" (Jewish settlement in Mandatory Palestine) and its relationship to British imperialism. Third, we analyze shifts in the domestic and foreign policies of the organized American Jewish community during the era of the civil rights movement (1946–64).

HIST 599a / JDST 801a, Medieval Jewish History: 800–1500 CE Staff

This course is an introduction to some of the major themes in the history of the Jewish people from late antiquity to 1500. We trace the development of Jewish communities in Muslim and Christian lands, focusing on the complex relationship that Jews had with their host societies. Other topics include Jewish self-government and communal organization and major currents in Jewish intellectual culture. The course follows a thematic line, moving from demographics to economics, from legal issues to intellectual and social questions.

HIST 600b / JDST 802b, Jewish Everyday Life in the Middle Ages Staff

Medieval Jewish history has been based primarily on written sources and hence has tended to concentrate on the intellectual male elite, institutions, and events. In recent years, historians are increasingly interested in everyday, or quotidian, history, looking beyond the intellectual elite to society as a whole and using, alongside texts, archaeology and the material world. Following the "material turn," this seminar focuses on Jewish material culture, using archaeology and art history in the service of cultural history. Among the subjects considered are the Jewish quarter and street; the synagogue; the ritual bath (mikve); the cemetery and gravestone; book culture; charters; jewelry; fashion; and food.

HIST 601a / JDST 790a / RLST 776a, Jewish History, Thought, and Narratives in Medieval Societies Ivan Marcus

Research seminar that focuses on the two medieval Jewish subcultures of Ashkenaz (northern Christian Europe) and Sefarad (mainly Muslim and Christian Spain).

HIST 613a / ENGL 592a, English Paleography and Manuscript Culture, 1500–1750

Kathryn James

This course provides a detailed introduction to early modern English paleography and manuscript cultures. The primary objective is for students to acquire fluency in reading the main English hands encountered in the early modern archive. Students become familiar with the documentary forms and methods of production of early modern British manuscripts and with the techniques and terms by which these are understood and described. Topics include Anglicana, secretary, chancery, and italic hands; alphabets; writing techniques; abbreviations; numbers; shorthand and cipher; transcription; the forms and vocabulary associated with early modern letters, sermon-notes, diaries, annotations, inventories, and other documentary forms. The course

meets in the Beinecke Library and is based on the library's early modern English manuscript collections.

HIST 619a, Readings in the Social and Cultural History of Britain, 1500–1750 Keith Wrightson

Reading and discussion of central works in the social and cultural history of the period. The class begins with the fundamental issues of social structure and population dynamics. Thereafter the weekly agenda is decided in consultation, selecting from such topics as urbanization; poverty; household and family relationships; gender and sexuality; community structures; crime and the law; protest and rebellion; education, literacy, and print culture; material culture; popular religion; witchcraft; national identities; agrarian custom and change; history and social memory.

HIST 654a, Readings in 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 656a / PLSC 629a, Histories of Political Thought Isaac Nakhimovsky

The intersection between political theory and intellectual history, examined from a historiographical rather than an exclusively methodological perspective. The course aims to develop a comparative framework for discussing the kinds of preoccupations and commitments that have animated various important contributions to the history of political thought since the nineteenth century.

HIST 667b / FREN 900b / WGSS 667b, History of Sexuality in Modern Europe Carolyn Dean

An introduction to the various lines of inquiry informing the history of sexuality. The course asks how historians and others constitute sexuality as an object of inquiry and addresses different arguments about the evolution of sexuality in Europe, including the relationship between sexuality and the state and sexuality and gender.

HIST 677b, Russia in the Age of Peter the Great Paul Bushkovitch

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

HIST 687a, 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 701a / AMST 920a, Writing Workshop in U.S. History Joanne Meyerowitz

For advanced graduate students in History, American Studies, and related fields. Students share and comment on draft dissertation chapters, article manuscripts, and conference papers.

HIST 703a / AMST 803a, Research in Early National America Joanne Freeman

A research seminar focused on the early national period of American history, broadly defined. Early weeks familiarize students with sources from the period and discuss research and writing strategies. Students produce a publishable article grounded in primary materials.

HIST 704b, Research in Early American and Atlantic History, 1500–1815 Mark Peterson

The Atlantic turn in historical scholarship on colonial America has made it clear that there is a great deal of fundamental work to be done to understand the interconnected world of European colonial projects and their fraught relationships with the peoples of Africa and the Americas. Yale's archival resources housed in the Beinecke Library, Sterling Library, and the Yale Center for British Art, Yale Divinity School, and other archives offer a treasure trove of materials to form the basis for such research projects. This seminar, to be taught in the Beinecke Library, is designed to introduce graduate students to an array of such source materials and to address challenges and questions in using these sources ranging from orthography to contextualization. The goal is for each student to produce an article-length original research paper grounded in Yale's collections.

HIST 711a / AFAM 738a / AMST 706a / WGSS 716a, Readings in African American Women's History Crystal Feimster

The diversity of African American women's lives from the colonial era through the late twentieth century. Using primary and secondary sources we explore the social, political, cultural, and economic factors that produced change and transformation in the lives of African American women. Through history, fiction, autobiography, art, religion, film, music, and cultural criticism we discuss and explore the construction of African American women's activism and feminism; the racial politics of the body, beauty, and complexion; hetero- and same-sex sexualities; intraracial class relations; and the politics of identity, family, and work.

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

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

HIST 737b, Research Seminar in U.S. Political Economy Jennifer Klein

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

HIST 746a / AMST 903a, Introduction to Public Humanities Staff

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. Required for the M.A. with a concentration in Public Humanities.

HIST 747a / AFAM 763a / AMST 731a, Methods and Practices in U.S. Cultural History Matthew Jacobson

This sampling of U.S. cultural history from the early national period to the present is designed to unfold on two distinct planes. The first is a rendering of U.S. culture itself—a survey, however imperfect, of the major currents, themes, and textures of U.S. culture over time, including its contested ideologies of race and gender, its organization of productivity and pleasure, its media and culture industries, its modes of creating and disseminating “information” and “knowledge,” its resilient subcultures, and its reigning nationalist iconographies and narratives. The second is a sampling of scholarly methods and approaches, a meta-history of “the culture concept” as it has informed historical scholarship in the past few decades. The cultural turn in historiography since the 1980s has resulted in a dramatic reordering of “legitimate” scholarly topics, and hence a markedly different scholarly landscape, including some works that seek to narrate the history of the culture in its own right (Kasson’s history of the amusement park, for instance), and others that resort to cultural forms and artifacts to answer questions regarding politics, nationalism, and power relations (Melani McAlister’s *Epic Encounters*). In addition to providing a background in U.S. culture, then, this seminar seeks to trace these developments within the discipline, to understand their basis, to sample the means and methods of “the cultural turn,” and to assess the strengths and shortcomings of culture-based historiography as it is now constituted.

HIST 748a, American Conservatism in the Twentieth Century Beverly Gage
An examination of historical and historiographical problems in the study of American conservatism. Topics include electoral and institutional politics, social movements, business and labor, mass politics, free-market ideology, neoconservatism, anticommunism, and the Christian right.

HIST 749a / AMST 838a / HSHM 753a, Research in Twentieth-Century United States Environmental History Paul Sabin

Students conduct advanced research in primary sources and write original essays over the course of the term. Topics are particularly encouraged in twentieth-century environmental history (broadly defined, no specified geography) as well as in U.S. history, with a focus on politics, law, and economic development. Readings and library activities inform students’ research projects. Interested graduate students should contact the instructor with proposed research topics.

HIST 752b / AMST 741b, Indians and Empires Ned Blackhawk

This course explores recent scholarship on Indian-imperial relations throughout North American colonial spheres from roughly 1500 to 1900. It examines indigenous

responses to Spanish, Dutch, French, English, and lastly American and Canadian colonialism and interrogates commonplace periodization and geographic and conceptual approaches to American historiography. It concludes with an examination of American Indian political history, contextualizing it within larger assessments of Indian-imperial and Indian-state relations.

HIST 759a / PHIL 755a, Conservatism: Seminar Samuel Moyn, Scott Shapiro, and Ross Douthart

This seminar examines conservatism's origins as a body of theory; turns to the trajectory of American conservatism since World War II, focusing on both intellectual history and popular mobilization; and concludes with a survey of versions of conservatism prominent in contemporary legal scholarship.

HIST 768b / AMST 768b, Asian American History and Historiography Mary Lui

This reading and discussion seminar examines Asian American history through a selection of recently published texts and established works that have significantly shaped the field. Major topics include the racial formation of Asian Americans in U.S. culture, politics, and law; U.S. imperialism; U.S. capitalist development and Asian labor migration; and transnational and local ethnic community formations. The class considers both the political and academic roots of the field as well as its evolving relationship to "mainstream" American history.

HIST 781a, Global Legal History Rohit De and Sergei Antonov

This seminar has three goals and components. The first is to offer students an opportunity to think broadly about the place of law in society by examining how societies throughout history have engaged with law, rules, and legal institutions, and to engage with the growing body of literature on global and comparative history. Secondly, this is a course on methodology that introduces students to the major approaches to legal history and trains them to read and locate legal sources in their historical context. Finally, the seminar serves as an introduction to the craft of legal history.

HIST 784b, Internationalizing History Staff

This reading seminar exposes students to a range of approaches to transnational history in the nineteenth and twentieth centuries. It is intended not just for students specializing in international history but also those hoping to use the insights of transnational and international history in national histories.

HIST 786a, Special Topics in International History Staff

Research and writing on students' individual topics in international history. Permission of the instructor required.

HIST 791a, Cities of Empire 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 807a / AMST 650a, Resistance, Rebellion, and Survival Strategies in Modern Latin America Gilbert Joseph

An interdisciplinary examination of new conceptual and methodological approaches to such phenomena as peasants in revolution, millenarianism, “banditry,” refugee movements, and transnational migration.

HIST 810a, Introduction to Brazilian History Stuart Schwartz

An introduction to the historical problems and historiography of Brazil. Readings of basic books in the field and discussion of the historiographical traditions. Basic readings are in English but students are encouraged to use Portuguese.

HIST 813a, The Liberation Theology Movement in Latin America: History and Sources Erika Helgen

This course explores the history of liberation theology and liberationist Christian movements in Latin America, paying particular attention to the political, economic, social, and cultural ramifications of the emergence of the “Church(es) of the People.” The majority of the assigned readings are primary sources that document a wide variety of liberationist experiences and actors. Students read about activists in peasant leagues, priests resisting authoritarian regimes, bishops coming together to outline new paths for the Latin American Catholic Church, women promoting feminist liberation theologies, laypeople leading ecclesial base communities, and more. The seminar examines and discusses a number of questions, including: How did the liberation theology movement change over time? What was the relationship between religion and politics in Latin America during times of war and dictatorship? How did the liberation theology movement subvert traditional notions of political and religious authority? What does it mean to build a “Church of the People,” and how did the liberation theology movement succeed and/or fail to build such a church?

HIST 814a, Law and Politics in the Iberian Atlantic Marcela Echeverri Munoz

A review of recent historiography on Latin America that recovered the importance of law and justice for colonial political culture. The course explores the intersection between imperial legal frameworks and traditions of political participation in the Iberian Atlantic societies, asking how monarchical subjects’ interpretation of law shaped local politics. It concludes with the study of the rise of constitutionalism in the nineteenth century.

HIST 832a / AFST 832a, Methods and Practices in African History Daniel Magaziner

This course provides a survey of African historical methods, considering topics from the use of historical linguistics and oral tradition to creative archival and narrative methodologies. We read monographs and other scholarly works, including classics in the discipline and new methodologically innovative studies. Students produce a substantive historiographical essay as well as a detailed analysis of a primary source of their choosing.

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 840b, Colonialism in Africa Robert Harms

Discussion of the theory and practices of colonialism in Africa. Topics include the motives for European expansion, the scramble for Africa, early colonialism, direct and

indirect rule, “colonization of the mind,” the colonial state, the developmental state, late colonialism, and paths to decolonization.

HIST 861b, Research in Ottoman History Alan Mikhail

Research seminar focused on methods, sources, and problems in the field of Ottoman history. The overall goal is for students to produce a publishable article based on primary materials. Topics may come from any period of Ottoman history.

HIST 873a / EALL 873a / EAST 573a, China and the World circa 1900 Peter Perdue and Jing Tsu

Reading and discussion of significant themes in China and world history in the first decade of the twentieth century. We concentrate on topics that contain international, transnational, and comparative implications, and include discussion of literary and historical material. Most readings are in English, but selected primary sources in Asian languages may be used. Open to all History, East Asian Studies, and East Asian Languages and Literatures students, and others by request. Includes research paper and weekly writing exercises. Prerequisite: knowledge of one foreign language, European or Asian.

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 888b / RLST 592b, Society and Religion on the Silk Road Eric Greene

An introduction to artifacts and documents pertaining to social history and religion from the most important sites on the Northern and Southern Silk Roads in China, including Niya, Kizil, Turfan, and Dunhuang. Assigned readings are in English. Readers of Chinese also participate in a separate section reading documents in classical Chinese from Turfan and Dunhuang.

HIST 921b / HSHM 710b, Problems in Science Studies Lisa Messeri

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 / AMST 878a / HSHM 701a, Problems in the History of Medicine and Public Health John Warner

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

HIST 936a / HSHM 716a, Early Modern Science and Medicine Paola Bertucci

The course focuses on recent works in the history of science and medicine in the early modern world. We discuss how interdisciplinary approaches—including economic

and urban history, sociology and anthropology of science, gender studies, art and colonial history – have challenged the classic historiographical category of “the Scientific Revolution.” We also discuss the avenues for research that new approaches to early modern science and medicine have opened up, placing special emphasis on the circulation of knowledge, practices of collecting, and visual and material culture.

HIST 940b / HSHM 770b / WGSS 782b, Disability Histories: Research Seminar

Naomi Rogers

This course introduces students to the major issues in current disability history as well as theoretical debates in disability studies. We discuss cultural, social, and political meanings of citizenship; efforts to define and classify disabled bodies; contested notions of bodily difference; and the ways disability has and continues to be used as a metaphor for socially defined inferiority like gender, race, or sexuality. By the fourth week students have identified the topic for their research papers and discussed them in class. The next month is devoted to research and writing. We start meeting again after spring break to read and discuss a draft of each paper.

HIST 980a, Genocide in History and Theory Benedict Kiernan

Comparative research and analysis of genocidal occurrences around the world from ancient times to the present; theories and case studies; an interregional, interdisciplinary perspective. Readings and discussion, guest speakers, research paper.

HIST 994a or b, Oral Exam Tutorial Staff

Graded Satisfactory/Unsatisfactory.

HIST 995a or b, Prospectus Tutorial Staff

Graded Satisfactory/Unsatisfactory.

HIST 998a or b, Directed Readings Staff

Offered by permission of the instructor and DGS to meet special requirements not covered by regular courses. Graded Satisfactory/Unsatisfactory.

HIST 999a or b, Directed Research Staff

Offered by arrangement with the instructor and permission of DGS to meet special requirements.

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

Chair

Tim Barringer (Loria 657, 203.432.8162, timothy.barringer@yale.edu)

Director of Graduate Studies

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Professors Carol Armstrong, Tim Barringer, Edward Cooke, Jr., Diana Kleiner, Pamela Lee, Kobena Mercer, Amy Meyers (*Adjunct*), Mary Miller, Robert Nelson, Kishwar Rizvi, Nicola Suthor, Mimi Hall Yiengpruksawan

Associate Professors Cécile Fromont, Milette Gaifman, Jacqueline Jung, Jennifer Raab

Assistant Professors Marisa Bass, Craig Buckley, Subhashini Kaligotla

Lecturers Martina Droth, Karen Foster, Ian McClure

FIELDS OF STUDY

Fields include ancient Greek and Roman; Medieval and Byzantine; Renaissance; Early Modern; eighteenth-, nineteenth-, and twentieth-century European; Modern Architecture; African; African American and African diaspora; American; American Decorative Arts; British; Pre-Columbian; Islamic; East Asian.

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 Geology and Geophysics—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 500a, Methods in Art History Carol Armstrong

This seminar is designed to introduce students to a range of art historical methods past and present: a variety of formalisms, connoisseurship, different kinds of iconography, the social history of art, psychoanalysis, and a number of other approaches that are sometimes referred to as visual culture. Readings include classic texts by Riegl, Wölfflin, Panofsky, and Warburg, and more recent approaches by Alpers, Clark, and Crary, among others.

HSAR 509b / EALL 506b, Japanese Classics in Text and Image Edward Kamens and Mimi Yiengpruksawan

Fiction, poetry, and plays from the eighth century through the nineteenth, studied alongside related works of art and illustrated books housed in collections at Yale. An introduction to the Japanese classics as well as an example of interdisciplinary study in the humanities. No knowledge of Japanese required.

HSAR 512a, Directed Research Nicola Suthor

By arrangement with faculty.

HSAR 564b / ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HIST 502b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

HSAR 581a / ARCG 581a / CLSS 890a, Roman Painting: Achievement and Legacy Diana Kleiner

Roman mural painting in all its aspects and innovations. Individual scenes and complete ensembles in palaces, villas, and houses in Rome and Pompeii are explored, as are their rediscovery and revival in the Renaissance and neoclassical period. Special attention is paid to the four architectural styles; history and mythological painting; the impact of the theater; the part played by landscape, genre, and still life; the accidental survival of painted portraiture; and the discovery and rejection of *trompe l'oeil* illusionism and linear perspective.

HSAR 591a / MDVL 650a, Visions and Art in Medieval Europe Jacqueline Jung

From the *Book of Revelation* to the *Showings* of Julian of Norwich (d. 1423), accounts of visions in the Christian tradition were inextricably intertwined with the visual arts. Through examinations of medieval texts, images, and material culture, in conjunction with modern analyses of related phenomena, this seminar explores the range of representational practices that helped medieval Christians summon up, make sense of, and communicate extraordinary moments of contact with the divine. We address such questions as the changes in visionary experiences over time, the role of language and literacy in the communication of such experiences, the impact of gender on visions, the varieties and functions of other senses (especially touch and taste) in medieval visions, and the impact of visionary reports on the development of art. We begin by addressing the theoretical, cognitive, and anthropological facets of visionary experience before turning to medieval primary sources such as saints' lives, accounts of otherworld journeys, miracle books, sermons, monastic chronicles, and individually composed vision books, and to modern interpretations by historians such as Caroline Bynum, William Christian, Peter Dinzelbacher, Jeffrey Hamburger, Barbara Newman, Giselle de Nie, and Jean-Claude Schmitt. Visual materials include both depictions of visions (such as Apocalypse manuscripts, paintings of the Temptation of St. Anthony, and renderings of Hildegard's visions) and images that played a role in sparking visionary experience (such as Marian statues, crucifixes, Man of Sorrows images, and Baby Jesus dolls). Reading knowledge of German, French, and Latin is strongly recommended.

HSAR 605a / RUSS 603a, Russian Realist Literature and Painting Molly Brunson

An interdisciplinary examination of the development of nineteenth-century Russian realism in literature and the visual arts. Topics include the Natural School and the formulation of a realist aesthetic; the artistic strategies and polemics of critical realism; narrative, genre, and the rise of the novel; the Wanderers and the articulation of a Russian school of painting; realism, modernism, and the challenges of periodization. Readings include novels, short stories, and critical works by Dostoevsky, Turgenev, Goncharov, Tolstoy, Chekhov, and others. Painters of focus include Fedotov, Perov, Shishkin, Repin, and Kramskoy. Special attention is given to the particular methodological demands of inter-art analysis.

HSAR 652a, Documenting the World Kishwar Rizvi

This seminar explores the significance of the documentary survey in Europe and the Middle East. Writing the history of the world can only be undertaken from a particular ideological point of view; for example, although medieval illustrated manuscripts, such as the *Compendium of History* of Rashid al-Din (1304) and the *Travels of Sir John Mandeville* (ca. 1371), were concerned with situating the reader within the context of religious and political authority, during the eighteenth century the attempt was made to document the world through scientific explorations of race, religion, and geography, as exemplified by the magnum opus *Ceremonies and Customs of the World Religions*, by Bernard and Picart (1727–31). This seminar studies original and facsimile copies of manuscripts at Yale libraries.

HSAR 674b, The History of Color, 1400–2000 Carol Armstrong and Nicola Suthor

This seminar looks at the vexed history of color in all of its aspects, from the Renaissance to the present. Divided between *colore/couleur* and *colorito/coloris*, and frequently opposed to *disegno/dessin*, color has often been relegated to second place and to the status of supplement, derogatorily associated with the superficial, the ephemeral,

the deceptive, the illusory, the artificial, and the feminine. At the same time, it has been understood as the “difference” of painting, it is the essence of “what painting is” from a material and practical point of view, it has been at the heart of the *paragone* debates, and it has been a linchpin of modern and modernist art and theory. This course looks at the history of thought about color in a variety of areas: the alchemical and chemical; the practical and the theoretical; the science of optics; discourse, rhetoric, poetics, and philosophy. Writers addressed include Cennino Cennini and other authors of artist’s manuals; Roger de Piles, Sir Isaac Newton, and Johann Wolfgang van Goethe; Charles Baudelaire, Michel Eugène Chevreul, and Josef Albers; Rainer Maria Rilke and Ludwig Wittgenstein. Artists considered include Titian, Peter Paul Rubens, and Jean-Antoine Watteau; Eugène Delacroix, J.M.W. Turner, Edouard Manet, and the Impressionists; Georges Seurat and Paul Cézanne; Henri Matisse, Helen Frankenthaler, and the color-field painters.

HSAR 743a, The Book in the Sixteenth-Century Americas Barbara Mundy

This course centers on books created in the Americas over the course of the sixteenth century, with an emphasis on Mexico, where a millennium-long book tradition was reshaped through its encounter with manuscripts and printed books of European origin. It surveys the Aztec, Mixtec, and Maya screenfold manuscripts that were the indigenous forbears of the sixteenth-century butterfly-bound book, and it considers the impact that new genres and new technologies, particularly the printing press, had on indigenous manuscripts. Topics include the nature of writing systems and pictography; the visual properties of literary genres; the semantics and economies of early modern media, particularly paper and ink; and the conceptual frameworks of “colonial” and “hybrid.” We work closely with works in Yale collections, particularly the Beinecke Library.

HSAR 753a, Theories of Imagination and Visual Perception Margaret Olin

This seminar traces the role of imagination and visual perception as conceived by philosophers, phenomenologists, perceptual psychologists, and other theorists in mainly Western thought since the seventeenth century. The ways in which perception and imagination are conceived together are informed by changing conceptions of each term. “Imagination” can be seen as a mental power of internal image making that must be considered separately from perception, or it may be considered as an indispensable component of perception, which itself can be conceived as a more or less faithful representation or a creative process. Readings are chosen from among the works of John Locke, Immanuel Kant, Hippolyte Taine, Hermann von Helmholtz, Henri Bergson, Jean Piaget, Maurice Merleau-Ponty, and others. The significance of the discourse for art and literature is stressed. Students make presentations and submit papers on topics of their choosing in consultation with the instructor. Qualified undergraduates are welcome.

HSAR 786a / AFAM 745a, Black Atlantic Visual Arts since 1980 Kobena Mercer

This seminar surveys black diaspora practices in late-twentieth- and early twenty-first-century art while questioning the survey genre as such. Examining contributions of black artists to paradigm shifts that have interrogated the identity of art over the past thirty years, we review the demands that issues of race and ethnicity place on interpretive models in the historiography of art. Considering thematic categories in which to understand what is distinctive to the diasporic conditions of Black Atlantic practitioners, while consistently relating their concerns to broad patterns in art practice

as a whole in an era of globalization, the aim is to identify critical terms that best narrate the transformations black diaspora artists have introduced to a period characterized by the shift from modern to postmodern to contemporary.

HSAR 803a / EAST 500a, Reflecting Truth: Meiji Photography between

Performativity and Representation, Modernity and Empire Staff

Celebrating 150 years since the Meiji Restoration (1868) is an ideal opportunity to look back and ponder the engagement with an alternative history of photography, from a Japanese point of view. Photography arrived in Japan soon after its creation in the UK and France (1839), and first images were created as soon as 1848 in Kagoshima and Nagasaki. We consider the two paths photography developed in Japan, and their intersections: experimental approaches with performative modes of execution (i.e., direct light, opaque image, camera-less photographs, etc.), versus representations of Japan, a method that can be studied through two tracks—the creation of exotic, nonmodern images for the Western, consuming eye; and the documentation of Japan's rapid modernization and political developments into settlement, nationalism, colonialism, and militarism.

HSAR 814a, Japan's Global Baroque Mimi Yiengpruksawan

The intersection of art, science, and diplomacy at Kyoto and Nagasaki in the time of Japanese, Portuguese, Spanish, and Dutch cultural and mercantile interaction in the sixteenth and seventeenth centuries, with attention to the entangled political relations linking the shogun Toyotomi Hideyoshi, Philip II of Spain, Jesuit missionaries such as Alessandro Valignano, and the Christian *daimyō* of Kyushu and the Inland Sea. Focus on Japanese castle architecture, *nanban* screens, world maps, *arte sacra*, and tea ceremony practices as related to the importation of European *arte sacra*, prints and drawings, scientific instruments, and world atlases such as *Theatrum Orbis Terrarum*. Includes inquiry into back-formations such as “baroque” and “global” to describe and/or interpret sixteenth- and seventeenth-century cultural productions.

HSAR 822a / EALL 710a, Fragmentism and Assemblage in Traditional Japanese

Culture Edward Kamens and Mimi Yiengpruksawan

A cross-disciplinary consideration of the phenomenon of disaggregation of texts and visual artworks and their reconfiguration in new forms. Focus on examples from the Japanese past in comparative and theoretical perspective. Students engage directly in the preparation of an installation on this theme in the Yale Art Gallery for spring 2019. Prerequisite: proficiency in literary and modern Japanese.

HSAR 837a, The Painting of Modern Life Marisa Bass

“Genre imagery” is a category of art perennially resistant to interpretation, and one most often defined by what it is not. It encompasses pictures understood to be secular, nonnarrative representations of everyday life, which at the same time appear staged, parodic, and at far remove from lived experience. These are works that raise issues of class and of gender and that speak above all to the exigencies of modern life within the culture of consumerism that bore them. This course examines genre painting from its first emergence in the sixteenth-century Netherlands to its apogee in the seventeenth century. We interrogate the notion of self-awareness in these works, the issues associated with their enduring characterization as “moralizing” images, their development in relation to the tectonic shifts of the Protestant Reformation, and the polyvalence of their comic mode. Particularly crucial to our discussion is the artist Pieter Bruegel the Elder, whose works in many ways defy the very category to which

they most seem to belong. This seminar travels over October recess to Vienna to see the retrospective Bruegel exhibition at the Kunsthistorisches Museum, among other collections. Enrollment is limited and advanced permission of the instructor is required.

History of Science and Medicine

McClellan Hall, 203.432.1365

<http://hshm.yale.edu>

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

Chair

Deborah Coen

Director of Graduate Studies

Paola Bertucci

Faculty Sakena Abedin (*History of Science & Medicine*), Paola Bertucci (*History*), Deborah Coen (*History*), Ivano Dal Prete (*History*), Rachel Elder (*History of Science & Medicine*), Joanna Radin (*History of Medicine*), Chitra Ramalingam (*History of Science & Medicine*), 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*), Amy Meyers (*Yale Center for British Art*), 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 ADMISSIONS REQUIREMENTS

Preference is normally given to applicants with a strong undergraduate background in history and/or a science relevant to their graduate interests. However, the HSHM

faculty will take into consideration outstanding performance in any field pertinent to the program.

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), 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 defense 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 Defense 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 the three Problems graduate seminars and one additional graduate seminar 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 658b, The History of the Laboratory Chitra Ramalingam

The social and cultural history of the experimental laboratory as a site for scientific activity, from early modern origins to the present day. The early modern origins of the laboratory; private, institutional, and state laboratories; relations between labs and field stations; the lab in the colonial and developing world; industrial and corporate labs; laboratory architecture; secrecy and openness; gender in the experimental workplace; and popular representations of the laboratory.

HSHM 701a / AMST 878a / HIST 930a, Problems in the History of Medicine and Public Health John Warner

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

HSHM 710b / HIST 921b, Problems in Science Studies Lisa Messeri

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 716a / HIST 936a, Early Modern Science and Medicine Paola Bertucci

The course focuses on recent works in the history of science and medicine in the early modern world. We discuss how interdisciplinary approaches—including economic and urban history, sociology and anthropology of science, gender studies, art and colonial history—have challenged the classic historiographical category of “the Scientific Revolution.” We also discuss the avenues for research that new approaches to early modern science and medicine have opened up, placing special emphasis on the circulation of knowledge, practices of collecting, and visual and material culture.

HSHM 753a / AMST 838a / HIST 749a, Research in Twentieth-Century United States Environmental History Paul Sabin

Students conduct advanced research in primary sources and write original essays over the course of the term. Topics are particularly encouraged in twentieth-century environmental history (broadly defined, no specified geography) as well as in U.S. history, with a focus on politics, law, and economic development. Readings and library activities inform students' research projects. Interested graduate students should contact the instructor with proposed research topics.

HSHM 770b / HIST 940b / WGSS 782b, Disability Histories: Research Seminar

Naomi Rogers

This course introduces students to the major issues in current disability history as well as theoretical debates in disability studies. We discuss cultural, social, and political meanings of citizenship; efforts to define and classify disabled bodies; contested notions of bodily difference; and the ways disability has and continues to be used as a metaphor for socially defined inferiority like gender, race, or sexuality. By the fourth week students have identified the topic for their research papers and discussed them in class. The next month is devoted to research and writing. We start meeting again after spring break to read and discuss a draft of each paper.

Immunobiology

Anlyan Center (TAC) S625, 203.785.3857
<http://immunobiology.yale.edu>
 M.S., M.Phil., Ph.D.

Chair

David Schatz

Director of Graduate Studies

Carla Rothlin (TAC 625, 203.737.4679, carla.rothlin@yale.edu)

Director of Graduate Admissions

João Pereira (TAC 541A, 203.737.2089, joao.pereira@yale.edu)

Student Services Officer

Barbara Cotton (TAC S625, 203.785.3857, barbara.cotton@yale.edu)

Professors Jeffrey Bender (*Internal Medicine*), Marcus Bosenberg, 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*), Ruslan Medzhitov, Jordan Pober, Craig Roy (*Microbial Pathogenesis*), David Schatz

Associate Professors Tarek Fahmy (*Biomedical Engineering*), Ann Haberman (*Laboratory Medicine*), John MacMicking (*Microbial Pathogenesis*), Eric Meffre, Carla Rothlin, Bing Su

Assistant Professors Stephanie Eisenbarth (*Laboratory Medicine*), Nikhil Joshi, Carrie Lucas, Noah Palm, João Pereira, Aaron Ring

FIELDS OF STUDY

The Immunobiology graduate program is designed to prepare students for independent careers in research and teaching in immunology or related disciplines. The educational program emphasizes interdisciplinary training and collaborative and interactive research, an approach based on the idea that solving difficult problems requires the integration of individuals with common goals but differing expertise. Graduate students are diverse in their interests and ethnic backgrounds, and more than 50 percent are women.

RESEARCH AREAS

Research focuses on the molecular, cellular, and genetic underpinnings of immune system function and development, on host-pathogen interactions, and on human and translational immunology, with a particular interest in a variety of autoimmune disorders. These research interests break down into six major themes, spanning almost all aspects of the immune system and its role in disease prevention.

Lymphocyte development A central focus of research is to understand the molecular events underlying the development of B and T lymphocytes. Areas of major interest include the receptors and signals that control lymphocyte lineage commitment, cell maturation, cell proliferation, and cell death; the establishment of the proper environments for lymphocyte development; mechanisms that regulate the state of

chromatin during lymphocyte development; and the mechanisms by which antibody and T cell receptor genes are assembled and diversified.

Mounting an immune response An effective immune response requires the coordinated action of numerous cell types. A critical first step is the activation of cells of the innate immune system, including monocytes, macrophages, dendritic cells, and neutrophils; and the receptors and signaling molecules that control this process are under intensive study. The mechanism by which cells take up, process, and present antigen is a major interest, as is the recognition of this antigen by T cell receptors on T lymphocytes. Cytoplasmic signal transduction molecules, nuclear transcription factors, and mechanisms controlling gene expression are all under study.

Regulating the immune response The immune response is tightly regulated through the interaction of cell surface receptors with secreted cytokines and with one another, and the mechanisms by which these interactions exert their regulatory influences are studied in several laboratories. Another major interest is in learning how specialized cells or anatomic locations, such as vascular endothelial cells or the epidermis, regulate and direct the immune response.

Consequences of an immune response Apart from the obvious consequence of the elimination of an invading organism, an appropriate immune response results in immunological memory and large numbers of activated lymphocytes, which must be eliminated. The mechanisms controlling immunological memory, tolerance, and apoptosis, as well as those leading to autoimmunity, are a major interest of many faculty. Diabetes, multiple sclerosis, lupus, and rheumatoid arthritis are just some of the autoimmune diseases under study. Much of this work takes place in the context of the Section of Human and Translational Immunology.

Infectious disease and the host-pathogen interaction A major interest is the study of infectious organisms – bacterial, viral, and parasitic – and the immune response to them. A great deal of effort is directed toward understanding the strategies used by infectious agents to avoid the immune system. HIV, HBV (hepatitis B virus), herpes simplex virus, parvoviruses, *Candida albicans*, *Borrelia burgdorferi* (the causative agent of Lyme disease), *Leishmania*, *Streptococcus pneumoniae*, and *Legionella pneumophila* are all under study.

Structural analysis of immune system receptors and effectors There is a growing interest in using structural approaches to understand the function of key molecules of the immune response. For example, a major effort is devoted toward understanding how the Toll-like receptors, despite their similarity in extracellular-ligand recognition regions, are able to specifically recognize such a wide variety of pathogen-associated molecular patterns (PAMPS). Another effort is aimed at understanding the mechanism of APOBEC enzymes in controlling viruses such as HIV.

FACILITIES

More than thirty laboratories are actively involved in research in immunology. Many share immediately adjoining or nearby laboratory space on the top three floors of the Anlyan Center (TAC), 10 Amistad Street, and 300 George Street, and three faculty are funded by the Howard Hughes Medical Institute. The Department of Immunobiology provides one of the largest, highest-ranked training programs in immunology in the country, led by a faculty with a reputation for excellence in research. The Department of

Immunobiology maintains a wide variety of major equipment, and Dr. Richard Flavell oversees a very active transgenic mouse/ES cell/knockout facility to which members of the department have access.

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.

Admission requirements In addition to meeting general BBS requirements, applicants are expected to have a firm foundation in the biological and physical sciences. It is preferred that students have taken courses in biology, organic chemistry, biochemistry, genetics, cell biology, physics, and mathematics. Actual course requirements, however, are not fixed, and students with outstanding records in any area of the biological sciences may qualify for admission. There are no specific grade requirements for prior course work, but a strong performance in basic science courses is of great importance for admission. In special cases, the Medical College Admission Test (MCAT) scores may substitute for scores on the general GRE.

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 Yale McDougal Center one-day seminar entitled “Teaching at Yale” is offered each year. 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 503b, Responsible Conduct of Research, Refresher Course Staff

The NIH requires that students receive training in the responsible conduct of research every four years. This course meets that requirement for fourth-year students. The course has two components: (1) one large-group session is held for all fourth-year students through the BBS; the main topics are scientific misconduct and authorship; (2) two Immunobiology faculty facilitate discussions based on RCR topics, gathered in advance from the students; anonymous or hypothetical stories are selected by the faculty and discussed in a workshop environment in which students are then asked to analyze each case and suggest courses of actions.

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 531b, Advanced Immunology Staff

The historical development and central paradigms of key areas in immunology. The course attempts to develop a clear understanding of how these paradigms were established experimentally. Landmark studies are discussed to determine how the conclusions were obtained and why they were important at the time they were done. Lecture and discussion format; readings of primary research papers and review articles. Prerequisite: IBIO 530 or equivalent. Enrollment limited to fifteen.

IBIO 532b, Inflammation Ruslan Medzhitov

This course covers fundamentals of inflammation from a broad biological perspective, with a focus on both physiological and pathological aspects of inflammation.

IBIO 536a, Immunobiology Seminar: Neuroimmunology Staff

This course explores the diverse array of interactions between the immune and nervous systems, both in homeostasis and disease settings, including but not limited to neurodegenerative, vascular, and malignant diseases.

IBIO 537b, Immunobiology Seminar: Translational Immunobiology Kevin O'Connor

This course is designed to introduce immunobiology Ph.D. students to translational research and medicine. Each weekly seminar focuses on a specific disease with a conspicuous immunological component. In-class periods consist of very interactive, didactic sections covering disease phenotype, underlying immunobiology and pathology, and mechanisms of treatment approaches, including limitations. Discussions are led by principal investigators who focus on human translational immunology and by clinician-scientists who see patients in associated clinics. Examples of topics include: T and B cell contributions to the underlying pathophysiology of multiple sclerosis, type 1 diabetes, systemic lupus erythematosus, myasthenia gravis, and other autoimmune diseases; immune responses to acute brain injury; inherited immune disorders; paradigms governing how antitumor immune responses are promoted or suppressed; and current approaches in immunotherapy-based clinical trials. Assignments challenge students to think creatively about solutions to problems that obstruct the progress toward understanding disease mechanisms and developing therapeutics. A term assignment, in the form of a research proposal, focuses on independent study of a translational immunobiology problem of each student's choosing. Students are provided with elective opportunities for experiential learning through clinic visits with course faculty instructors. The combination of medical knowledge and interaction with translational and clinician-scientists provides a new perspective to immunobiology Ph.D. students that broadens their basic science training. The exposure to the practice of medicine enables them (and other graduate students) to work more confidently at the interface of research and medicine and facilitate collaborations with clinical investigators. Prerequisite: IBIO 531 or a similar course that provides a solid foundation in fundamental immunology; may be waived for highly motivated students.

IBIO 600a, Introduction to Research: Faculty Research Presentations Carla Rothlin

Introduction to the research interests of the faculty. Required of all first-year Immunology/BBS students. Pass/Fail.

IBIO 601b / CB&B 601b, Fundamentals of Research: Responsible Conduct of Research Carla Rothlin

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

IBIO 611a, Research Rotation 1 Carla Rothlin

Intensive experience in the design and execution of experiments in immunology or other areas of biology. Students design a focused research project in consultation with a faculty mentor and execute the designed experiments in the mentor's laboratory. Students are expected to read relevant background papers from the literature, design and perform experiments, interpret the resulting data, and propose follow-up

experiments. Students are also expected to attend the mentor's weekly lab meeting(s) as well as weekly Immunobiology departmental seminars and Research in Progress seminars. The course concludes with the student giving a brief presentation of the work performed at Rotation Talks, attended by other first-year immunology-track graduate students. Evaluation is by the mentor; students also evaluate the rotation experience. Students must turn in a prioritized list of four possible mentors to Barbara Cotton in the office of the director of graduate studies at least one week prior to the beginning of the course. Mentors are assigned by the DGS. Graded Pass/Fail. 1 course credit; minimum of 20 hours/week. Required of all first-year Immunology/BBS students.

IBIO 612b, Research Rotation 2 Carla Rothlin

Intensive experience in the design and execution of experiments in immunology or other areas of biology. Students design a focused research project in consultation with a faculty mentor and execute the designed experiments in the mentor's laboratory. Students are expected to read relevant background papers from the literature, design and perform experiments, interpret the resulting data, and propose follow-up experiments. Students are also expected to attend the mentor's weekly lab meeting(s) as well as weekly Immunobiology departmental seminars and Research in Progress seminars. The course concludes with the student giving a brief presentation of the work performed at Rotation Talks, attended by other first-year immunology-track graduate students. Evaluation is by the mentor; students also evaluate the rotation experience. Students must turn in a prioritized list of four possible mentors to Barbara Cotton in the office of the director of graduate studies at least one week prior to the beginning of the course. Mentors are assigned by the DGS. Graded Pass/Fail. 1 course credit; minimum of 20 hours/week. Required of all first-year Immunology/BBS students.

IBIO 613b, Research Rotation 3 Carla Rothlin

Intensive experience in the design and execution of experiments in immunology or other areas of biology. Students design a focused research project in consultation with a faculty mentor and execute the designed experiments in the mentor's laboratory. Students are expected to read relevant background papers from the literature, design and perform experiments, interpret the resulting data, and propose follow-up experiments. Students are also expected to attend the mentor's weekly lab meeting(s) as well as weekly Immunobiology departmental seminars and Research in Progress seminars. The course concludes with the student giving a brief presentation of the work performed at Rotation Talks, attended by other first-year immunology-track graduate students. Evaluation is by the mentor; students also evaluate the rotation experience. Students must turn in a prioritized list of four possible mentors to Barbara Cotton in the office of the director of graduate studies at least one week prior to the beginning of the course. Mentors are assigned by the DGS. Graded Pass/Fail. 1 course credit; minimum of 20 hours/week. Required of all first-year Immunology/BBS students.

Interdepartmental Neuroscience Program

Sterling Hall of Medicine L-200, 203.785.5932

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

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

Director of Graduate Studies

Charles Greer (*Neurosurgery; Neuroscience*)

(FMB 412, 203.785.4034, charles.greer@yale.edu)

Professors Amy Arnsten (*Neuroscience; Psychology*), Anton Bennett (*Pharmacology; Comparative Medicine*), Hal Blumenfeld (*Neurology; Neuroscience; Neurosurgery*), Angélique Bordey (*Neurosurgery; Cellular & Molecular Physiology*), Tyrone Cannon (*Psychology; Psychiatry*), John Carlson (*Molecular, Cellular, & Developmental Biology*), B.J. Casey (*Psychology*), Marvin Chun (*Psychology; Neuroscience*), Lawrence Cohen (*Cellular & Molecular Physiology*), R. Todd Constable (*Radiology & Biomedical Imaging; Neurosurgery*), Michael Crair (*Neuroscience; Ophthalmology & Visual Science*), Pietro De Camilli (*Cell Biology; Neuroscience*), Nihal DeLanerolle (*Neurosurgery; Neuroscience*), Sabrina Diano (*Obstetrics, Gynecology, & Reproductive Sciences; Comparative Medicine; Neuroscience*), Ralph DiLeone (*Psychiatry; Neuroscience*), Ronald Duman (*Psychiatry; Neuroscience*), Barbara Ehrlich (*Pharmacology; Cellular & Molecular Physiology*), 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*), 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*), Daeyeol Lee (*Neuroscience; Psychology*), Paul Lombroso (*Child Study Center; Neuroscience; Psychiatry*), Laura Manuelidis (*Neuropathology*), Gregory McCarthy (*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*), Marc Potenza (*Psychiatry; Child Study Center; Neuroscience*), Pasko Rakic (*Neuroscience; Neurology*), Robert Roth, Jr. (*Psychiatry*), 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*), Gordon Shepherd (*Neuroscience*), Fred Sigworth (*Cellular & Molecular Physiology; Biomedical Engineering*), Dana Small (*Psychiatry; Psychology [Assoc. Prof.]*), 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*), Robert Wyman (*Molecular, Cellular, & Developmental Biology*), 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*), Sviatoslav Bagriantsev (*Cellular & Molecular Physiology*), Charles Bruce (*Neuroscience*), William Cafferty (*Neurology*), Jessica Cardin (*Neuroscience*), Sreeganga Chandra (*Neurology; Neuroscience; Molecular, Cellular, & Developmental Biology*), Damon Clark (*Molecular, Cellular, & Developmental Biology; Physics*), Daniel Colon-Ramos (*Cell Biology; Neuroscience*), Kelly Cosgrove (*Psychiatry; Radiology & Biomedical Imaging; Neuroscience*), Jonathan Demb (*Ophthalmology & Visual Science; Cellular & Molecular Physiology*), Tore Eid (*Laboratory Medicine; Neurosurgery*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology; Physics*), Sourav Ghosh (*Neurology*), Elena Gracheva (*Cellular & Molecular Physiology; Neuroscience*), Marc Hammarlund (*Genetics; Neuroscience*), Michael Higley (*Neuroscience*), Erdem Karatekin (*Cellular & Molecular Physiology; Molecular Biophysics & Biochemistry*), In-Jung Kim (*Ophthalmology & Visual Science; Neuroscience*), Hedy Kober (*Psychiatry*), Ifat Levy (*Comparative Medicine; Neuroscience*), Chiang-shan Ray Li (*Psychiatry; Neuroscience*), Janghoo Lim (*Genetics; Neuroscience*), Angeliki Louvi (*Neurosurgery; Neuroscience*), Dhasakumar Navaratnam (*Neurology; Neuroscience*), Timothy Newhouse (*Chemistry*), Kevin O'Connor (*Neurology*), Maria Piñango (*Linguistics*), Christopher Pittenger (*Psychiatry; Child Study Center; Psychology*), Michael Schwartz (*Neuroscience*), Satinder Singh (*Cellular & Molecular Physiology*), Justus Verhagen (*Neuroscience*), Weimin Zhong (*Molecular, Cellular, & Developmental Biology*)

Assistant Professors Alan Anticevic (*Psychiatry; Psychology*), Rui Chang (*Cellular & Molecular Physiology; Neuroscience*), Steve Chang (*Psychology; Neuroscience*), Philip Corlett (*Psychiatry*), Guillaume De Lartigue (*Cellular & Molecular Physiology*), Marcelo de Oliveira Dietrich (*Comparative Medicine; Neuroscience*), George Dragoi (*Psychiatry; Neuroscience*), Dylan Gee (*Psychology*), Jason Gerrard (*Neurosurgery; Neuroscience*), Junjie Guo (*Neuroscience*), Ellen Hoffman (*Child Study Center*), Avram Holmes (*Psychology*), Monika Jadi (*Psychiatry*), James Jeanne (*Neuroscience*), Kristopher Kahle (*Neurosurgery; Pediatrics; Cellular & Molecular Physiology*), Alex Kwan (*Psychiatry; Neuroscience*), John Murray (*Psychiatry*), Anirvan Nandy (*Neuroscience*), Hyojung Seo (*Psychiatry*), Shaul Yogev (*Neuroscience*), Jiangbing Zhou (*Neurosurgery; Biomedical Engineering*)

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.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants to the Interdepartmental Neuroscience Program should have a B.S. or B.A. Most applicants have had course work in neuroscience, psychobiology, physiological psychology, mathematics through calculus, general physics, general biology, general chemistry, organic chemistry, biochemistry, computer science, or engineering.

Deficiencies in these areas can be corrected through appropriate course work in the first year of residence. Laboratory research experience is desirable but is not a formal requirement. Scores for the GRE (General Test required; Subject Test recommended) or MCAT, three letters of recommendation, transcripts of undergraduate grades, and a statement of interest must accompany the application.

To enter the Interdepartmental Neuroscience Ph.D. program, students apply to the Neuroscience track within the program in Biological and Biomedical Sciences (BBS), <http://bbs.yale.edu>.

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. 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 annually. 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 510a, Structural and Functional Organization of the Human Nervous System

Michael Schwartz

An integrative overview of the structure and function of the human brain as it pertains to major neurological and psychiatric disorders. Neuroanatomy, neurophysiology, and clinical correlations are interrelated to provide essential background in the neurosciences. Lectures in neurocytology and neuroanatomy survey neuronal organization in the human brain, with emphasis on long fiber tracts related to clinical neurology. Lectures in neurophysiology cover various aspects of neural function at the cellular and systems levels, with a strong emphasis on the mammalian nervous system. Clinical correlations consist of sessions applying basic science principles to understanding pathophysiology in the context of patients. Seven two-hour laboratory sessions are coordinated with lectures throughout the course to provide an understanding of the structural basis of function and disease. Case-based conference sections provide an opportunity to integrate and apply the information learned about the structure and function of the nervous system in the rest of the course to solving a focused clinical problem in a journal club format. Variable class schedule; contact course instructors. This course is offered to graduate and M.D./Ph.D. students only and cannot be audited.

INP 511a and INP 512b, Lab Rotation for First-Year Students Charles Greer

Required of all first-year Neuroscience track graduate students. Rotation period is one term. Grading is Satisfactory/Unsatisfactory.

INP 513a and INP 514b, Second-Year Thesis Research Charles Greer

Required of all second-year INP graduate students. Grading is Satisfactory/Unsatisfactory.

INP 519a or b, Tutorial Staff

By arrangement with faculty and approval of DGS.

INP 521b, Neuroimaging in Neuropsychiatry II: Clinical Applications Irina Esterlis
Neuroimaging methodologies including Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), Magnetic Resonance Imaging (MRI), functional Magnetic Resonance Imaging (fMRI), and Magnetic Resonance Spectroscopy (MRS) are rapidly evolving tools used to study the living human brain. Neuroimaging has unprecedented implications for routine clinical diagnosis, for

assessment of drug efficacy, for determination of psychotropic drug occupancy, and for the study of pathophysiological mechanisms underlying neurologic and psychiatric disorders. The course is designed to provide an overview of the application of state-of-the-art neuroimaging methods to research in neurologic and psychiatric disorders.

INP 523a / ENAS 880a, Imaging Drugs in the Brain Evan Morris

Seminar course to explore the uses of functional imaging (PET and fMRI) to study the mechanisms of action and long-term effects of drugs (legal and illegal) on brain function. Basic research findings are the main topics, augmented by some discussion of imaging in drug development by Pharma. The central theme of the course is experiment design: how to design the proper imaging experiment to ask the question. What are the endpoints of the experiment? What are the limitations of interpretation? What are the proper controls and what are the proper analyses to ensure reliable, interpretable results? The syllabus is comprised primarily of classic journal articles, in addition to the occasional book chapter or review article. Most class periods begin with a short lecture to cover methodological concepts, followed by discussion of reading material. A number of class periods are organized as games, contests, or other in-class exercises. The emphasis is on formulating the question and designing the experiment. Topics include basic understanding of imaging technology (brief physics, biochemistry, and mathematics) as it relates to imaging of drugs, receptors, neurotransmitters; understanding the primary outcomes of imaging experiments; imaging experiment design; recent findings related to drug abuse; common neurophysiological pathways of addictive drugs (how to image reward); and uses of imaging in drug development (what do drug companies want to measure?). Weekly homework: concise written synopses of assigned articles (students routinely endorse the synopses as the best way to learn the material).

INP 530a / PSYC 530a, Foundations of Neuroscience: Biological Bases of Human Behavior Steve Wohn Chang

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 540b, How to Give a Talk Jessica Cardin

This course is a practical introduction to the art and science of giving a data-based neuroscience seminar. The ability to give a clear, convincing, and engaging talk about your work is one of the key career skills of successful scientists. Content, visual presentation, body language, and delivery all combine to determine your impact on your audience. The focus in class is on student presentation skills and detailed feedback, interspersed with short example talks by invited guests. Students give at least two talks

over the course of the term and participate in weekly Q&A and feedback. Grading is based on class participation. Enrollment limited to ten.

INP 558b / PSYC 558b, Computational Methods in Human Neuroscience Nicholas 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, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or a 200-level biology course, or permission of the instructor.

INP 580b, Bioethics in Neuroscience Charles Greer

This course is an introduction to ethics and ethical decision-making in the neurosciences. Format for the course is an informal discussion. Each week we are joined by members of the Yale faculty and community who share their experiences and expertise as it relates to the topic of the week. Required of first-year INP students. Grading is Satisfactory/Unsatisfactory and is based on attendance/participation, weekly reaction papers, and a final term paper. Enrollment limited to Neuroscience track students.

INP 701a, Principles of Neuroscience Angeliki Louvi and William Cafferty

General neuroscience seminar: lectures, readings, and discussion of selected topics in neuroscience. Emphasis is on how approaches at the molecular, cellular, physiological, and organismal levels can lead to understanding of neuronal and brain function.

INP 702a, Foundations of Cellular and Molecular Neurobiology Michael Higley

A comprehensive overview of cellular and molecular concepts in neuroscience. Each exam (of three) covers one-third of the course (Cell Biology, Electrophysiology, and Synaptic Function) and is take-home, with short answer/essay questions.

INP 703b, Foundations of Systems Neuroscience Amy Arnsten

An examination of the neural circuits that subserve sensory, motor, cognitive, and affective function, and their relationships to human disorders. A comparative species approach is used to highlight the evolution of neural circuits and their functions.

INP 704b, Comparative Neuroanatomy Charles Greer and Caroline Zeiss

This laboratory-based course examines the fundamental structural organization of the brain in a comparative context. For example, principles of the organization of systems and circuits are compared across human and nonhuman primates and rodents. Labs

also explore the organization of the nervous system in zebrafish, *drosophila*, and *c. elegans*. The course is open only to graduate students enrolled in the Interdepartmental Neuroscience Program and complements the lecture course INP 703. Graded Satisfactory/Unsatisfactory. ½ Course cr

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

Dean Karlan

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. The Graduate Record Examination (GRE) and the Test of English as a Foreign Language (TOEFL) examinations are also required. For information on testing requirements and application procedures, please see the Graduate School's Admissions website, <http://gsas.yale.edu/admission-graduate-school>.

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, six of which make up the core elements of the IDE program and are required; the remaining two are graduate electives. The required courses are ECON 545, Microeconomics; ECON 546, Growth and Macroeconomics; ECON 558, Econometrics; ECON 559, Development Econometrics; ECON 591, Economics of Poverty Alleviation; 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 Forestry & Environmental Studies (F&ES) and the School of Public Health (YSPH) are also available. Application to

F&ES 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 (F&ES) or Master of Public Health (YSPH) degree.

Prospective applicants are encouraged to visit the IDE program website at <http://ide.yale.edu>. Program materials are available upon request to Wendy Lewis, Senior Administrative Assistant, International and Development Economics Program, Yale University, PO Box 208269, New Haven CT 06520-8269; e-mail, ide@yale.edu.

Investigative Medicine

2 Church Street South, Suite 112, 203.785.7467
<http://medicine.yale.edu/investigativemedicine>
Ph.D.

Director of Graduate Studies

Joseph Craft (joseph.craft@yale.edu)

Deputy Director

Eugene Shapiro

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*), Chirag Parikh (*Internal Medicine*), Eugene Shapiro (*Pediatrics; Epidemiology*), George Tellides (*Surgery*), Mary Tinetti (*Internal Medicine; Epidemiology*)

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 ADMISSIONS REQUIREMENTS

The Investigative Medicine program is designed for students with an M.D. or D.O. degree. To be eligible for admission, applicants must have completed two or more years of postgraduate clinical training. Prospective students who are already in a residency or subspecialty clinical fellowship program at Yale may apply to the Investigative Medicine program anytime during the first two years of that training (approximate). Application to the program also may be made concurrently with application for residency or fellowship training in a clinical department at the Yale School of Medicine. Special arrangements will be made for a deferred acceptance by the Graduate School.

The most important criteria for selection into the program are commitment to rigorous training in clinical investigation and evidence of high academic achievement

in undergraduate and medical school courses, and on scores from the USMLE. All applicants must be eligible to practice medicine in the United States.

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, Writing Your Career Development (K-type) Grant *or* IMED 670, Writing Your First Independent Investigator-Initiated (R-type) Grant

IMED 680, Topics in Human Investigation

CBIO 601, Frontiers

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, Writing Your Career Development (K-type) Grant *or* IMED 670, Writing Your First Independent Investigator-Initiated (R-type) Grant

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 and David Fiellin

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. Two weeks, July 23–August 4, 2018. Permission of instructor required.

IMED 630a, Ethical Issues in Biomedical Research Joseph Craft

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. Consent of instructor required.

IMED 635a, 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 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. Two weeks, July 9–July 20, 2018. Consent of instructor required.

IMED 655b, Writing Your Career Development (K-type) Grant 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 limited to students who plan to submit grant proposals for a K-type mentored career development award. Attendance and active participation are required. There may be spaces to audit the course. Consent of instructor required.

IMED 660a, Methods in Clinical Research, Part I Eugene Shapiro

This yearlong course (with IMED 661 and 662), presented by the Robert Wood Johnson Clinical Scholars Program, presents in depth the methodologies used in patient-oriented research, including methods in biostatistics, clinical epidemiology, health services research, community-based participatory research, and health policy. Consent of instructor required.

IMED 661a, Methods in Clinical Research, Part II Eugene Shapiro

This yearlong course (with IMED 660 and 662), presented by the Robert Wood Johnson Clinical Scholars Program, presents in depth the methodologies used in patient-oriented research, including methods in biostatistics, clinical epidemiology, health services research, community-based participatory research, and health policy. Consent of instructor required.

IMED 662b, Methods in Clinical Research, Part III Eugene Shapiro

This yearlong course (with IMED 660 and 661), presented by the Robert Wood Johnson Clinical Scholars Program, presents in depth the methodologies used in patient-oriented research, including methods in biostatistics, clinical epidemiology, health services research, community-based participatory research, and health policy. Consent of instructor required.

IMED 670b, Writing Your First Independent Investigator-Initiated (R-type) Grant

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 limited to students who plan to submit an R-type (e.g., R01 or R21) grant, as well as VA and foundation grant proposals. Attendance and active participation are required. Consent of instructor required.

IMED 680b / B&BS 680b, Topics in Human Investigation 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.

IMED 900a and IMED 901b, Independent Research Staff

Italian Language and Literature

82-90 Wall Street, 203.432.0595

<http://italian.yale.edu>

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

Chair

Millicent Marcus

Director of Graduate Studies

Christiana Purdy Moudarres (82-90 Wall St., Rm. 407, 203.432.0597)

Professors Millicent Marcus, Giuseppe Mazzotta, Jane Tylus

Assistant Professor Christiana Purdy Moudarres

Lecturer Serena Bassi

Lector Simona Lorenzini

Affiliated Faculty Roberto González Echevarría (*Spanish & Portuguese*), Gundula Kreuzer (*Music*), David Quint (*English*), Gary Tomlinson (*Music*)

Visiting faculty from other universities are regularly invited to teach courses in the department.

FIELDS OF STUDY

The Italian 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 ADMISSIONS REQUIREMENTS

The department recognizes that good preparation in Italian literature is unusual at the college level and so suggests that applicants begin as soon as possible to acquire a broad general knowledge of the field through outside reading. At the end of the first and second years, students' progress is analyzed in an evaluative colloquium. Applicants who have had little or no experience in Italy are generally urged to do some work abroad during the course of their graduate program. For all students of Italian, a reading knowledge of Latin is essential. This may be acquired during the course of the first year, but applicants are reminded that it is difficult to schedule beginning language courses in addition to a normal graduate program. Students are advised to acquire proficiency in the languages required for the doctoral program before matriculation.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Candidates must demonstrate a reading knowledge of a second Romance language, Latin, and a non-Romance language (German recommended). 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. 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. 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 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. All documentation within the application should include this information.

Italian and Renaissance Studies

The Department of Italian 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 Language and Literature, Yale University, PO Box 208311, New Haven CT 06520-8311.

COURSES

ITAL 530a, Dante in Translation Christiana Purdy Moudarres

A critical reading of Dante's *Divine Comedy* and selections from the minor works, with an attempt to place Dante's work in the intellectual and social context of the late Middle Ages by relating literature to philosophical, theological, and political concerns.

ITAL 560a / CPLT 708a, Age of Disenchantment Giuseppe Mazzotta

This course focuses on the literary debates, theological arguments, and scientific shifts taking place between the Council of Ferrara-Florence (1437–38) and the Council of Trent and beyond, by reading key texts by Valla, Cusa, Pulci, Luther, Erasmus, Ariosto, Campanella, Bruno, Galileo, and Bellarmino. It examines issues such as the crisis of belief, the authority of the past, the emergence of freedom, new aesthetics, and the effort to create a new theological language for modern times.

ITAL 590a / CPLT 916a / FILM 830a, Literature into Film Millicent Marcus

We study a series of written works and their cinematic adaptations, considering first the texts in autonomous, literary terms, and then their transformation into audiovisual spectacles. In most cases we screen the film on Tuesday evening and do a comparative study in the Thursday class period, making extensive use of video clips to do close visual analysis of scenes in the light of their corresponding textual sources. Rather than develop a general theory of adaptation, we construct methodological approaches on an ad hoc basis, taking each instance of adaptation as a case study amenable to a variety of methodologies—psychoanalytic, feminist, ideological, generic, semiotic, and so forth. The class is conducted as a seminar, and active student participation is expected. There are two papers—one shorter one of a critical nature at midterm and a final research paper (approximately 15–20 pages). Films examined include (tentatively) Pasolini's *Medea* and *Decameron*, the Tavianis' *Padre padrone*, Visconti's *Death in Venice*, Rosi's *Three Brothers*, Salvatores's *I'm Not Afraid*, and De Sica's *Two Women*. Writing assignments comprise 75 percent of the final grade and class participation 25 percent.

ITAL 691a or b, Directed Reading Christiana Purdy Moudarres

ITAL 701b, Romantic Quarrels Giuseppe Mazzotta

The course examines the extraordinary intellectual and political feverishness that characterizes Italian history between the time of the French Revolution and the achievement of the national unity of the country (1861). Radical literary theories, terrorist political practices, epoch-making literary works, and passionate debates about aesthetics mark this period. Its vitality and contradictions emerge from a reading of selected works by Cuoco, Alfieri, Foscolo, Leopardi, Mazzini, Manzoni, Rosmini, and De Sanctis. They all in varying degrees explore the nexus between the idea of a “country,” the sense of secret revolutionary action (the so-called *Risorgimento*), the value of the classical heritage, and the need for the emergence of a new sense of history and a new philosophical discourse that would be addressed also for Europe. In Italian.

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

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 *De*

bello civili, Dante's *Purgatorio*, Tasso's *Gerusalemme liberata*, Camões's *Os Lusíadas*, and Spenser's *Faerie Queene*.

ITAL 780b, 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 940b / CPLT 715b, 1492: Before and After: Geographical and Linguistic

Itineraries Jane Tylus

Not simply the date of Columbus's landing, 1492 also marks Lorenzo de' Medici's death, the banishment of Jews from Spain and Sicily, the election of a Borgia pope—Alexander VI, celebrated by Machiavelli—and the birth of Pietro Aretino. We briefly consider the shared cultural and religious history of Italy and Spain, even as most of our attention will be focused on Italy's role as precursor: the Florentine Vespucci was the first to use the phrase "nuovo mondo," and Columbus was inspired by the stories of Marco Polo and travels of Italian pilgrims to the Holy Land. We start with Columbus and his contemporary Savonarola and move into the "new worlds" of the early sixteenth century as represented by four topics: the rise of print; the burgeoning pastoral genre; the (brief) reaffirmation of the Florentine republic with cameo appearances by Michelangelo, Leonardo, and Machiavelli; and the otherworldly (but also very much of this world) romance of Ariosto. We spend time in the Beinecke Library with maps, Savonarola's sermons, and early sixteenth-century Siennese pastoral plays, and also spend an afternoon at the Metropolitan Museum of Art with Renaissance paintings. In English.

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.

ADMISSIONS REQUIREMENTS

All applicants must hold a J.D. from an accredited United States law school at the time they matriculate in the program. Applicants must have taken the Law School Admission Test (LSAT). For additional admissions requirements, please see the Ph.D. in Law program's website, <http://law.yale.edu/phd>.

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 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; 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 and their descriptions, see the Law School bulletin, online at <http://bulletin.yale.edu>. For courses in other schools at Yale University, please see their respective bulletins or <http://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

Robert Frank

Director of Graduate Studies

Claire Bower

Professors Stephen Anderson (*Emeritus*), Robert Frank, Laurence Horn (*Emeritus*), Frank Keil, * Zoltán Szabó, * Petronella Van Deusen-Scholl (*Adjunct; Center for Language Study*), Raffaella Zanuttini

Associate Professors Ryan Bennett, Claire Bower, Maria Piñango, Kenneth Pugh (*Adjunct; Haskins Laboratories*)

Assistant Professors Jason Shaw, 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 must include a set of core courses, designed to expose students to core theoretical ideas, together with courses exposing students to a range of methodologies in linguistic research.

During their first six terms, students must complete a minimum of fourteen term courses at the graduate level, of which seven must be completed during the first two terms, and twelve during the first four terms. During the initial two years of course work, students must receive at least three grades of H (= Honors). Two grades of F, or three of P or F, during the initial two-year period constitute grounds for dismissal from the Ph.D. program.

Core courses The core requirement ensures that students achieve expertise at the level of the following courses: LING 612, Linguistic Change; LING 620, General Phonetics; LING 635, Phonological Theory; LING 654, Syntax II; LING 663, Semantics I; LING 680, Morphology.

The usual way to demonstrate this expertise will be to take all of these courses. Because several of these courses have prerequisites, students will typically need to take more basic courses in order to prepare themselves for the courses listed here. For example, LING 632, Introduction to Phonological Analysis, serves as a prerequisite for LING 635; and LING 653, Syntax I, is a prerequisite for LING 654; entering students usually take both of these prerequisite courses in the first term. However, students entering the Ph.D. program with sufficient background will be able to place out of antecedent courses. To facilitate placement, reading lists covering the material in the following basic courses will be provided, and students may request to take placement exams in areas in which their previous preparation is such that they could proceed directly to more advanced course work: LING 512, Historical Linguistics; LING 620, General Phonetics; LING 632, Introduction to Phonological Analysis; LING 653, Syntax I; LING 663, Semantics I.

By August 1, entering students may send a request to the DGS for a placement exam in any of these five areas. The exams will be given during the week prior to the fall term. Passing an exam allows the student to place out of the corresponding course. Students placing out of courses are nonetheless expected to complete the same requirement of a minimum of fourteen term courses in the first three years.

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 624, Formal Foundations of Linguistic Theories; LING 627, Language and Computation I; LING 630, Techniques in Neurolinguistics; LING 631, Neurolinguistics; LING 641, Field Methods.

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.

Seminar courses Starting in year three and continuing until the prospectus is approved, students are expected to enroll in one seminar course for credit each term. Students should use such seminars as opportunities both for exploring new research areas and, especially, for pushing current research interests in novel directions.

Research

The primary focus of a Ph.D. program is independent research. In the course of our Ph.D. program, students will learn to 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.

1. *Research adviser and first-year directed readings.* By the end of the first term of the program, students will need to find a department faculty member who is willing to serve as their research adviser. This choice should be made on the basis of

compatibility of research interests and discussions between the student and faculty member. 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 are required to 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 set in stone: students who want to change their choice of topic or adviser for whatever reason may do so, so long as they are able to find a faculty member who is willing to serve as their adviser on a new topic. 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.

2. *Portfolio*. At the conclusion of the first year of the program, students must submit to the faculty a portfolio of two research papers, in two distinct subfields. These papers should demonstrate a student's mastery of the material in these fields to the level covered in the core 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 versions of term papers from classes taken during the first year in the program, which are then lightly revised on the basis of comments received from the course instructors. The deadline for the submission of these papers is June 15.
3. *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 the beginning of the third week of the fall term.
4. *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. Because the transition from student to scholar can be a difficult one, we have broken the process of writing the first QP into a number of smaller steps with specific deadlines for each (all during the second year of the program): (a) Students are required to make a presentation of their preliminary results in an appropriate venue (lab meeting, reading group, seminar, etc.) by no later than the end of the fall term. (b) 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 abstract 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. (c) Students must submit a first draft of their QP to their adviser and reader no later than February 1. (d) Students must make an oral presentation of their work. This oral presentation may take place in the department (typically at a Friday Lunch Talk). Alternatively, the oral presentation requirement may be satisfied via a presentation at a professional conference, provided at least one member of the department faculty is in attendance. (e) Once the QP has been orally presented, students must submit the final version of the paper to their adviser and reader no later than three weeks from the date of presentation.

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 the beginning of the fall term of the third year. Students must follow the same steps and deadlines listed above for the second QP, this time during the third year.

5. *Prospectus*. No later than the beginning of the seventh term, students must choose a dissertation topic and find a faculty member who is willing to serve as dissertation adviser. By the end of the seventh term, 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 members of the Linguistics department. The prospectus document should be fifteen to twenty pages in length. After the document is submitted, the prospectus must be defended orally in front of the faculty. Upon successful completion of the prospectus defense, students advance to Ph.D. candidacy.
6. *Dissertation*. By the end of the eighth term, students must complete a chapter of the dissertation, together with a detailed outline of the dissertation and comprehensive bibliography. At this point (and at one-term intervals thereafter until the completion of the dissertation), the student will meet with the entire dissertation committee to evaluate progress toward the dissertation. When this 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.

Students are expected to complete their dissertations by the end of the fifth 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.

Feedback and Evaluation

At the conclusion of each academic year, all Ph.D. students will receive a written evaluation of their performance in the program, highlighting their strengths and accomplishments, as well as mentioning areas for improvement. Because of the

fundamental role played by research in the Ph.D. program, we expect the completion of the research requirements to take highest priority. It is particularly important that students make satisfactory progress toward the first QP and complete all work by the deadlines given above. Failure to do so may result in being asked to leave the program.

Language Requirement

Students are expected to exhibit some breadth in their knowledge of the languages of the world beyond those most commonly studied (including but not confined to Romance, Germanic, and Slavic languages) 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 class, or one or more classes 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 are required to serve as Teaching Fellows for a minimum of two terms, usually beginning in the first term of the third year. In addition, students must complete two additional terms of 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.
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, Old English I Staff

The essentials of the language, some prose readings, and close study of several celebrated Old English poems.

LING 510a, Introduction to Linguistics Jason Shaw

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 Claire Bower and Rikker Dockum

Introduction to language change and language history. Types of change that a language undergoes over time: sound change, analogy, syntactic and semantic change, borrowing. Techniques for recovering earlier linguistic stages: philology, internal reconstruction, the comparative method. The role of language contact in language change. Evidence from language in prehistory.

LING 515a / SKRT 510a, Introductory Sanskrit I Staff

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 525b / SKRT 520b, Introductory Sanskrit II Staff

Continuation of LING 515/SKRT 510. Focus on the basics of Sanskrit grammar; readings from classical Sanskrit texts written in the Indian Devanagari script. Prerequisite: LING 515/SKRT 510.

LING 538a / SKRT 530a, Intermediate Sanskrit I Staff

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 548b / SKRT 540b, Intermediate Sanskrit II Staff

Continuation of LING 538, focusing on Sanskrit literature from the *kavya* genre. Readings include selections from the *Jatakamala* of Aryasura and the opening verses of Kalidasa's *Kumarasambhava*. Prerequisite: LING 538/SKRT 530 or equivalent.

LING 564a, Principles of Language Teaching and Learning Petronella 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 600b, Experimentation in Linguistics Maria Piñango and Jason Shaw

Principles and techniques of experimental design and research in linguistics. Linguistic theory as the basis for framing experimental questions. The development of theoretically informed hypotheses, notions of control and confounds, human subject research, statistical analysis, data reporting, and dissemination.

LING 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 613b / AFST 613b, Hybrid Grammars: Dynamics of Language Contact, Language Acquisition, and Language Change Staff

Traditional approaches to language acquisition and change have typically assumed that children develop a mental grammar that replicates uniformly the linguistic knowledge of the current members of their monolingual speech communities. Therefore, language change must result from external factors: language contact involving a cohort of L2-learners. Likewise, multilingualism, thus language contact, is commonly assumed to hinder acquisition, and presupposed “intense” contact situations are regarded as propitious for *creolization*. This course proposes a shift of perspective, focusing on multiple-variety ecologies such as creole societies in which speakers-listeners can acquire, alternate between, and sometimes “mix” different languages, dialects, or registers. Two major questions are addressed: (1) How does acquisition proceed in such multiple-variety ecologies? (2) What does a theory of the multilingual mind tell us about acquisition of L1 and the emergence of grammars? The descriptive and theoretical framework adopted is that of hybrid grammars as developed in Aboh (2015). Prerequisite: familiarity with syntax and linguistic variation.

LING 617a, Language and Mind Maria Piñango

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 Bower

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 620b, 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 627a, Language and Computation I Robert Frank

Design and analysis of computational models of language. Topics include finite state tools, computational morphology and phonology, grammar and parsing, lexical semantics, and the use of linguistic models in applied problems. Prerequisite: prior programming experience or permission of the instructor.

LING 631b, Neurolinguistics Maria Piñango

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 632a, Introduction to Phonological Analysis 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 problem solving. Prerequisite: LING 510 or 620.

LING 635b, Phonological Theory Natalie Weber

Topics in the architecture of a theory of sound structure. Motivations for replacing a system of ordered rules with a system of ranked constraints. Optimality theory: universals, violability, constraint types, and their interactions. Interaction of phonology and morphology, as well as relationship of phonological theory to language acquisition and learnability. Opacity, lexical phonology, and serial versions of optimality theory. Prerequisite: LING 632 or permission of the instructor.

LING 641b, Field Methods Claire Bowers

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 Hadas Kotek

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 Hadas Kotek

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 681b / AFST 681, Comparative Syntax: A View from Kwa (Niger-Congo) Staff

This course adopts a microcomparative perspective by looking at closely related languages (i.e., Gbe and Kwa families of Niger-Congo) as well as a macrocomparative perspective that situates these languages in the larger context of typologically and genetically unrelated languages (e.g., Romance, Germanic). We set the stage by first looking at word formation, word classes, and the role of tones at the morphosyntactic level. Building on this, the first part of the course discusses topics such as Tense, Mood, Aspect (TMA) expressions, word order variation (e.g., VO vs. OV patterns), serial verb constructions, restructuring, and the notion of “light verb.” These topics allow us to establish a profile of the clause structure in these languages. With this knowledge at hand, the second part of the course addresses the question of information structure and the commonly assumed parallelism between the CP and DP domains. The descriptive framework adopted is the cartographic approach developed by Rizzi (1997), Cinque (1999), Aboh (2004), and much related work. Prerequisite: some background in syntax.

LING 772a, Meaning, Concepts, and Words Maria Piñango

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 790a, Research Methods Hadas Kotek

An introduction to research methods in linguistics. Observational and experimental approaches to research in the field. Topics include collection and organization of linguistic data, basic field methods, and use of language corpora and databases. Introduction to research in language acquisition and language change. Prerequisites: one course in syntax and one course in phonology.

Management

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<https://som.yale.edu/programs/phd>
 M.A., M.Phil., Ph.D.

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Director of Graduate Studies

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Professors Rick Antle, Nicholas Barberis, James Baron, Paul Bracken, Zhiwu Chen, Judith Chevalier, James Choi, Ravi Dhar, Jonathan Feinstein, Shane Frederick, William Goetzmann, Gary Gorton, Jonathan Ingersoll, Edward Kaplan, James Levinsohn, Andrew Metrick, A. Mushfiq Mobarak, Barry Nalebuff, Nathan Novemsky, Edieal Pinker, Benjamin Polak, K. Geert Rouwenhorst, Peter Schott, Fiona Scott-Morton, Subrata Sen, Robert Shiller, Jiwoong Shin, Edward Snyder, Olav Sorenson, Matthew Spiegel, K. Sudhir, Shyam Sunder, Arthur Swersey, Jacob Thomas, Heather Tookes, Amy Wrzesniewski, Gal Zauberman, X. Frank Zhang

Associate Professors Victoria Brescoll, Daylian Cain, Arthur Campbell, Rodrigo Canales, Lisa Kahn, Sang-Hyun Kim, Marissa King, Donald Lee, Justin Murfin

Participating Faculty from the School of Management Jason Abaluck, Saed Alizamir, Lorenzo Caliendo, Zoë Chance, Jason Dana, Joyee Deb, Florian Ederer, Constanca Esteves-Sorenson, Stanley Garstka, Jeffrey Garten, Roger Ibbotson, Ivana Katic, Ahmed Khwaja, Thomas Kolditz, Kalin Kolev, Balázs Kovács, Michael Kraus, Vineet Kumar, Alina Lerman, Vahideh Manshadi, Alan Moreira, Tyler Muir, George Newman, Marina Niessner, Amandine Ody-Brasier, Taly Reich, Jeffrey Sonnenfeld, Thomas Steffen, Kosuke Uetake, Victor Vroom, Kevin Williams

FIELDS OF STUDY

Current fields include accounting, financial economics, marketing (behavioral), marketing (quantitative), operations, and organizations and management.

SPECIAL ADMISSIONS REQUIREMENTS

The GRE General Test or the GMAT Test is required by the Graduate School. Applicants whose native language is not English must take the Test of English as a Foreign Language (TOEFL).

CORE REQUIREMENTS FOR THE PH.D. DEGREE

All students are required to take the Ph.D. Student Research Workshop (MGMT 780) and each 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.

The general structure of the program is as follows. During the first four terms of study, students take a minimum of twelve courses in addition to attending conference and seminar presentations and other academic activities. Courses are selected in consultation with the faculty advisers and the director of graduate studies (DGS). 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). 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 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 fourteen Ph.D.-level courses in their first two years of study: one microeconomics course (ECON 545); two empirical methods courses (e.g., PSYC 518, S&DS 563); five depth courses (MGMT 750, MGMT 753, MGMT 754, MGMT 758; PSYC 543 or PSYC 601, or INP 597); and six electives (from MGMT 703; PSYC 509, PSYC 607, PSYC 610, PSYC 621, PSYC 749; S&DS 530). 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 remaining 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 others students or faculty. Students select a faculty adviser for each paper and work with him or her 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 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; PSYC 629); 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 700a, Seminar in Accounting Research I Zeqiong Huang

Study of analytical modeling techniques in accounting research that covers topics such as performance measurement for incentives, the consequences of asymmetric information in economic relationships and the role of accounting therein, information sharing within and across firms, and the pricing of related-party transactions.

MGMT 720a, Models of Operations Research and Management Vahideh Manshadi

MGMT 731a, Organizations and the Environment Olav Sorenson

This course, offered every other year, reviews economic, psychological, and sociological perspectives of how organizations interact with one another. Sessions are generally organized around phenomena and jointly taught by two instructors from different perspectives.

MGMT 734a / SOCY 506a, Designing Social Research Balazs Kovacs

This is a course in the design of social research. The goal of research design is "to ensure that the evidence obtained enables us to answer the initial [research] question as unambiguously as possible" (de Vaus 2001: 9). A good research design presupposes a well-specified (and hopefully interesting) research question. This question can be stimulated by a theoretical puzzle, an empirical mystery, or a policy problem. With the research question in hand, the next step is to develop a strategy for gathering the empirical evidence that will allow you to answer the question "as unambiguously as possible."

MGMT 740a / ECON 670a, Financial Economics I Jonathan Ingersoll and 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 753a / PSYC 553a, Behavioral Decision-Making I: Choice Ravi Dhar and Nathan Novemsky

The seminar examines research on the psychology of decision-making, focusing on judgment. Although the normative issue of how decisions should be made is relevant, the descriptive issue of how decisions are made is the main focus of the course. Topics of discussion include judgment heuristics and biases, confidence and calibration, issues of well-being including predictions and experiences, regret and counterfactuals. The

goal of the seminar is threefold: to foster a critical appreciation of existing knowledge in behavioral decision theory, to develop the students' skills in identifying and testing interesting research ideas, and to explore research opportunities for adding to that 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 780a, Ph.D. Student Research Workshop Matthew Spiegel

MGMT 781a, Workshop Staff

781-01, Accounting/Finance Workshop; 781-03, Marketing Workshop; 781-04, Organizations and Management Workshop; 781-05, Operations Workshop.

MGMT 782a, Doctoral Student Pre-Workshop Seminar Staff

782-01, Accounting Doctoral Student Pre-Workshop Seminar; 782-02, Financial Economics Doctoral Student Pre-Workshop Seminar; 782-03, Marketing Doctoral Student Pre-Workshop Seminar; 782-04, Organizations and Management Doctoral Student Pre-Workshop Seminar; 782-05, Operations Doctoral Student Pre-Workshop Seminar.

Mathematics

10 Hillhouse Avenue, 203.432.7058

<http://math.yale.edu>

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

Chair

Yair Minsky

Director of Graduate Studies

Alexander Goncharov [F]

Hee Oh [Sp]

Professors Richard Beals (*Emeritus*), Jeffrey Brock, Andrew Casson (*Emeritus*), Ronald Coifman, Igor Frenkel, Howard Garland (*Emeritus*), Alexander Goncharov, Roger Howe (*Emeritus*), Peter Jones, Gil Kalai (*Adjunct*), Ivan Losev, Alexander Lubotzky (*Adjunct*), Gregory Margulis, Yair Minsky, Vincent Moncrief (*Physics*), Hee Oh, Sam Payne, Nicholas Read (*Physics; Applied Physics*), Vladimir Rokhlin (*Computer Science*), Wilhelm Schlag, George Seligman (*Emeritus*), Daniel Spielman (*Computer Science*), Van Vu, John Wettlaufer (*Geology & Geophysics; Physics*), Gregg Zuckerman

Associate Professor Yifeng Liu

Assistant Professor Stefan Steinerberger

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; geometric analysis; 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

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; and (6) complete a dissertation that clearly advances understanding of the subject it considers. The normal time for completion of the Ph.D. program is five years. Requirement (1) should be completed by the end of the second year. A sequence of three qualifying examinations (algebra and number theory, real and complex analysis, topology) is offered each term, at intervals of about one month. All qualifying examinations must be taken by the end of the third term. 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, most Mathematics students are required to assist in teaching during five terms. Students in years one and two serve as tutors and graders in undergraduate mathematics courses during one term per year. The department also offers a required teaching practicum in year two. In years three through five, students normally teach one section of calculus or its equivalent during one term per year. Students receiving external fellowships may petition for a waiver of teaching while receiving external funding in place of University funding, but they are still required to teach one section of calculus or its equivalent for a minimum of two terms over the course of their program.

MASTER'S DEGREES

M.Phil. In addition to the Graduate School's Degree Requirements (see under Policies and Regulations), a student must undertake a reading program of at least two terms' duration in a specific significant area of mathematics under the supervision of a faculty adviser and demonstrate command of the material studied during the reading period at a level sufficient for teaching and research.

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 separate master's program in Mathematics.

COURSES

MATH 500a, Modern Algebra I Staff

A survey of algebraic constructions and theories at a sophisticated level. Topics include categorical language, free groups and other free objects in categories, general theory of rings and modules, artinian rings, and introduction to homological algebra.

MATH 520a, Measure Theory and Integration Staff

Construction and limit theorems for measures and integrals on general spaces; product measures; L_p spaces; integral representation of linear functionals.

MATH 544a, Introduction to Algebraic Topology I Yair Minsky

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 545b, Introduction to Algebraic Topology II Staff

Mechanical Engineering & Materials Science

Dunham Laboratory, 203.432.4252

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, Alessandro Gomez, Sohrab Ismail-Beigi, Shun-Ichiro Karato, Marshall Long, Corey O'Hern, Brian Scassellati, Jan Schroers, Udo Schwarz, Mitchell Smooke

Associate Professor Aaron Dollar

Assistant Professors Eric Brown, Judy Cha, Rebecca Kramer-Bottiglio, Madhusudhan Venkadesan

Lecturers Beth Anne Bennett, Kailasnath Purushothaman, Joseph Zinter

FIELDS OF STUDY

Fluids and thermal sciences Suspensions; electrospray theory and characterization; electrical propulsion applications; electrified and magnetized interfaces of electrically conducting liquids and ferrofluids; combustion and flames; computational methods for fluid dynamics and reacting flows; turbulence; laser diagnostics of reacting and nonreacting flows; and magnetohydrodynamics.

Soft matter/complex fluids Jamming and slow dynamics in gels, glasses, and granular materials; mechanical properties of soft and biological materials; and structure and dynamics of proteins and other macromolecules. Several faculty in Mechanical Engineering are also affiliated with the Integrated Graduate Program in Physical and Engineering Biology (<http://peb.yale.edu>).

Materials science Studies of thin films; nanoscale effects on electronic properties of two-dimensional layered materials; 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; nanotribology; nanostructured energy applications; nanoparticle synthesis for energy applications; combinatorial materials science; and in situ transmission electron and scanning probe microscopy.

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; soft-bodied control; electromechanical energy conversion; biomechanics of human movement; mechanics of biological muscle; and human-powered vehicles.

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

For course listings, see Engineering & Applied Science.

Medieval Studies

53 Wall Street, Rm. 310, 203.432.0672

<http://medieval.yale.edu>

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

Chair and Director of Graduate Studies

Ardis Butterfield

Acting Chair and Director of Graduate Studies (2018–2019)

Jessica Brantley

Executive Committee R. Howard Bloch, Jessica Brantley, Ardis Butterfield, Stephen Davis, Paul Freedman, Dimitri Gutas (*Emeritus*), Jacqueline Jung, Ivan Marcus, Giuseppe Mazzotta, Robert Nelson, Emily Thornberry, Shawkat Toorawa, Anders Winroth

Faculty associated with the program R. Howard Bloch, Gerhard Böwering, Jessica Brantley, Ardis Butterfield, Walter Cahn (*Emeritus*), Marcia Colish (*Emerita*), Stephen Davis, Paul Freedman, Johanna Fridriksdottir, Creighton Gilbert (*Emeritus*), Walter Goffart (*Emeritus*), Harvey Goldblatt, Frank Griffel, Dimitri Gutas (*Emeritus*), Valerie Hansen, Peter Hawkins, Jacqueline Jung, Traugott Lawler (*Emeritus*), Ivan Marcus, Vasileios Marinis, Giuseppe Mazzotta, Mary Miller, Robert Nelson, Henry Parkes, Fred Robinson (*Emeritus*), Barbara Shailor, Emily Thornberry, Shawkat Toorawa, Anders Winroth, Mimi Hall Yiengpruksawan, Anna Zayarnyaya

Lecturer Raymond Clemens

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 ADMISSIONS REQUIREMENTS

The General Test of the GRE is required. A writing sample of ten to twenty pages should be included with the application.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Languages required are Latin, French, and German. Latin may be replaced with Arabic, Greek, or Hebrew when appropriate. Proficiency in Latin, Arabic, Greek, and Hebrew is tested with an examination administered and evaluated by the program during the first term. Proficiency in French and German is demonstrated by passing the departmental examinations and should be achieved by the third term. 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 in the third and fourth years.

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 Latin, Arabic, Greek, or Hebrew.

COURSES

MDVL 536a / HIST 536a, Charters, Cartularies, and Archives Paul Freedman and N. Raymond Clemens

An examination of medieval documentation and how to use it to answer questions about medieval politics, society, and religion. Charters are single documents representing transactions, ranging from wills to grants of rights to sales contracts. Cartularies are collections of documents that show how an institution (usually an ecclesiastical institution) acquired property; and they back up and prove rights over those properties. The course looks at archives and ways in which documents end up in archives, how they are organized, and what that can tell us about the issues they focus on.

MDVL 563b / CLSS 602b, Advanced Latin Paleography Barbara Shailor

The challenges of using hand-produced Latin manuscripts in research, with an emphasis on texts from the late Middle Ages. Gothic cursive scripts and book hands ca. 1200–ca. 1500; fragments of unidentified codices; complex or composite codices with heavy interlinear and marginal annotations. Manuscripts and fragments selected largely from collections in the Beinecke Library. Prerequisite: CLSS 601 or permission of the instructor.

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 650a / HSAR 591a, Visions and Art in Medieval Europe Jacqueline Jung

From the *Book of Revelation* to the *Showings* of Julian of Norwich (d. 1423), accounts of visions in the Christian tradition were inextricably intertwined with the visual arts. Through examinations of medieval texts, images, and material culture, in conjunction with modern analyses of related phenomena, this seminar explores the range of representational practices that helped medieval Christians summon up, make sense of, and communicate extraordinary moments of contact with the divine. We address such

questions as the changes in visionary experiences over time, the role of language and literacy in the communication of such experiences, the impact of gender on visions, the varieties and functions of other senses (especially touch and taste) in medieval visions, and the impact of visionary reports on the development of art. We begin by addressing the theoretical, cognitive, and anthropological facets of visionary experience before turning to medieval primary sources such as saints' lives, accounts of otherworld journeys, miracle books, sermons, monastic chronicles, and individually composed vision books, and to modern interpretations by historians such as Caroline Bynum, William Christian, Peter Dinzelbacher, Jeffrey Hamburger, Barbara Newman, Giselle de Nie, and Jean-Claude Schmitt. Visual materials include both depictions of visions (such as Apocalypse manuscripts, paintings of the Temptation of St. Anthony, and renderings of Hildegard's visions) and images that played a role in sparking visionary experience (such as Marian statues, crucifixes, Man of Sorrows images, and Baby Jesus dolls). Reading knowledge of German, French, and Latin is strongly recommended.

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

Registrar

Corey Brushett

Professors Serap Aksoy (*Epidemiology*), Susan Baserga (*Molecular Biophysics & Biochemistry; Genetics; Therapeutic Radiology*), 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*), Durland Fish (*Emeritus, Microbial Diseases*), Richard Flavell (*Immunobiology*), Jorge Galán (*Microbial Pathogenesis; Cell Biology*), Eduardo Groisman (*Microbial Pathogenesis*), Akiko Iwasaki (*Immunobiology; Molecular, Cellular, & Developmental Biology*), Christine Jacobs-Wagner (*Molecular, Cellular, & Developmental Biology; Microbial Pathogenesis*), Albert Ko (*Epidemiology; Internal Medicine*), Ruslan Medzhitov (*Immunobiology*), I. George Miller (*Pediatrics; Epidemiology; Molecular Biophysics & Biochemistry*), Walther Mothes (*Microbial Pathogenesis*), Melinda Pettigrew (*Epidemiology*), John Rose (*Pathology*), Craig Roy (*Microbial Pathogenesis; Immunobiology*), Nancy Ruddle (*Emerita, Epidemiology*), Dieter Söhl (*Molecular Biophysics & Biochemistry; Chemistry*), William Summers (*Emeritus, Molecular Biophysics & Biochemistry*), Joann Sweasy (*Therapeutic Radiology; Genetics*), Peter Tattersall (*Laboratory Medicine; Genetics*), Christian Tschudi (*Epidemiology*), Paul Turner (*Ecology & Evolutionary Biology*)

Associate Professors Murat Acar (*Molecular, Cellular, & Developmental Biology; Physics*), Choukri Ben Mamoun (*Internal Medicine; Microbial Pathogenesis*), Jason Crawford (*Chemistry; Microbial Pathogenesis*), Andrew Goodman (*Microbial Pathogenesis*), Farren Isaacs (*Molecular, Cellular, & Developmental Biology*), Barbara Kazmierczak (*Internal Medicine; Microbial Pathogenesis*), Priti Kumar (*Internal Medicine/Infectious Diseases*), Brett Lindenbach (*Microbial Pathogenesis*), Jun Liu (*Microbial Pathogenesis*), John MacMicking (*Microbial Pathogenesis; Immunobiology*), Kathryn Miller-Jensen (*Biomedical Engineering; Molecular, Cellular, & Developmental Biology*), Carla Rothlin (*Immunobiology*), Christian Schlieker (*Molecular Biophysics & Biochemistry; Cell Biology*), Richard Sutton (*Internal Medicine; Microbial Pathogenesis*), Jeffrey Townsend (*Biostatistics; Ecology & Evolutionary Biology*), Yong Xiong (*Molecular Biophysics & Biochemistry*)

Assistant Professors Stavroula Hatzios (*Molecular, Cellular, & Developmental Biology*), Ya-Chi Ho (*Microbial Pathogenesis; Internal Medicine/Infectious Diseases*), Nikhil Malvankar (*Molecular Biophysics & Biochemistry*), Noah Palm (*Immunobiology*), E. Hesper Rego (*Microbial Pathogenesis*), Aaron Ring (*Immunobiology*)

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, parasitology, microbiome, and microbial ecology and evolution.

SPECIAL ADMISSIONS REQUIREMENTS

To enter the Ph.D. program, students apply to the Microbiology track within the interdepartmental graduate program in the Biological and Biomedical Sciences (BBS), <http://bbs.yale.edu>. An undergraduate major in biology, biophysics, biochemistry, microbiology, or molecular biology is recommended; the GRE General Test or MCAT is required.

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. An individualized qualifying exam on topics selected by each student, in consultation with the faculty, 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 685, MBIO 530, MBIO 734, MBIO 680, 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 701, MBIO 702, MBIO 670, MBIO 671, and MBIO 672. 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 561a / CB&B 561a / MB&B 561a / MCDB 561a / PHYS 561a, Introduction to Dynamical Systems in Biology Damon Clark, Kathryn Miller-Jensen, and Jonathon Howard

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MATLAB in a series of in-class hackathons that illustrate biological examples discussed in lectures.

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

MBIO 670a and MBIO 671b and MBIO 672b, Laboratory Rotations Walther Mothes
Rotation in three laboratories. Required of all first-year graduate students.

MBIO 680b / EMD 680b, Advanced Topics in Tropical Parasitic Diseases Christian Tschudi

An introductory topic-based course in modern parasitology. For each topic there is an introductory lecture followed by a journal club-like discussion session of relevant papers selected from the literature. The course provides an introduction to basic biological concepts of parasitic eukaryotes causing diseases in humans. Topics include strategies used by parasitic eukaryotes to establish infections in the host and approaches to disease control, through either chemotherapy, vaccines, or genomics. In addition, emphasis is placed on evaluating the quality and limitation of scientific publications and developing skills in scientific communication. Prerequisite: permission of the instructor.

MBIO 685b, Molecular Mechanisms of Microbial Pathogenesis 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, Bacterial Determinants of Pathogenesis 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- and second-year students; not for credit. The course is offered every other year, alternating with MBIO 703, so that it can be taken once during each student's tenure in the program. 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
<http://medicine.yale.edu/mbb>
M.S., M.Phil., Ph.D.

Chair

Mark Hochstrasser

Acting Chair [F]

Karla Neugebauer

Director of Graduate Studies

Yong Xiong (336 Bass, 203.432.5662, nessie.stewart@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, Mark Gerstein, Nigel Grindley (*Emeritus*), Mark Hochstrasser, Jonathon Howard, Michael Koelle, Anthony Koleske, William Konigsberg, Peter Lengyel (*Emeritus*), J. Patrick Loria (*Chemistry*), I. George Miller (*Pediatric Infectious Diseases; Public Health*), Andrew Miranker, Peter Moore (*Emeritus, Chemistry*), Karla Neugebauer, Thomas Pollard (*Molecular, Cellular & Developmental Biology*), Karin Reinisch (*Cell Biology*), David Schatz (*Immunobiology*), Robert Shulman (*Emeritus*), Fred Sigworth (*Cellular & Molecular Physiology; Biomedical Engineering*), Dieter Söll, Mark Solomon, Joan Steitz, Thomas Steitz, Scott Strobel, William Summers (*Emeritus*), Kenneth Williams (*Adjunct; Research*)

Associate Professors Titus Boggon (*Pharmacology*), Erdem Karatekin (*Cellular & Molecular Physiology*), Christian Schlieker, Charles Sindelar, Yong Xiong

Assistant Professors Julien Berro, Wendy Gilbert, Nikhil Malvankar, Candice Paulsen, Matthew Simon, Sarah Slavoff (*Chemistry*), Seyedtaghi Takyar (*Internal Medicine/Pulmonary*)

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, and control of the cell cycle. Structural and computational biology is a strong component of many of these research efforts.

SPECIAL ADMISSIONS REQUIREMENTS

Courses in introductory biology, general chemistry, organic chemistry, physical chemistry, mathematics through differential equations, and one year of physics with

calculus are required for admission. Biochemistry is strongly recommended. Applicants must take the GRE General Test, which is preferred, or the MCAT.

To enter the Ph.D. program, students apply to an interest-based track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), <http://bbs.yale.edu>.

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 First-Year Students). All students are required to take, for credit, seven one-term science courses. To obtain the desired breadth and depth of education, students 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), 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. 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 at the TF-10 level during their graduate careers, usually during the second and third years. 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 members of MB&B. 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 / MCDB 500a, Biochemistry Ronald Breaker and Donald Engelman
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 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 Simon Mochrie

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 545b, Methods and Logic in Molecular Biology Wendy Gilbert, Mark Hochstrasser, and Christian Schlieker

An examination of fundamental concepts in molecular biology through analysis of landmark papers. Development of skills in reading the primary scientific literature and in critical thinking. Open only to MB&B students pursuing the B.S./M.S. degree.

MB&B 561a / CB&B 561a / MBIO 561a / MCDB 561a / PHYS 561a, Introduction to Dynamical Systems in Biology Damon Clark, Kathryn Miller-Jensen, and Jonathon Howard

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MATLAB in a series of in-class hackathons that illustrate biological examples discussed in lectures.

MB&B 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MCDB 562b / PHYS 562b, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or a 200-level biology course, or permission of the instructor.

MB&B 591a / ENAS 991a / MCDB 591a / PHYS 991a, Integrated Workshop

Corey O'Hern, Mark Gerstein, Scott Holley, Marcus Bosenberg, Madhusudhan Venkadesan, Michael Murrell, and Nikhil Malvankar

This required course for students in PEB involves hands-on laboratory modules with students working in pairs. A biology student is paired with a physics or engineering student; a computation/theory student is paired with an experimental student. The modules are devised so that a range of skills is acquired, and students learn from each other. Modules are hosted in faculty laboratories. Receives no course credit toward MB&B graduate course requirements. With permission of the DGS, can be used by PEB students to replace the third rotation of MB&B 650 but will receive no separate course credit toward MB&B course requirements.

MB&B 600a, Principles of Biochemistry I Michael Koelle, Matthew Simon, Enrique De La Cruz, and Candice Paulsen

Discussion of the physical, structural, and functional properties of proteins, lipids, and carbohydrates, three major classes of molecules in living organisms. Energy metabolism, hormone signaling, and muscle contraction as examples of complex biological processes whose underlying mechanisms can be understood by identifying and analyzing the molecules responsible for these phenomena.

MB&B 601b, Principles of Biochemistry II Christian Schlieker and Karla Neugebauer

A continuation of MB&B 600a that considers the chemistry and metabolism of nucleic acids, the mechanism and regulation of protein and nucleic acid synthesis, and selected topics in macromolecular biochemistry.

MB&B 602a / CBIO 602a / MCDB 602a, Molecular Cell Biology Charles Lusk, Michael Caplan, Nadya Dimitrova, Thomas Pollard, James Rothman, Valerie Horsley, Thomas Melia, Megan King, Martin Schwartz, Christopher Burd, and Josephina van Wolfswinkel

A comprehensive introduction to the molecular and mechanistic aspects of cell biology for graduate students in all programs. Emphasizes fundamental issues of cellular organization, regulation, biogenesis, and function at the molecular level. Prerequisites: none, but some knowledge of basic cell biology and biochemistry is assumed. Students who have not taken courses in these areas can prepare by reading relevant sections in basic molecular cell biology texts. We recommend Pollard et al., *Cell Biology* (3rd ed., 2016), Alberts et al., *Molecular Biology of the Cell* (6th ed., 2014), or Lodish et al., *Molecular Cell Biology* (8th edition, 2016).

MB&B 625a / GENE 625a / MCDB 625a, Basic Concepts of Genetic Analysis Jun Lu

The universal principles of genetic analysis in eukaryotes are discussed in lectures. Students also read a small selection of primary papers illustrating the very best of genetic analysis and dissect them in detail in the discussion sections. While other Yale graduate molecular genetics courses emphasize molecular biology, this course focuses on the concepts and logic underlying modern genetic analysis.

MB&B 635a / ENAS 518a, Quantitative Approaches in Biophysics and Biochemistry

Julien Berro, Yong Xiong, and Jonathon Howard

The course offers an introduction to quantitative methods relevant to analysis and interpretation of biophysical and biochemical data. Topics covered include statistical testing, data presentation, and error analysis; introduction to dynamical systems; analysis of large datasets; and Fourier analysis in signal/image processing and

macromolecular structural studies. The course also includes an introduction to basic programming skills and data analysis using MATLAB. Real data from research groups in MB&B are used for practice. Prerequisites: MATH 120 and MB&B 600 or equivalents, or permission of the instructors.

MB&B 650a and MB&B 651b, Lab Rotation for First-Year Students Yong Xiong
Required of all first-year BQBS graduate students. Credit for full year only.

MB&B 675a, Seminar for First-Year Students Yong Xiong and Karen Anderson
Required of all first-year BQBS graduate students.

MB&B 676b, Responsible Conduct of Research Susan Baserga, Dieter Söll, Mark Gerstein, Christian Schlieker, Jonathon Howard, Karla Neugebauer, Julien Berro, and Wendy Gilbert

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 BBSB graduate students.

MB&B 710b / C&MP 710b, Electron Cryo-Microscopy for Protein Structure Determination Frederick Sigworth and Charles Sindelar

Understanding cellular function requires structural and biochemical studies at an ever-increasing level of complexity. The course is an introduction to the concepts and applications of high-resolution electron cryo-microscopy. This rapidly emerging new technique is the only method that allows biological macromolecules to be studied at all levels of resolution from cellular organization to near atomic detail. ½ Course cr

MB&B 720a, Macromolecular Structure and Biophysical Analysis Andrew Miranker and Yong Xiong

An in-depth analysis of macromolecular structure and its elucidation using modern methods of structural biology and biochemistry. Topics include architectural arrangements of proteins, RNA, and DNA; practical methods in structural analysis; and an introduction to diffraction and NMR. Prerequisites: physical chemistry (may be taken concurrently) and biochemistry.

MB&B 730a, Methods and Logic in Molecular Biology Mark Solomon, Anthony Koleske, Scott Holley, 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 743b / GENE 743b / MCDB 743b, Advanced Eukaryotic Molecular Biology
Mark Hochstrasser and Wendy Gilbert

Selected topics in transcriptional control, regulation of chromatin structure, mRNA processing, mRNA stability, RNA interference, translation, protein degradation, DNA replication, DNA repair, site-specific DNA recombination, somatic hypermutation. Prerequisite: biochemistry or permission of the instructor.

MB&B 749a, Medical Impact of Basic Science Joan Steitz, Thomas Steitz, I. George Miller, David Schatz, Daniel DiMaio, Karla Neugebauer, and Wendy Gilbert

Consideration of examples of recent discoveries in basic science that have elucidated the molecular origins of disease or that have suggested new therapies for disease. Emphasis is placed on the fundamental principles on which these advances rely. Reading is from the primary scientific and medical literature, with emphasis on developing the ability to read this literature critically. Aimed primarily at undergraduates. May not be taken by MB&B B.S./MS. students for graduate course credit. Prerequisite: biochemistry or permission of the instructor.

MB&B 750b, Biological Membranes Donald Engelman

Biological membranes and their resident proteins are essential for cellular function; yet comparatively little is known about their structure and dynamics. This class provides an introduction to the biochemistry and biophysics of lipids, lipid bilayers, and lipid-derived second messengers. In addition, structural as well as functional aspects of the different classes of membrane proteins are discussed along with an outline of experimental approaches used to achieve an understanding of membrane protein structure and function at a molecular level. Counts as 0.5 credit toward MB&B graduate course requirements. Prerequisite: biochemistry.

MB&B 752b / CB&B 752b / CPSC 752b / MCDB 752b, Biomedical Data Science: Mining and Modeling Mark Gerstein

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 753b, Biomedical Data Science: Mining Mark Gerstein

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. This module of the full-term course MB&B 752 focuses on the first of these techniques, data mining. Specific topics include sequence alignment, comparative genomics and phylogenetics, biological databases, microarray normalization, and machine-learning approaches to data integration. Counts as 0.5 credit toward MB&B graduate course requirements. Prerequisites: biochemistry and calculus, or permission of the instructor.

MB&B 754b, Biomedical Data Science: Modeling Mark Gerstein

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. This module of the full-term course MB&B 752 focuses on the second of these techniques, simulation. Specific topics to be covered include geometric analysis of protein structure, molecular-dynamics simulation, and biological networks. Counts as 0.5 credit toward MB&B

graduate course requirements. Prerequisites: biochemistry and calculus, or permission of the instructor.

MB&B 760a, Principles of Macromolecular Crystallography Thomas Steitz and Yong Xiong

Rigorous introduction to the principles of macromolecular crystallography, aimed at students who are planning to carry out structural studies involving X-ray crystallography or who want to obtain in-depth knowledge for critical analysis of published crystal structures. Counts as 0.5 credit toward MB&B graduate course requirements. Prerequisites: physical chemistry and biochemistry. ½ Course cr

MB&B 800a, Advanced Topics in Molecular Medicine Susan Baserga and William Konigsberg

The seminar, which covers topics in the molecular mechanisms of disease, illustrates timely issues in areas such as protein chemistry and enzymology, intermediary metabolism, nucleic acid biochemistry, gene expression, and virology. M.D. and M.D./Ph.D. students only. Prerequisite: biochemistry (may be taken concurrently).

MB&B 900a and MB&B 901b, Reading Course in Biophysics Yong Xiong

Directed reading course in biophysics. Term paper required. By arrangement with faculty. Open only to graduate students in MB&B. Please see syllabus for additional requirements.

MB&B 902a and MB&B 903b, Reading Course in Molecular Genetics Yong Xiong

Directed reading course in molecular genetics. Term paper required. By arrangement with faculty. Open only to graduate students in MB&B. Please see syllabus for additional requirements.

MB&B 905b, Reading Course in Biochemistry Yong Xiong

Directed reading course in biochemistry. Term paper required. By arrangement with faculty. Open only to graduate students in MB&B. Please see syllabus for additional requirements.

Molecular, Cellular, and Developmental Biology

Kline Biology Tower, 203.432-3538

<http://mcdm.yale.edu>

M.S., Ph.D.

Chair

Vivian Irish

Director of Graduate Studies

Farren Isaacs

Professors Ronald Breaker, John Carlson, Lynn Cooley (*Genetics*), Craig Crews, Stephen Dellaporta, Paul Forscher, Mark Hochstrasser (*Molecular Biophysics & Biochemistry*), Scott Holley, Vivian Irish, Akiko Iwasaki (*Immunobiology*), Christine Jacobs-Wagner, Douglas Kankel, Paula Kavathas (*Immunobiology*), Haig Keshishian, Mark Mooseker, Thomas Pollard, Anna Pyle, Matthew Rodeheffer (*Comparative Medicine*), Joel Rosenbaum, Alanna Schepartz (*Chemistry*), Hugh Taylor (*Obstetrics, Gynecology, & Reproductive Sciences*), Robert Wyman

Associate Professors Murat Acar, Sreeganga Chandra (*Neurology*), Damon Clark, Thierry Emonet, Valerie Horsley, Farren Isaacs, Kathryn Miller-Jensen (*Biomedical Engineering*), Weimin Zhong

Assistant Professors Shirin Bahmanyar, David Breslow, Nadya Dimitrova, Joshua Gendron, Stavroula Hatzios, Yannick Jacob, Josien van Wolfswinkel

FIELDS OF STUDY

Research in genetics and molecular biology encompasses studies of non-coding RNAs, genome engineering, genome organization and regulation, gene dosage, aging, bacterial chemotaxis, and oncogenes. 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, neural and epidermal stem cells, and systems developmental biology. Research in neurobiology focuses on growth cone motility, neural differentiation, synaptogenesis, visual perception, olfaction, and the formation of topographic maps. A Special Program in Plant Sciences provides research and training in the molecular genetics of flowering, epigenetics, the physiology of hormone action, pathogen defense systems, 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), <http://bbs.yale.edu>.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants should have obtained training in the structure, development, and physiology of organisms; the structure, biochemistry, and physiology of cells; genetics; elementary

calculus; elementary physics; inorganic and organic chemistry; statistics or advanced mathematics. Lack of some prerequisites can be made up in the first year of graduate study. Students having different science training, such as degrees in chemistry, physics, or engineering, are encouraged to apply. In addition to the GRE General test, a Subject Test is recommended, preferably in Biology, or in Biochemistry, Cell and Molecular Biology.

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, First-Year Introduction to Research. 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 Center for Science and Social Science Information (CSSSI). All students are required to teach in two one-term (TF level 10) courses during their Ph.D. study, but not during the first year of graduate study. 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 901, First-Year Introduction to Research—Ethics: Scientific Integrity in Biomedical Research, 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 Course and Honors 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 / MB&B 500a, Biochemistry Ronald Breaker and Donald Engelman
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 504b, Responsible Conduct of Research Staff
This course meets the NIH requirement that students receive training in the responsible conduct of research at least every four years. Two ninety-minute sessions for MCDB students; additional sessions for fourth-year MCDB students. Attendance is taken, and students who attend both sessions receive a grade of Satisfactory. Graded Satisfactory/Unsatisfactory.

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 Mark Saltzman and Stuart Campbell
The course develops a foundation in human physiology by examining the homeostasis of vital parameters within the body, and the biophysical properties of cells, tissues, and organs. Basic concepts in cell and membrane physiology are synthesized through exploring the function of skeletal, smooth, and cardiac muscle. The physical basis of blood flow, mechanisms of vascular exchange, cardiac performance, and regulation of overall circulatory function are discussed. Respiratory physiology explores the

mechanics of ventilation, gas diffusion, and acid-base balance. Renal physiology examines the formation and composition of urine and the regulation of electrolyte, fluid, and acid-base balance. Organs of the digestive system are discussed from the perspective of substrate metabolism and energy balance. Hormonal regulation is applied to metabolic control and to calcium, water, and electrolyte balance. The biology of nerve cells is addressed with emphasis on synaptic transmission and simple neuronal circuits within the central nervous system. The special senses are considered in the framework of sensory transduction. Weekly discussion sections provide a forum for in-depth exploration of topics. Graduate students evaluate research findings through literature review and weekly meetings with the instructor.

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

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

MCDB 561a / CB&B 561a / MB&B 561a / MBIO 561a / PHYS 561a, Introduction to Dynamical Systems in Biology Damon Clark, Kathryn Miller-Jensen, and Jonathon Howard

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MATLAB in a series of in-class hackathons that illustrate biological examples discussed in lectures.

MCDB 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / PHYS 562b, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or a 200-level biology course, or permission of the instructor.

MCDB 570b, Biotechnology Craig Crews, Ronald Breaker, Timothy Nelson, and Joseph Wolenski

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 Douglas Kankel

A two-credit course taken in the third-to-last term (typically the second term of the junior year). At the start of this course, each student forms a committee composed of the student's adviser and two faculty members that meets to discuss the research project. At the end of this course, students complete a detailed prospectus describing their thesis project and the work completed thus far. The committee evaluates an oral and written presentation of this prospectus; the evaluation determines whether the student may continue in the combined program. Required of students in the joint B.S./M.S. program with Yale College. 2 Course cr

MCDB 591a / ENAS 991a / MB&B 591a / PHYS 991a, Integrated Workshop

Corey O'Hern, Mark Gerstein, Scott Holley, Marcus Bosenberg, Madhusudhan Venkadesan, Michael Murrell, and Nikhil Malvankar

This required course for students in PEB involves hands-on laboratory modules with students working in pairs. A biology student is paired with a physics or engineering student; a computation/theory student is paired with an experimental student. The modules are devised so that a range of skills is acquired, and students learn from each other. Modules are hosted in faculty laboratories.

MCDB 595a and MCDB 596b, Intensive Research in MCDB for B.S./M.S. Candidates

Douglas Kankel

A four-credit, yearlong course (two credits each term) that is similar to MCDB 495/496 and is taken during the senior year. During this course, students give an oral presentation describing their work. At the end of the course, students are expected to present their work to the department in the form of a poster presentation. In addition, students are expected to give an oral thesis defense, followed by a comprehensive examination of the thesis conducted by the thesis committee. Upon successful completion of this examination, as well as other requirements, the student is awarded the combined B.S./M.S. degree. Required of students in the joint B.S./M.S. program with Yale College. 2 Course cr per term

MCDB 602a / CBIO 602a / MB&B 602a, Molecular Cell Biology Charles Lusk,

Michael Caplan, Nadya Dimitrova, Thomas Pollard, James Rothman, Valerie Horsley, Thomas Melia, Megan King, Martin Schwartz, Christopher Burd, and Josephina van Wolfswinkel

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 Charles Lusk, Michael Caplan, Nadya Dimitrova, Thomas Pollard, James Rothman, Valerie Horsley, Thomas Melia, Megan King, Martin Schwartz, and Christopher Burd

A graduate-level seminar in modern cell biology. The class is devoted to the reading and critical evaluation of classical and current papers. The topics are coordinated with the CBIO 602 lecture schedule. Thus, concurrent enrollment in CBIO 602 is required.

MCDB 625a / GENE 625a / MB&B 625a, Basic Concepts of Genetic Analysis Jun Lu

The universal principles of genetic analysis in eukaryotes are discussed in lectures. Students also read a small selection of primary papers illustrating the very best of genetic analysis and dissect them in detail in the discussion sections. While other Yale graduate molecular genetics courses emphasize molecular biology, this course focuses on the concepts and logic underlying modern genetic analysis.

MCDB 650a, Epigenetics Josephina van Wolfswinkel and Nadya Dimitrova

Study of epigenetic states and the various mechanisms of epigenetic regulation, including histone modification, DNA methylation, nuclear organization, and regulation by noncoding RNAs. 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, Stephen Dellaporta, and Josephina 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 677b / GENE 777b, Mechanisms of Development Zhaoxia Sun

An advanced course on mechanisms of animal development focusing on the genetic specification of cell organization and identity during embryogenesis and somatic differentiation. The use of evolutionarily conserved signaling pathways to carry out developmental decisions in a range of animals is highlighted. Course work includes student participation in critical analysis of primary literature and a research proposal term paper.

MCDB 720a / INP 720a, Neurobiology Haig Keshishian and Paul Forscher

Examination of the excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and intracellular mechanisms underlying the generation and control of behavior.

MCDB 743b / GENE 743b / MB&B 743b, Advanced Eukaryotic Molecular Biology Mark Hochstrasser and Wendy Gilbert

Selected topics in transcriptional control, regulation of chromatin structure, mRNA processing, mRNA stability, RNA interference, translation, protein degradation, DNA replication, DNA repair, site-specific DNA recombination, somatic hypermutation. Prerequisite: biochemistry or permission of the instructor.

MCDB 752b / CB&B 752b / CPSC 752b / MB&B 752b, Biomedical Data Science:**Mining and Modeling** Mark Gerstein

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, First-Year Introduction to Research – Grant**Writing and Scientific Communication** Valerie Horsley

Grant writing, scientific communication, and laboratory rotation talks for Molecular Cell Biology, Genetics, and Development track students.

MCDB 901b / CBIO 901b / GENE 901b, First-Year Introduction to Research – Ethics:**Scientific Integrity in Biomedical Research** Joerg Bewersdorf

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

MCDB 902a or b and MCDB 903b, Advanced Graduate Seminar Staff

The course allows students to hone their presentation skills through yearly presentation of their dissertation work. Two students each give thirty-minute presentations in each class session. Students are required to present every year beginning in their third year in the MCDB program. Each MCDB graduate student is expected to attend at least 80 percent of the class sessions. Two faculty members co-direct the course, attend the seminars, and provide feedback to the students.

MCDB 911a / CBIO 911a / GENE 911a, First Laboratory Rotation Valerie Horsley

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

MCDB 912a / CBIO 912a / GENE 912a, Second Laboratory Rotation Valerie Horsley

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

MCDB 913b / CBIO 913b / GENE 913b, Third Laboratory Rotation Valerie Horsley

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

James Hepokoski

Director of Graduate Studies

Richard Cohn (Stoeckel, 203.432.2986, dgs.music@yale.edu)

Professors Ardis Butterfield, Richard Cohn, Michael Friedmann (*Adjunct*), Daniel Harrison, James Hepokoski, Richard Lalli (*Adjunct*), Patrick McCreless, Ian Quinn, Gary Tomlinson, Michael Veal

Associate Professors Robert Holzer (*Adjunct*), Brian Kane, Gundula Kreuzer, Markus Rathey (*Adjunct*), Anna Zayaruznaya

Assistant Professor Henry Parkes

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 ADMISSIONS REQUIREMENTS

Previous training in music theory or music history is required. Samples of the applicant's previous work such as extended papers, advanced exercises, and analyses must be submitted. The GRE General Test is required by the Graduate School. Applicants whose native language is not English must take the Test of English as a Foreign Language (TOEFL).

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 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. PROGRAM: 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. 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 628a, Early Song Tradition in the Habsburg Spanish Empire Staff

This seminar explores the song tradition in the Hispanic world from the succession of the Catholic Monarchs through the reign of Charles II, the last Habsburg ruler of Spain—from approximately 1469 to 1700. Attention is given to manifestations of musical globalization and sources that reveal the circulation and transmission of Iberian musico-literary genres in the vast Spanish empire, including Portugal, Europe, the New World, and Asia. The course provides an introduction to the literary and musical sources of the Iberian song: from early poetic anthologies and songbooks, to villancicos' manuscripts, chapbooks, printed vihuela and guitar tutor books, Iberian songs in manuscripts and printed collections of neighboring countries, early anthologies, catalogs and library collections, music and poetic treatises, and songs in dramas, novels, and other literary genres by authors such as Miguel de Cervantes, Lope de Vega, or Sor Juana Inés de la Cruz. We also explore complex representations of Indians, African slaves, and Jewish *conversos* in relation to literary conventions and early modern ideas about religious devotion and racial difference. We approach these topics through a close engagement with materials in special collections and archives.

MUSI 697a, Proseminar: Ethnomusicology Michael Veal

A survey of the major works, topics, issues, and techniques of ethnomusicological research as it has developed over the past century. We consider the position of the field within the broader contexts of society and the academy and provide a bibliographic foundation for further work in the field.

MUSI 698b, Proseminar: Music Theory Daniel Harrison

A survey of the major works, topics, questions, and techniques of research in the field of music theory as it has developed over the past half-century. We consider the position of the field within the broader contexts of the academy and provide a bibliographic foundation for further work in the field.

MUSI 720a, History of Theory I Ian Quinn

A survey of the history of music theory from Greek antiquity to the Renaissance. Readings are drawn from Aristoxenos, the *Sectio canonis*, Ptolemy, Boethius, the *Musica enchiridiadis*, Guido of Arezzo, John of Garland, Franco of Cologne, Jehan de Murs, Marchetto of Padua, Philippe de Vitry, Tinctoris, Glarean, Gaffurius, and Zarlino. Topics include systems and scales, tuning, transmission, institutional sites, speculative and practical traditions, methodology, and the scientific status of music theory.

MUSI 812a or b, Directed Studies: Ethnomusicology Staff**MUSI 814a or b, Directed Studies: History of Music** Staff

By arrangement with faculty.

MUSI 837a / FILM 804a, Opera: Explorations of a Technical Medium Gundula Kreuzer

Opera has been assigned—and might yet assume—various roles in genealogies of technical media. This seminar explores both what media archaeology and other recent approaches in media studies and science and technology studies hold for an understanding of the nature of opera, and what opera might in turn contribute to a historically expanded perspective on modern and digital multimedia. In addition to such theoretical topics as the role of architecture, strategies of acoustic immersion, the development of illusionist devices, the orchestra as technology, and Wagner's theories, we examine the medial configurations in select operatic scenes and their renditions, from the illusionist picture-frame stage to present-day mobile or site-specific conceptions. Projects are tailored to students' interests and disciplines. Reading knowledge of Western musical notation is helpful but not required of students from outside the Music department.

MUSI 903b, The Voice Brian Kane

The seminar is intended as a general introduction to the emerging field of voice studies. Students develop an overview of the field and acquire familiarity with the central topics, problems, and thinkers about the voice, both historical and contemporary. In addition to weekly readings, writing assignments, and presentations, students are involved in the selection of topics and texts, depending on their interests. Special emphasis is placed on the interaction of voice studies with music, philosophy, and media studies.

MUSI 914a or b, Directed Studies: Theory of Music Staff

By arrangement with faculty.

MUSI 952b, Musical Meter Richard Cohn

Describing and representing musical meters and their relations; interpreting metric syntaxes in terms of musical “form.” Nineteenth-century central-European concert music (Beethoven, Schumann, Brahms, Dvorák); West African drumming; American minimalism, jazz, and EDM; if sufficient time, musics of south Asia and/or southeastern Europe.

MUSI 998a, Prospectus Workshop Ian Quinn**MUSI 999b, Dissertation Colloquium** Ian Quinn

Near Eastern Languages and Civilizations

Arnold Hall, 304 Elm Street, 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*), Shawkat Toorawa, Kevin van Bladel, Harvey Weiss

Senior Lecturer Kathryn Slanski

Lecturers Karen Foster, Christina Geisen, Agnete Lassen, Klaus Wagensonner

Senior Lector II Shiri Goren

Senior Lectors I Sarab al-Ani, Muhammad Aziz, Jonas Elbousty, Dina Roginsky,

Farkhondeh Shayesteh

Lectors Elham Alkasimi, Ozgen Felek, Selim Tiryakiol, 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.

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 full-year 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 three full years of course work: four yearlong courses or eight term courses per 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.

Of the twenty-four 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.

Advanced standing In exceptional cases, upon presenting evidence of successful completion of graduate courses at other universities or at Yale prior to their matriculation in the Ph.D. program, students with significant prior knowledge in their primary fields of study may apply for a waiver of up to eight courses toward the twenty-four required for candidacy. The faculty adviser and the DGS will normally present such applications to the faculty of the department, with a recommendation, no later than the end of the second year.

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, 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. For students who enter with advanced standing, the qualifying examination could be taken at the end of the second 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 Applicants who do not enroll in the Ph.D. program may pursue a Master of Arts degree. Students enrolled in the M.A. program should complete a minimum of twelve term courses with at least two term grades of Honors and an average of High Pass in the remaining courses, and will be required to submit a master's thesis no later than April 1 of the fourth term of study. No financial aid is available. Students enrolled in the Ph.D. program are also eligible for this degree by meeting the same requirements. Automatic petition for the M.A. degree is not available to students in Near Eastern Languages and Civilizations.

COURSES

AKKD 500a, Elementary Akkadian I Eckart Frahm

Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 501b, Elementary Akkadian II Eckart Frahm

Introduction to the language of ancient Babylonia and its cuneiform writing system, with exercises in reading, translation, and composition.

AKKD 510a, Akkadian Dialects Benjamin Foster

ARBC 500a, Elementary Modern Standard Arabic I Elham Alkasimi

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 Sarab Al Ani

A two-term course for students with previous background in Arabic. It is designed to improve proficiency in aural and written comprehension as well as in speaking and writing skills. The course aims to develop the following skills: reading to extract the gist as well as key details of written Modern Standard Arabic texts on a variety of academic, social, cultural, economic, and political topics; speaking with greater fluency and enhanced engagement in conversations on a variety of topics; mastering writing, easily forming and recognizing grammatically correct Arabic sentences. Prerequisite: ARBC 501 or successful completion of a placement test.

ARBC 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 Muhammad Aziz

Focus on improving the listening, writing, and speaking skills of students who already have a substantial background in the study of modern standard Arabic. Prerequisite: ARBC 503 or permission of the instructor.

ARBC 505b, Advanced Modern Standard Arabic II Muhammad Aziz

Focus on improving the listening, writing, and speaking skills of students who already have a substantial background in the study of modern standard Arabic. Prerequisite: ARBC 503 or permission of the instructor.

ARBC 509a, Intermediate Classical Arabic I 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 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 519a, Levantine Arabic Sarab Al Ani**ARBC 523a, Arabic Prose Narrative** Muhammad Aziz

Close reading of some of Naguib Mahfouz's novels. Attention to idiomatic expressions, structural patterns, literary analysis, and discussions. Students write a brief report on their weekly reading and discuss the main ideas of the assigned reading. Short midterm paper relevant to Mahfouz (to be discussed with the instructor) and a final paper. Prerequisite: ARBC 503 or permission of the instructor.

ARBC 530a, Arabic Seminar: Early Arabic Poetry Kevin Van Bladel

Study and interpretation of classical Arabic texts for advanced students. Prerequisite: ARBC 510 or permission of the instructor.

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 512b / RLST 658b, Egyptian Monastic Literature in Coptic Stephen Davis
Readings in the early Egyptian classics of Christian ascetism in Sahidic Coptic, including the Desert Fathers and Shenoute. Prerequisite: EGYP 510b or equivalent.

EGYP 514a / RLST 653a, Gnostic Texts in Coptic Harold Attridge
The course reads selected portions of important texts from the Nag Hammadi collection, including the Apocryphon of John, the Gospel of Thomas, the Gospel of Truth, Thunder, the Treatise on Resurrection, the Tripartite Tractate, as well as other noncanonical texts preserved in Coptic, including the Gospel of Mary and the Gospel of Judas. Prerequisite: EGYP 510 or equivalent.

EGYP 521b, The Wisdom of Ancient Egypt: Pharaonic Cultural Texts in Translation
Christina Geisen

Overview of the different text genres in ancient Egypt. Critical analysis of primary sources and their important role in the reconstruction of the history and cultural aspects of ancient Egyptian civilization.

EGYP 522a, Ancient Egyptian Hieratic Texts Christina Geisen
An introduction to the hieratic script mainly used for everyday documents. The course also considers Old and Late Egyptian texts.

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 578b, The Egyptian Netherworld Books John Darnell
Study of the Underworld texts from the royal tombs of the New Kingdom. Readings from the *Amduat*, the Book of Gates, the Book of Caverns, the Book of the Creation of the Solar Disk, the Book of the Day and the Night, the cryptographic Books of the Solar-Osirian Unity, the Book of the Heavenly Cow, and the Book of Nut. Discussions of the significance of these texts for understanding Egyptian religion, and the possible contributions of these compositions to the Hermetica and Christian Gnosticism.

EGYP 579a, 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 Orit Yeret
A two-term review and continuation of grammatical study leading to a deeper comprehension of style and usage. Focus on selected readings, writing, comprehension, and speaking skills. Prerequisite: HEBR 501 or equivalent.

HEBR 503b, Intermediate Modern Hebrew II 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 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 509b, Reading Academic Texts in Modern Hebrew Dina Roginsky

The course addresses the linguistic needs of English-speaking students who would like to be able to read with ease and accuracy contemporary Hebrew-language scholarship in the fields of Judaic studies, religious studies, history, political science, sociology, Near Eastern studies, and other related fields. Particularly, this course confronts reading comprehension problems through straightforward exposition of the grammar supported by examples from scholarly texts. Conducted in Hebrew. Prerequisite: two years of modern or biblical Hebrew, or permission of the instructor.

HEBR 511a, Elementary Biblical Hebrew Staff

A two-term introduction to Biblical Hebrew. Intensive instruction in grammar and vocabulary, supplemented by readings from the Bible. No prior knowledge of Hebrew required.

HEBR 512b, Intermediate Biblical Hebrew 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 516b, Israeli Popular Music Dina Roginsky

Changes in the development of popular music in Israel explored as representations of changing Israeli society and culture. The interaction of music and cultural identity; the role of modern popular music in representing, shaping, challenging, and criticizing social conventions; songs of commemoration and heroism; popular representation of the Holocaust; Mizrahi and Arab music; feminism, sexuality, and gender; class and musical consumption; criticism, protest, and globalization. Prerequisite: HEBR 502 or equivalent.

HEBR 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.

MESO 530a, Beginning Sumerian I Klaus Wagensohnner

A two-term introduction to the Sumerian language.

MESO 531b, Beginning Sumerian II Klaus Wagensohnner

A two-term introduction to the Sumerian language.

MESO 533a, Advanced Sumerian Benjamin Foster**NELC 508a, Ancient Painting and Mosaics** Karen Foster

Study of the major developments in wall painting, vase painting, and mosaics as seen in ancient Egypt, the Aegean Bronze Age, and the Greek, Etruscan, and Roman world.

NELC 509a / ARCG 744a, The Age of Akhenaton John Darnell

Study of the period of the Egyptian pharaoh Akhenaton (reigned 1353–1336 B.C.E.), often termed the Amarna Revolution, from historical, literary, religious, artistic, and archaeological perspectives. Consideration of the wider Egyptian, ancient Near Eastern, African, and Mediterranean contexts. Examination of the international diplomacy, solar theology, and artistic developments of the period. Reading of primary source material in translation.

NELC 519b, Religion and Politics in the Ancient Near East Kevin Van Bladel

Survey of interaction between religion and politics in ancient Mesopotamia, compared to Egypt and Israel. Topics include divine kingship and royal rituals, religious justification of war, the politics of religious icons, politics and scholarship, political dimensions of myths, religious reforms, and the invention of monotheism as a response to empire.

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 529a, Seals and Sealing in the Ancient Near East Agnete Lassen

The course investigates seals and seal use in Mesopotamia and surrounding areas from the earliest impressions in the Neolithic to the Neo-Babylonian period. The teaching will take the form of a research seminar with active student participation and will be based on the extensive glyptic material in the Yale Babylonian Collection.

NELC 533b / ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HIST 502b / HSAR 564b / JDST 653b / RLST 803b, Sensory Experiences in Ancient Ritual
Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

NELC 537b / ANTH 692b / ARCG 692b, Imaging Ancient Worlds Roderick McIntosh, John Darnell, and Agnete Lassen

The interpretation of epigraphic and archaeological material within the broader context of landscape, by means of creating a virtual model to reconstruct the sensory experiences of the ancient peoples who created the sites. Use of new technologies in computer graphics, including 3-D imaging, to support current research in archaeology and anthropology.

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 588b / ANTH 773b / ARCG 773b, Abrupt Climate Change and Societal Collapse

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 589b / ANTH 763b / ARCG 763b, Archaeologies of Empire Harvey Weiss

Comparative study of origins, structures, efficiencies, and limitations of imperialism, ancient and modern, in the Old and New World, from Akkad to “Indochine,” and from Wari to Aztec. The contrast between ancient and modern imperialisms examined from the perspectives of nineteenth- and twentieth-century archaeology and political economy.

NELC 605a, Global Environmental History Harvey Weiss**NELC 606a, Agriculture: Origins, Evolution, Crises** Harvey Weiss

Analysis of the societal and environmental drivers and effects of plant and animal domestication, the intensification of agroproduction, and the crises of agroproduction: land degradation, societal collapses, sociopolitical transformation, sustainability, and biodiversity.

NELC 611a / ARCG 611a / CLSS 811a / RLST 833a, The Ancient Egyptian Temple as Cosmos: Correlation of Architecture and Decoration Program Christina Geisen

The course focuses on the correlation of archaeology, iconography, and philology by analyzing ancient Egyptian temples under the specific consideration of the interplay of architecture and decoration program. The different types of temples and their developments over time are discussed. The main focus is the function of each temple type, which can only be understood by analyzing the architecture of the monument, its decoration program, related texts (such as rituals, myths, and festival description, but also historical texts), and its place in the cultic landscape of the specific location. The class also provides an overview of rituals performed and festivals celebrated in the temples, as well as of the administrative sphere of the temple. Optional field trip to the Metropolitan Museum of Art in New York to see the Temple of Dendur. No previous knowledge of ancient Egyptian culture or languages is necessary; all texts are read in translation.

NELC 701a / JDST 736a / RLST 746a, Midrash Seminar: The Revelation at Sinai
Steven Fraade

The giving of the Torah to Israel as seen through rabbinic eyes. Close readings of midrashic texts. Views of revelation, tradition, interpretation, law, and commandment in their literary and historical contexts. Interpretations and interpretive strategies compared and contrasted with those of other ancient biblical exegetes (Jewish and non-Jewish). Prerequisite: reading fluency in ancient Hebrew.

NELC 702a / JDST 727a / RLST 752a, Mishnah Seminar: Tractate Ta'anit on Fasting

Steven Fraade

Close study of a section of the Mishnah, the earliest digest of Jewish law, treating procedures for public fasts in response to drought and other forms of collective adversity. Particular attention to the textual practices of rabbinic legal discourse in relation to its social function, and to the interplay of law and narrative. Prerequisite: reading fluency in ancient Hebrew.

NELC 703b / JDST 721b / RLST 751b, Introduction to Judaism in the Ancient World:**From Temple to Talmud** Steven Fraade

The emergence of classical Judaism in its historical setting. Jews and Hellenization; varieties of early Judaism; apocalyptic and postapocalyptic responses to suffering and catastrophe; worship and atonement without sacrificial cult; interpretations of scriptures; law and life; the rabbi; the synagogue; faith in reason; Sabbath and festivals; history and its redemption.

NELC 768b, 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 C.E.) and the state of research on the topic.

NELC 829b, 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.

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 561b, Persian Culture and Media Farkhondeh Shayesteh

Advanced study of Persian grammar, vocabulary, and culture through the use of authentic Persian media. Examination of daily media reports on cultural, political, historical, and sporting events in Iran, Afghanistan, Tajikistan, and other Persian-

speaking regions. Designed for nonnative speakers. Prerequisite: PERS 140 or permission of instructor.

Neuroscience

Sterling Hall of Medicine C303, 203.785.4323

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

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

Starting in the 2019–2020 academic year, graduate degrees will no longer be offered through the Department of Neuroscience graduate program. Instead, all students interested in pursuing a graduate degree in neuroscience should enter through the Interdepartmental Neuroscience Program (INP), which will continue to offer graduate degrees in neuroscience for all interested Yale graduate students. See INP for information on admissions requirements and process.

Nursing

400 West Campus Drive, 203.785.2389
<http://nursing.yale.edu/academics/doctor-philosophy-phd>
 M.Phil., Ph.D.

Dean

Ann Kurth

Director of Graduate Studies

David Vlahov (203.785.3554, david.vlahov@yale.edu)

Professors Jane Dixon, Marjorie Funk, Margaret Grey, Holly Kennedy, M. Tish Knobf, Ann Kurth, Ruth McCorkle, Linda Pellico, Carmen Portillo, Nancy Redeker, Lois Sadler, David Vlahov, Robin Whittemore

Associate Professors Joanne Iennaco, Joan Kearney, Mark Lazenby, Soohyun Nam, Julie Womack

FIELDS OF STUDY

Fields include chronic illness (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 vulnerable populations; acute and critical care; end-of-life and palliative care; genetic and environmental influences on health; gerontology and long-term care; and school- and community-based interventions.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants should have a master's degree in nursing, or the equivalent, including previous course work in statistics and graduate-level course work in research methods. The Graduate Record Examination (GRE) General Test is required. The Test of English as a Foreign Language (TOEFL) is required of all applicants for whom English is a second language. Samples of written work (e.g., published article, thesis, literature review) and a curriculum vitae are required. Qualified applicants will be invited for an interview with a member of the doctoral faculty.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Course Work

Completion of fourteen 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 for years 1–4 is also required. The required core courses are: NURS 901, Research Methods I: Quantitative Methods for Health Research; NURS 902, Research Methods II: Qualitative Methods for Health Research; NURS 903, Research Methods III: Measurement of Health Variables; NURS 904, Research Methods IV: Mixed Methods; NURS 905, Research Methods V: Intervention Development; NURS 908, Science, Scholarship, and Communication of Knowledge I; NURS 909, Science, Scholarship, and Communication of Knowledge II; NURS 910, Science, Scholarship, and Communication of Knowledge III; NURS 911, Science, Scholarship, and Communication of Knowledge IV; NURS 912, Foundations of

Scientific Inquiry I: Theoretical Basis for Nursing Science; NURS 913, Foundations of Scientific Inquiry II: Biopsychosocial Theories of Health; Symptom Management; Self-Management; NURS 917, Advanced Statistics for Clinical Nursing Research; NURS 929, Ethical Conduct of Clinical Research; and NURS 941, Health Policy, Leadership, and Systems.

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, Ethical Conduct of Clinical 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.

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 larger 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.

M.S.N./PH.D. JOINT-DEGREE PROGRAM

The joint-degree program combines the two-year M.S.N. degree from the School of Nursing and the five-year Ph.D. in Nursing. The joint program allows students to complete requirements for both degrees in five years. Applicants for admission to the joint program must be admitted to both schools. Students typically enter the joint program at matriculation, but M.S.N. students who are completing the Research Concentration may apply to the Ph.D. program while enrolled in the fall of year two of the M.S.N. degree. Students will be assigned a Ph.D. adviser upon enrollment in the joint program; the adviser will work closely with the student to determine a plan of study, course selection (aligned with the student's research interests), and the development of research ideas. The first two years of the program are spent in the School of Nursing, completing all requirements for the M.S.N. degree. In the second year, students will complete the Research Concentration, which provides mentored research experience and the development of a research proposal. The M.S.N. Research Concentration will fulfill one half of the first-term Research Assistantship in the Ph.D. program. Students are eligible to take Graduate School courses while enrolled at the School of Nursing, with up to three courses counting toward both degrees. Students may have the opportunity to undertake additional mentored research experiences in the summers following years one and two, including research assistantship hours.

The minimum residence requirement in the program is five years. The tuition requirement is two years in the School of Nursing, and three years in the Graduate School. Financial aid is awarded by each school according to its own criteria. While enrolled at the School of Nursing, students are eligible to compete for financial aid available to master's students, but are not eligible for Graduate School aid. Once they have completed the M.S.N. degree and are enrolled in the Graduate School in year three, students in the joint-degree program receive a full doctoral financial aid package, including up to three years of tuition, stipend, and a Health Award to cover the cost of Yale Health Hospitalization/Specialty Coverage. Students are expected to complete the joint-degree program within five years.

The M.S.N. and Ph.D. degrees are awarded separately, upon completion of the M.S.N. requirements (at the end of the second year of study in the M.S.N. program by the School of Nursing), and upon completion of the requirements for the Ph.D. by the Graduate School of Arts and Sciences. To qualify for the M.S.N. and Ph.D. degrees, students must satisfy all degree requirements of both schools. Any exception to this pattern of study must be approved by the DGS and the appropriate associate dean.

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, <http://nursing.yale.edu>.

REQUIRED COURSES

All Ph.D. students are required to take the following courses. Not all required courses are offered every year; only courses offered in 2018–2019 are listed below. For a complete list of Nursing courses, see the School of Nursing bulletin, online at <http://bulletin.yale.edu>; and Yale Course Search at <https://courses.yale.edu>.

NURS 901a, Research Methods I: Quantitative Methods for Health Research Jane Dixon

This course in research methods provides an opportunity to evaluate various scientific designs for investigating problems of importance to nursing and health, with a focus on quantitative research methods. Emphasis is placed on the interrelationships of the research question and study aims with study design and method—with the goal of understanding methods decisions that are made by researchers, and how these decisions influence study validity. The Yale Model for Generation of Knowledge for Evidence-Based Practice is introduced. The course prepares the student for designing a quantitative study. Required of all Ph.D. students in nursing. Open to master's students with permission of the instructor. Three hours per week.

NURS 902b, Research Methods II: Qualitative Methods for Health Research Staff

This course introduces the student 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 904a, Research Methods IV: Mixed Methods Mary Knobf

The purpose of this course is to provide an overview of mixed methods research. This overview consists of the history, philosophical foundations, purpose, data collection, analysis, and evaluation of the common mixed methods designs. Required of all Ph.D. students in nursing. Three hours per week for seven weeks.

NURS 906a, Dissertation Seminar I Margaret Grey

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 Margaret Grey

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 908a, Science, Scholarship, and Communication of Knowledge I Nancy Redeker

This is the first course in a four-course sequence designed to socialize the student into the roles and responsibilities of a Ph.D.-prepared nurse scientist. Students develop specific beginning competencies necessary to engage in a career as an independent nurse scientist, including basic principles and processes of scientific writing and communication, and research priorities and strategies for building a program of research. The NURS 908, 909, 910, 911 seminar series accompanies the research practicum and is required of all Ph.D. students in nursing. One hour every other week.

NURS 909b, Science, Scholarship, and Communication of Knowledge II Nancy Redeker

This is the second course in a four-course sequence designed to socialize the student into the roles and responsibilities of a Ph.D.-prepared nurse scientist. Students develop specific beginning competencies necessary to engage in a career as an independent nurse scientist, including basic principles and processes of grant writing and communicating research results. The NURS 908, 909, 910, 911 seminar series accompanies the research practicum and is required of all Ph.D. students in nursing. One hour every other week.

NURS 912a, Foundations of Scientific Inquiry I: Philosophical and Theoretical Basis for Nursing Science Mark Lazenby and Robin Whitemore

In this course students examine the nature of the philosophical and theoretical basis for nursing science. The nature of science is explored through a dialogue of competing philosophical perspectives, such as logical positivism, post-positivism, historicism, critical theory, and post-structuralism. The philosophies that have informed the scientific process and the conceptual and theoretical underpinnings of nursing science are discussed. Specific approaches to concept/theory development and analysis, with linkages to philosophical perspectives, are examined. Required of all Ph.D. students in nursing. Three hours per week.

NURS 913b, Foundations of Scientific Inquiry II: Theories of Health, Symptom Management, and Self-Management Dena Schulman-Green

This course examines major conceptualizations of health and illness, self- and family management, and research supporting these conceptualizations. Emphasis is placed on the link between health and illness self-management, with particular emphasis on vulnerable populations, and related concepts such as symptom distress, self-efficacy and coping, and the contributions of risk and protective factors to self-management. Self-management is considered from both an individual and family perspective, and sociocultural influences on self-management are explored. Required of all Ph.D. students in nursing. Three hours per week.

NURS 917b, Advanced Statistics for Clinical Nursing Research Margaret Holland

This term-long course starts with linear regression and advances to additional multivariate analyses most commonly used in nursing studies. The emphasis is on attaining a conceptual understanding of these statistical techniques, selecting appropriate techniques for a given clinical research problem, conducting computer-assisted data analyses, and correctly expressing the results of such analyses. The

laboratory part of the course covers fundamentals of data management and statistical analysis, and proceeds to the conduct of advanced analyses. The course emphasizes using programming language in SAS®. Required of all Ph.D. students in nursing; open to master's students with permission of the instructor. Four hours per week (two hours seminar, two hours lab).

NURS 929b, Ethical Conduct of Clinical Research Lois Sadler

The course introduces 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 Ph.D. students in nursing. Open to others with permission of the instructor. One hour per week.

NURS 941a, Health Policy, Leadership, and Systems Margaret Holland and Lisa Summers

The course addresses salient issues in health policy and the challenges to linking research and clinical care with public and private policy agendas. The course covers the following topics: health care delivery systems; policy and political factors that affect access to care and its financing, delivery, and quality; challenges to evidence-based policy and the dissemination of research findings to policy and community-based leaders. It also includes theories of leadership and policy change relevant to students' research topics. Critical thinking, problem-solving skills, and research-based analysis are integrated throughout the course. A major written assignment suitable for submission to a peer-reviewed journal (or that can be easily modified for same) is a course requirement. Prerequisite: students must pass a test based on the online Yale University School of Nursing Health Policy Module. Required of all Ph.D. students in nursing. Three hours per week.

ELECTIVES

NURS 920a, Doctoral Independent Study Staff

This elective is initiated by the student and negotiated with faculty. The purpose is to allow in-depth pursuit of individual areas of interest and/or practice. A written proposal must be submitted and signed by the student, the faculty member(s), and the program chairperson.

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, Jack Cooper (*Emeritus*), Priscilla Dannies (*Emerita*), Barbara Ehrlich, Jonathan Ellman, James Howe (*Emeritus*), 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, Daryl Klein, Yansheng Liu, Bryce Nelson

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.

SPECIAL ADMISSIONS REQUIREMENTS

A bachelor's degree in biology, chemistry, or another science is required. Undergraduate courses should include biology, organic chemistry, physics, and calculus. GRE scores are required; a GRE Subject Test, preferably in Biology or Chemistry, is recommended.

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), <http://bbs.yale.edu>. Most students interested in a Ph.D. in Pharmacology apply through the Molecular Medicine, Pharmacology, and Physiology track or the Biochemistry, Quantitative Biology, Biophysics, and Structural Biology 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 the core graduate pharmacology course (PHAR 504) and the two terms of the graduate seminar course (PHAR 502) or equivalent from another department. The other courses will be selected based on each student's interest but must include at least two of three other courses: PHAR 528, PHAR 529, and PHAR 550; PHAR 560 may be substituted for PHAR 550. Students are required to do three laboratory rotations. The Graduate School requires a grade of Honors for a minimum of two courses. Honors for seminar courses or rotations cannot be used toward this requirement. Students must meet the Honors requirement prior to

being admitted to candidacy. Students must also maintain an overall High Pass average. A grade of Honors or High Pass is required for PHAR 504. 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, two lectures from PHAR 580 and one lecture from 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 502a / C&MP 630a / PATH 680a, Seminar in Molecular Medicine,

Pharmacology, and Physiology Don Nguyen

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

PHAR 504a, Principles of Pharmacology Elias Lolis

This course covers the molecular mechanisms of therapeutics, which are presented in a conceptual framework to increase understanding but decrease memorization. Topics include (but are not limited to) receptor affinity, efficacy, multiple equilibria, pharmacokinetics, and toxicity; enzyme kinetics and inhibition, drug discovery and design; molecular basis of antimicrobial therapy, cardiology drugs, anticancer and antiviral therapies; and therapeutics for inflammatory disorders, asthma, and allergy.

PHAR 528a, Principles of Signal Transduction Anton Bennett

The regulation of intracellular signaling is of fundamental importance to the understanding of cell function and regulation. This course introduces the broad principles of intracellular signal transduction. More detailed lectures on specific intracellular signaling pathways are given in which students learn both the basic and most recent and cutting-edge concepts of intracellular signaling. Topics include regulation of signaling by protein phosphorylation, small G proteins, G-protein-coupled receptors, hormones, phospholipids, adhesion, and gasses.

PHAR 529b, Structural Biology and Drug Discovery Ya Ha and Titus Boggon

A comprehensive introduction to the concepts and practical uses of structural biology and structural biology-related techniques in drug discovery. The first half of the course focuses on techniques used to discover and optimize small and macromolecule drugs. Students are introduced to topics such as small molecule lead discovery, X-ray crystallography, cryo-electron microscopy, and biophysical techniques. The first half of the course also includes a practical component where students conduct hands-on structural biology experiments and learn about biophysical techniques in a laboratory setting. The second half of the course focuses on drug discovery, particularly for protein kinases. It includes a field trip to the Yale Center for Drug Discovery, where the students are introduced to the in-house Yale screening facilities for small molecule drug discovery. Two half-credit courses—PHAR 530 and PHAR 531—are also offered for the two halves of PHAR 529.

PHAR 530b, Targeted Use of Structural Biology in Drug Discovery Ya Ha and Titus Boggon

This 0.5-credit course, the second half of PHAR 529, begins in February. The goal of the course is to show students how concepts of structural biology are applied to areas of great importance in pharmacology such as protein kinases, proteases, cell surface receptors, integrins and other membrane-bound enzymes, and transporters and channels, and how these concepts facilitate drug development. ½ Course cr

PHAR 531b, Concepts of Structural Pharmacology Ya Ha and Titus Boggon

This 0.5-credit course, the first half of PHAR 529, introduces students to the concepts of structural biology and provides the background for how these concepts are applied to areas of great importance in pharmacology and how they facilitate drug development.

½ Course cr

PHAR 550a / C&MP 550a / ENAS 550a / MCDB 550a, Physiological Systems Mark Saltzman and Stuart Campbell

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

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

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.

Chair

Verity Harte

Director of Graduate Studies

Zoltán Szabó (C301, 203.432.1669, zoltan.szabo@yale.edu)

Professors Seyla Benhabib, 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

Assistant Professors Robin Dembroff, Daniel Greco, Elizabeth Miller, John Pittard

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 towards 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 teach in the third, fourth, and sixth years.
5. In addition to the twelve required philosophy courses, before the dissertation defense students must take at least one class that is not listed in philosophy on a subject that is relevant to their research.
6. The dissertation is expected to be submitted in the end of the fifth to sixth year.

CLASSICS AND PHILOSOPHY COMBINED PH.D. PROGRAM

The Classics and Philosophy Program is a combined program, offered by the Departments of Classics and Philosophy at Yale, for students wishing to pursue graduate study in ancient philosophy. Suitably qualified students may apply for entry to the program either through the Classics department for the Classics track or through the Philosophy department for the Philosophy track.

Applicants for the Classics track of the combined program must satisfy the general requirements for admission to the Classics graduate program, in addition to the requirements of the Classics track of the combined program. Details of the Classics track of the program are available online at <https://classics.yale.edu/research/ancient-philosophy/classics-and-philosophy-joint-program>.

Applicants for the Philosophy track of the combined program must satisfy the general requirements for admission to the Philosophy graduate program, in addition to the requirements of the Philosophy track of the combined program. Details of the Philosophy track of the program are available online at <http://philosophy.yale.edu/graduate-program/classics-and-philosophy-program>.

The combined program is overseen by an interdepartmental committee currently consisting of Verity Harte, David Charles, and Brad Inwood together with the director of graduate studies (DGS) for Classics and the DGS for Philosophy.

PHILOSOPHY AND PSYCHOLOGY COMBINED PH.D. PROGRAM

The Philosophy and Psychology Program is a combined program, offered by the Departments of Philosophy and Psychology at Yale. Students enrolled in the program complete a series of courses in each discipline as well as an interdisciplinary dissertation that falls at the intersection of the two. On completing these requirements, students are awarded a Ph.D. either in Philosophy and Psychology, or in Psychology and Philosophy.

Students can be admitted into the combined program either through the Psychology department or through the Philosophy department. Students must be accepted into one of these departments (the “home department”) through the standard admissions process, and both departments must then agree to accept the student into the combined program.

Students can be accepted into the combined program either (a) at the time they initially apply for admission to their home department, or (b) after having already completed some course work within the home department. In either case, students must be accepted into the combined program by each department.

Students in the combined program complete two-thirds of the course requirements of each of the two disciplines, then write a qualifying paper and a dissertation that are fully interdisciplinary. For more details about the program requirements, see <http://philosophy.yale.edu/graduate-program/philosophy-and-psychology-combined-phd-program>.

MASTER'S 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 602a / CPLT 699a / GMAN 603a, Heidegger's *Being and Time* Martin Hägglund

A systematic, chapter-by-chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy of the twentieth century. All the major themes of the book are addressed in detail, with a particular emphasis on care, time, death, and the meaning of being.

PHIL 604b, Leibniz Michael Della Rocca

A close examination of Leibniz's vast, intricate, and still poorly understood philosophical system. Topics to be explored include substance, necessity, freedom, psychology, teleology, and the problem of evil. Attention to relevant philosophical and theological antecedents, including Spinoza, Descartes, Suarez, Aquinas, and Aristotle. Attention also to Leibniz's relevance to contemporary philosophy.

PHIL 626b, Cognitive Science of Morality Joshua Knobe

Introduction to the emerging field of moral cognition. Focus on questions about the philosophical significance of psychological findings. Topics include the role of emotion in moral judgment; the significance of character traits in virtue ethics and personality psychology; the reliability of intuitions and the psychological processes that underlie them.

PHIL 627b, Computability and Logic Sun-Joo Shin

A technical exposition of Gödel's first and second incompleteness theorems and of some of their main consequences in proof theory and model theory, such as Löb's theorem, Tarski's undefinability of truth, provability logic, and nonstandard models of arithmetic.

PHIL 637b, Philosophy of Mathematics Sun-Joo Shin

Metaphysical and epistemological issues raised by mathematics. Questions concerning the notion of a set; whether one can quantify over absolutely everything; whether there are really infinite sets of different sizes; the significance of Gödel's incompleteness theorems; arguments designed to show that certain mathematical terms are referentially indeterminate.

PHIL 638a, Philosophy of Logic Sun-Joo Shin

Exploration of valid reasoning, mainly in the context of propositional and predicate logic. Topics include the well-known debate on the justification of *modus ponens*; Tarski's analysis of logic consequence; and the relatively recent and provocative claim

(made by Etchemendy) that Tarski's analysis of logical consequence fails in capturing ordinary and intuitive concept of logical consequence.

PHIL 641b, Reductionism Elizabeth Miller

An exploration of some reductive approaches in contemporary metaphysics and philosophy of science and some challenges to the reductive project. Is there a deep sense in which all the complexity of reality reduces to some more limited class of fundamental features?

PHIL 643a, Philosophy of Quantum Mechanics Elizabeth Miller

An examination of a wide range of philosophical issues as informed by quantum mechanics. Evaluation of different, and controversial, interpretations of quantum mechanics and their distinct ontologies. Subtopics include the measurement problem, nonlocality and holism, wave function realism, and the relationship between physics and metaphysics.

PHIL 650a, The Problem of Evil Keith DeRose

The evils of our world can seem to present strong reasons for disbelieving in the existence of God. This course examines the main forms that this problem for theism takes, and some of the proposed ways of solving, or at least mitigating, the problem.

PHIL 655a, Normative Ethics Shelly Kagan

A systematic examination of normative ethics, the part of moral philosophy that attempts to articulate and defend the basic principles of morality. The bulk of the course surveys and explores some of the main normative factors relevant in determining the moral status of a given act or policy (features that help make a given act right or wrong). Brief consideration of some of the main views about the foundations of normative ethics (the ultimate basis or ground for the various moral principles).

PHIL 664b, Justice, Taxes, and Global Financial Integrity Thomas Pogge

This seminar studies the formulation, interpretation, and enforcement of national and international tax rules from the perspective of national and global economic justice.

PHIL 665a, 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 674a / PLSC 580a, Borders, Culture, and Citizenship Seyla Benhabib

The contemporary refugee crisis in Europe and elsewhere; new patterns of migration, increasing demands for multicultural rights on the part of Muslim minorities in the West, and transnational effects of globalization faced by contemporary societies. This course examines these issues in a multidisciplinary perspective in the light of political theories of citizenship and migration, and laws concerning refugees and migrants in Europe and the United States.

PHIL 677a / WGSS 677a, Feminist Philosophy: Theories of Sex, Gender, and Sexual Orientation Robin Dembroff

This course surveys several feminist frameworks for thinking about sex, gender, and sexual orientation. We consider questions such as: Is there a tenable distinction between sex and gender? Between gender and sexual orientation? What does it mean to say that gender is a social construction, or that sexual orientation is innate? What is the place of politics in gender and sexual identities? How do these identities—and

especially resistant or transgressive identities – impact the creation and revision of social categories?

PHIL 679b, Contemporary Deontology Shelly Kagan

Most people are intuitively drawn to *deontological* moral theories rather than consequentialist ones (roughly, to theories that give priority to moral factors other than simply the potential goodness of results). In this course we read and evaluate three major contemporary works exploring this deontological perspective in a systematic way: Judith Thomson's *The Realm of Rights*, T.M. Scanlon's *What We Owe to Each Other*, and (parts of) F.M. Kamm's *Intricate Ethics*. Our goal throughout is to investigate the complications involved in moving beyond the initial pull toward deontology to spelling out such a deontological theory in fuller detail (whether at the normative or at the foundational level).

PHIL 685b, Wittgenstein Kenneth Winkler

Study and discussion of Wittgenstein's *Tractatus Logico-Philosophicus*, *Philosophical Investigations*, and *On Certainty*, with some attention to their background in writings by Frege, Russell, and Moore. Consideration of Wittgenstein's influence on more recent philosophers, among them Iris Murdoch, Elizabeth Anscombe, Saul Kripke, and Cora Diamond. Prerequisite: permission of the instructor.

PHIL 686a, Kant's Critique of Judgment Staff

In-depth study of Kant's third and final critique, one of the major works of modern philosophy, containing both the foundation of modern aesthetics and a critical reformulation of natural teleology. Discussions address both parts and their enigmatic unity; highlight the relation of nature and freedom, mechanism and teleology, theoretical and practical cognition at the heart of the book; and include post-Kantian thought (German Idealism, twentieth-century continental philosophy) that only became possible through Kant's third critique. Prerequisite: some familiarity with Kant's critical project.

PHIL 700a, Kant's Philosophy of Religion John Hare

This course looks at Kant's writings in the philosophy of religion and moral theology from the *Critique of Pure Reason* to the *Conflict of the Faculties*.

PHIL 705a, First-Year Seminar Keith DeRose

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 719a, Faith and the Will John Pittard

An investigation of questions concerning the nature of religious faith, the relationship of faith to the will and to desire, and the merits of various prudential, moral, and existential arguments for and against religious faith. Questions to be treated include: Is faith in some sense "meritorious" (to use Aquinas's language)? Do the commitments of faith essentially involve believing propositions? Can belief be voluntary? Can trust or hope be voluntary? Should we hold religious beliefs to the same epistemic standards that apply to more mundane beliefs? Or should we persist in faith even if these beliefs do not meet conventional rational standards? We explore these questions through writings by Aquinas, Pascal, Kierkegaard, Nietzsche, James, Freud, Wittgenstein, and various contemporary philosophers.

PHIL 731b, Theological Predications 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 734a / GMAN 651a / PLSC 583a, Contemporary Critical Theory Seyla Benhabib

An examination of the themes of statelessness, migration, and exile in the works of Arendt, Benjamin, Adorno, Shklar, and Berlin.

PHIL 741a / CLSS 886a, What Is Aristotelian Hylomorphism? David Charles

The aim of the seminar is to examine the extent to which Aristotle's version of hylomorphism as applied to psychological phenomena (such as the emotions, desire, perception, and thought) was modified and criticized by later philosophers. We assess the hypothesis that Aristotle's discussion of these issues was substantially modified by later philosophers and commentators in such a way as to set up (1) contemporary versions of hylomorphism and (2) the mind/body problem as formulated by Descartes.

PHIL 746b / CLSS 887b, Cicero and Ancient Ethics: The Dialogue *On Moral Ends* (*De finibus bonorum et malorum*) Brad Inwood

Cicero's most important and influential work on moral philosophy is the dialogue *On Moral Ends* (*De finibus bonorum et malorum*). Written within the general framework of eudaimonism, the dialogue expounds on and criticizes the ethical theory of three contemporary schools: Epicurean, Stoic, and Peripatetic. *On Moral Ends* presents important debates in ethics, gives us extensive evidence for Hellenistic philosophy in general, and had significant influence on moral theory in the early modern period. We read the entire dialogue, with more emphasis on the Stoic (books 3–4) and Peripatetic (book 5) debates than on the Epicurean (books 1–2). In class we work predominantly from the translation by Raphael Woolf, but Latin readers are expected to read key parts of the dialogue in Latin as well; there will be a separate meeting for discussion of issues that arise from the Latin text. Prerequisite: graduate enrollment in Philosophy or Classics, or permission of the instructor.

PHIL 748b / CLSS 865b, Plato's *Theaetetus* Verity Harte and David Charles

The class reads and discusses the Greek text of Plato's *Theaetetus*, a central work of Plato's philosophy and an important work in the history of philosophy. Focused on the nature of knowledge, the dialogue is notable for a series of arguments involving central notions of Plato's philosophy: knowledge, definition, perception, false judgment. The class is a core course for the combined Ph.D. program in Classics and Philosophy. The course is 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 750a or b, Tutorial Staff

By arrangement with faculty.

PHIL 755a / HIST 759a, Conservatism: Seminar Samuel Moyn, Scott Shapiro, and Ross Douthat

This seminar examines conservatism's origins as a body of theory; turns to the trajectory of American conservatism since World War II, focusing on both intellectual

history and popular mobilization; and concludes with a survey of versions of conservatism prominent in contemporary legal scholarship.

Physics

35 Sloane Physics Laboratory, 203.432.3607

<http://physics.yale.edu>

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

Chair

Paul Tipton

Director of Graduate Studies

Nikhil Padmanabhan [F] (graduatephysics@yale.edu)

Sean Barrett [Sp] (SPL 24, 203.432.6928, graduatephysics@yale.edu)

Professors Robert Adair (*Emeritus*), Charles Ahn (*Applied Physics*), Yoram Alhassid, Thomas Appelquist, Charles Bailyn (*Astronomy*), O. Keith Baker, Charles Baltay, Sean Barrett, Hui Cao (*Applied Physics*), Richard Casten (*Emeritus*), Flavio Cavanna (*Adjunct*), Paolo Coppi (*Astronomy*), David DeMille, Michel Devoret (*Applied Physics*), Frank Firk (*Emeritus*), Debra Fischer (*Astronomy*), Bonnie Fleming, Marla Geha (*Astronomy*), Steven Girvin, Leonid Glazman, Jack Harris, John Harris, Karsten Heeger, Jay Hirshfield (*Adjunct*), Jonathon Howard (*Molecular Biophysics & Biochemistry*), Francesco Iachello (*Emeritus*), Sohrab Ismaill-Beigi (*Applied Physics*), Steve Lamoreaux, Samuel MacDowell (*Emeritus*), 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, Jack Sandweiss (*Emeritus*), Peter Schiffer (*Applied Physics*), Robert Schoelkopf (*Applied Physics*), Ramamurti Shankar, Witold Skiba, Charles Sommerfield (*Emeritus*), A. Douglas Stone (*Applied Physics*), Hong Tang (*Electrical Engineering*), Paul Tipton, Thomas Ullrich (*Adjunct*), C. Megan Urry, Pieter van Dokkum (*Astronomy*), John Wettlaufer (*Geology & Geophysics*), Robert Wheeler (*Emeritus*), Werner Wolf (*Emeritus*), Michael Zeller (*Emeritus*)

Associate Professors Murat Acar (*Molecular, Cellular, & Developmental Biology*), Helen Caines, Damon Clark (*Molecular, Cellular, & Developmental Biology*), Sarah Demers, Thierry Emonet (*Molecular, Cellular, & Developmental Biology*), Walter Goldberger, Liang Jiang (*Applied Physics*), Reina Maruyama, Daisuke Nagai, Nikhil Padmanabhan, David Poland, Peter Rakich (*Applied Physics*)

Assistant Professors Eric Brown (*Mechanical Engineering & Materials Science*), Meng Cheng, Benjamin Machta, David Moore, John Murray (*Psychiatry*), Michael Murrell (*Biomedical Engineering*), Nir Navon, Laura Newburgh

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; Geology and Geophysics; Molecular Biophysics and Biochemistry; and Molecular, Cellular, and Developmental Biology.

SPECIAL ADMISSIONS REQUIREMENTS

The prerequisites for work toward a Ph.D. degree in physics include a sound undergraduate training in physics and a good mathematical background. The GRE General Test and the Subject Test in Physics are required.

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 six term courses: five foundational courses and one elective. The five core courses (1. PHYS 500, Advanced Classical Mechanics; 2. PHYS 508, Quantum Mechanics I; 3. PHYS 502, Electromagnetic Theory I; 4. PHYS 512, Statistical Physics I; and 5. PHYS 608, Quantum Mechanics II) serve to complete the student's undergraduate training in classical and quantum physics. For the sixth 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 DGS. In addition, all students are required to engage in a research project by taking PHYS 990, Special Investigations. In their first year of study, students must take, at a minimum, the foundational courses one through four, along with the research seminar courses: PHYS 515, Topics in Modern Physics Research, and PHYS 590, Responsible Conduct in Research for Physical Scientists. Certain equivalent course work or successful completion of a pass-out examination may allow substitution of elective courses for individual students.

Students who have completed their course requirements with satisfactory grades, passed the qualifying examination, and submitted an acceptable thesis prospectus are recommended for admission to candidacy. (A grade of Honors in PHYS 990, Special Investigations, may be counted toward the Graduate School requirement of two grades of Honors.) The qualifying examination, normally taken at the beginning of the third term (and no later than the beginning of the fifth term), consists of four separate, written exams on Classical Mechanics, Electromagnetic Theory, Statistical Mechanics, and Quantum Mechanics. Students normally submit the dissertation prospectus before the end of the third year of study.

There is no foreign language requirement. 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 at the TF-10 level, usually in the first two years. Formal association with a dissertation adviser normally begins in the fourth term, after the qualifying examination 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 director of graduate studies (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 four above, plus one of the following: PHYS 608, 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; e-mail, 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 502a, 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 504b, Modern Physics Measurements Steve Lamoreaux

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 Ramamurti Shankar

The principles of quantum mechanics with application to simple systems. Canonical formalism, solutions of Schrödinger's equation, angular momentum, and spin.

PHYS 512b, Statistical Physics I Meng Cheng

Review of thermodynamics, the fundamental principles of classical and quantum statistical mechanics, canonical and grand canonical ensembles, identical particles, Bose and Fermi statistics, phase transitions and critical phenomena, renormalization group, irreversible processes, fluctuations.

PHYS 515a, Topics in Modern Physics Research Yoram Alhassid

A seminar course intended to provide an introduction to current research in physics and an overview of physics research opportunities at Yale.

PHYS 523b / CB&B 523b / ENAS 541b / MB&B 523b, Biological Physics Simon Mochrie

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 Bonnie Fleming and Karsten Heeger
Introduction to a wide variety of topics in nuclear physics. A number of related nuclear models as well as experimental methods are discussed. The course also covers topics in 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 Oliver 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 528a or b / ENAS 848a or b, Soft Condensed Matter Physics Staff
An introduction to the physics and phenomenology of soft condensed matter: classical systems with mesoscale structure where thermal fluctuations and interfacial forces play essential roles. Discussion of applications to materials science/engineering, nanotechnology, and molecular/cellular biology. Essential concepts from statistical thermodynamics, classical mechanics, and electricity and magnetism are reviewed/developed as needed.

PHYS 530a, Scientific Teaching for Physical Sciences Staff
The course covers fundamentals of learning theory and practical strategies for teaching in the physical sciences. Students will practice teaching scientific concepts, manage classroom dynamics, and implement strategies for effective and inclusive teaching. In the second half of the course, will students (1) apply these principles as they develop and evaluate instructional materials for a college level science course and (2) develop a peer reviewed and polished teaching statement. Pre-reqs: Completed one semester 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 / APHY 548a / ENAS 850a, Solid State Physics I Sohrab Ismail-Beigi
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 / APHY 549b / ENAS 851b, 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 561a / CB&B 561a / MB&B 561a / MBIO 561a / MCDB 561a, Introduction to Dynamical Systems in Biology Damon Clark, Kathryn Miller-Jensen, and Jonathon Howard

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MATLAB in a series of in-class hackathons that illustrate biological examples discussed in lectures.

PHYS 562b / AMTH 765b / CB&B 562b / ENAS 561b / INP 562b / MB&B 562b / MCDB 562b, Dynamical Systems in Biology Thierry Emonet and Jonathon 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: MCDB 561 or equivalent, or a 200-level biology course, or permission of the instructor.

PHYS 608b, Quantum Mechanics II Nicholas Read

Approximation methods, scattering theory, and the role of symmetries. Relativistic wave equations. Second quantized treatment of identical particles. Elementary introduction to quantized fields.

PHYS 609a, Relativistic Field Theory I Thomas Appelquist

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 624a or b, Group Theory Staff

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 630b, Relativistic Field Theory II Thomas Appelquist

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 632a, Quantum Many-Body Theory II Leonid Glazman

A second course in quantum many-body theory, covering the core physics of electron systems, with emphasis on the electron-electron interaction, on the role of dimensionality, on the coupling either to magnetic impurities leading to the well-known Kondo effect or to the electromagnetic noise. Applications to mesoscopic systems and cold atomic gases are also developed.

PHYS 633b / APHY 633b, Introduction to Superconductivity Staff

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 669a, Relativistic Field Theory III Walter Goldberger

This course focuses on applications of quantum field theory to phenomena in particle physics and gravity. The first part consists of a detailed discussion of the Standard Model, both its formal properties and experimental predictions. The second part is a survey of modern scattering amplitude methods in gauge theory (with applications to collider physics) and in quantum gravity. The last part discusses the applications of field theory techniques to gravitational wave sources, including a brief introduction to LIGO phenomenology.

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 677a / APHY 677a, Noise, Dissipation, Amplification, and Information Michel Devoret

Graduate-level non-equilibrium statistical physics applied to noise phenomena, both classical and quantum. The aim of the course is to explain the fundamental link between the random fluctuations of a physical system in steady state and the response of the same system to an external perturbation. Several key examples in which noise appears as a resource rather than a limitation are treated: spin relaxation in nuclear magnetic resonance (motional narrowing), Johnson-Nyquist noise in solid state transport physics (noise thermometry), photon correlation measurements in quantum optics (Hanbury Brown-Twiss experiment), and so on. The course explores both passive and active systems. It discusses the ultimate limits of amplifier sensitivity and speed in physics measurements.

PHYS 762a or b / CHEM 562La or b, Laboratory in Instrument Design and the Mechanical Arts Kurt Zilm and David Johnson

Familiarization with modern machine shop practices and techniques. Use of basic metalworking machinery and instruction in techniques of precision measurement and properties of commonly used metals, alloys, and plastics.

PHYS 816b / APHY 816b, Techniques Microwave Measurement Robert Schoelkopf

An advanced course covering the concepts and techniques of radio-frequency design and their application in making microwave measurements. The course begins with a

review of lumped element and transmission line circuits, network analysis, and design of passive elements, including filters and impedance transformers. We continue with a treatment of passive and active components such as couplers, circulators, amplifiers, and modulators. Finally, we employ this understanding for the design of microwave measurement systems and techniques for modulation and signal recovery, to analyze the performance of heterodyne/homodyne receivers and radiometers.

PHYS 991a / ENAS 991a / MB&B 591a / MCDB 591a, Integrated Workshop

Corey O'Hern, Mark Gerstein, Scott Holley, Marcus Bosenberg, Madhusudhan Venkadesan, Michael Murrell, and Nikhil Malvankar

This required course for students in PEB involves hands-on laboratory modules with students working in pairs. A biology student is paired with a physics or engineering student; a computation/theory student is paired with an experimental student. The modules are devised so that a range of skills is acquired, and students learn from each other. Modules are hosted in faculty laboratories.

Political Science

Rosenkranz Hall, 203.432.5241
<http://politicalscience.yale.edu>
 M.A., M.Phil., Ph.D.

Chair

Steven Wilkinson

Director of Graduate Studies

Milan Svolik

Professors Bruce Ackerman, Akhil Amar (*Law*), Seyla Benhabib, Paul Bracken (*Management*), David Cameron, Bryan Garsten, Alan Gerber, Jacob Hacker, Gregory Huber, Isabela Mares, David Mayhew, Gerard Padró i Miquel, John Roemer, Frances Rosenbluth, James Scott, Ian Shapiro, Stephen Skowronek, Steven Smith, Milan Svolik, Peter Swenson, John Wargo (*Forestry & Environmental Studies*), Steven Wilkinson, Elisabeth Wood

Associate Professors Peter Aronow, Ana De La O Torres, Alexandre Debs, Hélène Landemore, Jason Lyall, Karuna Mantena, Nuno Monteiro, Kelly Rader

Assistant Professors Katharine Baldwin, Deborah Beim, Sarah Bush, Daniela Cammack, Alexander Coppock, John Henderson, Daniel Mattingly, Elizabeth Nugent, Giulia Oskian, Tyler Pratt, Didac Queralt, Thania Sanchez, Fredrik Sävje, Emily Sellars

FIELDS OF STUDY

Fields include political theory, international relations, comparative politics, American politics, political economy, quantitative empirical methods, qualitative and archival methods, and formal theory.

SPECIAL ADMISSIONS REQUIREMENT

The department requires that scores from the GRE General Test and a writing sample accompany an application. Additional details about the application process are available on the department website. The department only accepts applications for the Ph.D. program.

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 DEGREES

The Graduate School offers a combined degree in Political Science and African American Studies. For details, see African American Studies in this bulletin. Students may also pursue a joint degree with the 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.

COURSES

Empirical Analysis and Research Methodology

PLSC 503b, Quantitative Methods II: Foundations of Statistical Inference Didac Queralt

An intensive introduction to statistical theory for quantitative social inquiry. Topics include foundations of probability theory, statistical inference from random samples, estimation theory, linear regression, maximum likelihood estimation, and nonparametric identification.

PLSC 504a, Advanced Quantitative Methods Fredrik Sävje

The aim of this course is to provide students with the understanding and tools to critically consume and conduct statistical research. The theme is the challenge of drawing reliable causal inference. We will learn: how to use graphical methods to transparently analyze and present data; how to discipline our analyses against multiple-comparisons bias; how to use nonparametric methods to avoid implausible assumptions; how strong research design is essential to causal inference; how Bayesian inference provides the mathematical vocabulary for thinking about scientific inference; how causal graphs allow us to express and analyze causal assumptions, choose control variables, and think about selection bias; how placebo tests allow us to test assumptions; how to build and understand Likelihood and Bayesian models including Logistic and Probit models; how to think about and analyze time-series cross-sectional data. We will review instrumental variables methods and regression-discontinuity designs, though it is assumed that you have already covered these in PLSC 503. The course assumes students have command of the material covered in PLSC 500 and PLSC 503, including basic probability theory, matrix algebra, and the linear regression model.

PLSC 505b / SOCY 508b, Qualitative Field Research Daniel Mattingly

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 510a, Introduction to the Study of Politics Staff

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 518b, Introduction to Game Theory Alexandre Debs

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 519b, Formal Models of Comparative Politics Milan Svolik

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, social choice, collective action, democratization, and war. Prerequisite: PLSC 518, or an introductory course in game theory.

PLSC 520b, Game Theory and Political Science Staff

Introduction to game theory—a method by which strategic interactions among individuals and groups in society are mathematically modeled—and its applications to political science. Concepts employed by game theorists, such as Nash equilibrium, subgame perfect equilibrium, and perfect Bayesian equilibrium. Problems of cooperation, time-consistency, signaling, and reputation formation. Political applications include candidate competition, policy making, political bargaining, and international conflict.

PLSC 529a, Mathematics for Political Science Staff

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 540a, Research and Writing Staff

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.

Political Theory

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.

PLSC 565a, Democracy and Distribution Ian Shapiro

The attention showered in 2015 on Thomas Piketty's book *Capital in the Twenty-First Century* brought issues of inequality in the distribution of income and wealth to the forefront of public and scholarly attention. An enormous body of research has been produced over the past two decades to understand the nature of the dramatic rise in inequality, especially in the United States, and its causes. A long list of proposals for legal change has emerged in response to the outpouring of data and analysis. This course explores the facts and the causes of and political barriers to potential responses to these recent developments, principally but not exclusively in the United States. Ultimately, the question requires an examination of the relations between democracy and the distribution of income and wealth. Particular attention is paid to the ways in which different groups, classes, and coalitions affect, and are affected by, democratic distributive politics. Attention is paid to theories of distribution, politics of distribution, distributive instruments, and the implementation of policies affecting distribution. Substantive topics covered include regulation, protectionism, taxes, social insurance, welfare, public opinion, education, and unions. Follows Law School academic calendar.

PLSC 576a, Ancient Greek Political Development Daniela Cammack

This course explores the varieties of political experience in the ancient Greek world in the Archaic, Classical, and Hellenistic periods. Attention is given to different regime types (monarchy, tyranny, aristocracy, oligarchy, democracy), places (Athens, Sparta, Crete, Carthage, Syracuse, Persia), political forms (city-state, alliance, empire), institutions (assembly, council, courts, offices), and persons (political leader, citizen, woman, foreign resident, slave).

PLSC 580a / PHIL 674a, Borders, Culture, and Citizenship Seyla Benhabib

The contemporary refugee crisis in Europe and elsewhere; new patterns of migration, increasing demands for multicultural rights on the part of Muslim minorities in the West, and transnational effects of globalization faced by contemporary societies. This course examines these issues in a multidisciplinary perspective in the light of political theories of citizenship and migration, and laws concerning refugees and migrants in Europe and the United States.

PLSC 583a / GMAN 651a / PHIL 734a, Contemporary Critical Theory Seyla Benhabib

An examination of the themes of statelessness, migration, and exile in the works of Arendt, Benjamin, Adorno, Shklar, and Berlin.

PLSC 597a, Lincoln's Statecraft and Rhetoric Steven Smith

This class is based on a reading and interpretation of Lincoln's major speeches and letters. Its purpose is to understand his views on the problem of slavery, equality, and race in American society, but also to consider the relation of words to deeds in the practice of his statecraft. We also situate Lincoln within the history and theory of statesmanship.

PLSC 602b, Political Epistemology: On Knowledge and Belief in Politics Hélène Landemore

We arguably live in the age of "alternative facts" and "post-truths"—or, as philosopher Harry Frankfurt presciently theorized it, "bullshit." By contrast, this course aims

to explore the new and burgeoning field of “political epistemology,” for which the concepts of knowledge and even truth—both factual and moral—are central to politics. Political epistemology can be described as a branch of philosophy inquiring into how to acquire knowledge and into what we ought to believe in the political realm. It deals with the ways societies generate, process, and diffuse knowledge and beliefs. Typical questions in political epistemology relate to whether we can know anything in politics and to the epistemic status of political beliefs in general. Between the Charybdis of moral relativism and the Scylla of authoritarian dogmatism, is there any room for something like “political truths”? How would we best attain them and how would we know that we have? Political epistemologists are also concerned with the question of “peer-disagreement” and the proper epistemic stance to hold with respect to peers, typically other citizens, with whom we disagree. In this course we thus seek to understand better the ways in which political institutions and procedures (somewhat broadly construed, such as national assemblies, electoral rules, parties, the media, courts, etc., but including also social norms) generate and process knowledge. We also study the ways in which certain social, economic, and political arrangements may generate what has been diagnosed as “epistemic injustice” and how this specific type of injustice may be redressed and should be dealt with by both political theorists and political actors.

PLSC 629a / HIST 656a, Histories of Political Thought Isaac Nakhimovsky

The intersection between political theory and intellectual history, examined from a historiographical rather than an exclusively methodological perspective. The course aims to develop a comparative framework for discussing the kinds of preoccupations and commitments that have animated various important contributions to the history of political thought since the nineteenth century.

PLSC 630b, Philosophy of Science for the Study of Politics Hélène Landemore

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 640b, Advanced Topics in Modern Political Philosophy Steven Smith and Giulia Oskian

This seminar is designed to survey modern political philosophy at a level appropriate for graduate students (to help them prepare for the field exam) and for advanced undergraduates who have completed substantial course work in intellectual history and/or political theory. This term, the seminar addresses the topic of democracy and inequality from Rousseau to Marx. We pursue the politics of classical political economy by tracing discussions of the identity of the modern representative republic, the nature of capitalism or commercial society, and the relation between the two from Rousseau to Marx. While the main focus is close analysis of the writings of Rousseau, Smith, and Marx, we also mark the trajectory from Smith to Marx via readings from Kant, Hegel, Condorcet, Malthus, Ricardo, and Proudhon.

International Relations

PLSC 656a / GLBL 579a, Global Governance Yuriy Sergeyev

Examination of global policy problems, the acceleration of interdependence, and the role, potential, and limits of the institutions of global governance to articulate collective interests and to work out cooperative problem-solving arrangements. Consideration of gaps in global governance and controversies between globalization and state sovereignty, universality, and tradition.

PLSC 695a / GLBL 905a, International Security Nuno Monteiro

This course covers the main theories and problems in international security. After analyzing the main theoretical traditions devoted to understanding international security and world order, we discuss a variety of topics such as: the causes of war; the role of nuclear weapons and the problems with their proliferation; coercion, signaling, and crisis bargaining; military effectiveness; and U.S. grand strategy. Students acquire broad familiarity with the canonical literature in these fields, understand how to apply scholarship to analyze contemporary international security problems, and learn to identify opportunities for new research. The course is designed for master's and Ph.D. students who plan to pursue either policy or scholarly work in international security. Seminar sessions may feature outside guest scholars. Besides the weekly seminar sessions, students are strongly encouraged to attend weekly reading group sessions in which we dissect recent scholarship on the same topics for which we have read the canonical works.

PLSC 698a, International Political Economy Didac Queralt

This course examines how domestic and international politics influence the economic relations between states. It addresses the major theoretical debates in the field and introduces the chief methodological approaches used in contemporary analyses. We focus attention on four types of cross-border flows and the policies and international institutions that regulate them: the flow of goods (trade policy), the flow of capital (financial and exchange rate policy), the flow and location of production (foreign investment policy), and the flow of people (immigration policy).

Comparative Politics

PLSC 709b, Comparative Constitutional Law Staff

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 714b, Corruption, Economic Development, and Democracy Susan Rose-Ackerman

A seminar on the link between political and bureaucratic institutions, on the one hand, and economic development, on the other. A particular focus is the impact of corruption on development and the establishment of democratic government. Enrollment limited to fifteen.

PLSC 734a or b / SOCY 560a or b, Comparative Research Workshop Julia Adams

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 take the

course for a letter grade are expected to present a paper-in-progress the term that they are enrolled for credit.

PLSC 756a, The European Union David Cameron

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

PLSC 763b, 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, the first in the yearlong introduction to the study of comparative politics for Ph.D. students in political science, examines the purpose and methodology of comparative inquiry. Designed to introduce students to the study of comparative politics and to assist students in developing research topics and strategies, the course explores key themes—the origins of political regimes, the building of nations and states, ethnicity and nationalism, collective action, the politics of welfare states, and the logic of institutional change—through the critical reading and discussion of classic and contemporary works.

PLSC 778b, Comparative Politics II Elisabeth Wood

The second part of a two-part sequence designed to introduce graduate students to the fundamentals of comparative politics, including the major debates, topics, and methods.

PLSC 779a / ANTH 541 / HIST 965, Agrarian Societies: Culture, Society, History, and Development James Scott and Elisabeth Wood

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

PLSC 793a or b, Governing China Daniel Mattingly

Study of the politics of contemporary China with a focus on recent research. Topics include authoritarianism, representation, local governance, elite politics, censorship, propaganda, protest, and the rule of law.

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

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

PLSC 799b, Microhistorical Analysis in Social Science Research Isabela Mares

In recent years, historical research has experienced a remarkable resurgence across all social sciences. This course introduces students to a vibrant new wave of historical scholarship and prepares them to conduct original research on these topics. To understand the methodological choices made in recent historical scholarship, each week of the course pairs “classic” and contemporary research on some of the most important topics across social science disciplines, including democratization and the extension of suffrage, democratic erosion and breakdown, the development of fiscal capacity, the development of national identities, political culture, gender norms, and so on. The course prioritizes a hands-on approach based on an active examination of the most salient design choices made by these studies and on the replication of the results.

Political Economy

PLSC 712b, Comparative Political Economy Frances Rosenbluth

Introduction to issues in political economy across time and place. The field’s diverse theoretical underpinnings and its place in the context of political science and of the social sciences more generally; theoretical perspectives such as materialism, institutionalism, and cognition/culture/beliefs; interactions between government and the economy in democratic and nondemocratic regimes and in developed and developing countries.

PLSC 714b, Corruption, Economic Development, and Democracy Susan Rose-Ackerman

A seminar on the link between political and bureaucratic institutions, on the one hand, and economic development, on the other. A particular focus is the impact of corruption on development and the establishment of democratic government. Enrollment limited to fifteen.

PLSC 717a, Business and Government after Communism Ian Shapiro

Reassessment of business’s place in society – and its relations with government – in an era when alternatives to capitalism are moribund. Topics include the role of business in regime change, corruption and attempts to combat it, business and the provision of low-income housing and social services, and privatization of such core functions of government as prisons, the military, and local public services.

American Politics

PLSC 800a, Introduction to American Politics Greg Huber

An introduction to the analysis of U.S. politics. Approaches given consideration include institutional design and innovation, social capital and civil society, the state, attitudes, ideology, econometrics of elections, rational actors, formal theories of institutions, and transatlantic comparisons. Assigned authors include R. Putnam, T. Skocpol, J. 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 802b, Collective Action and Choice Deborah Beim

A graduate-level course, open to undergraduates, about the basic issues of collective action and choice (preference aggregation), with a particular focus on issues of American politics. Topics include externalities and public goods provision, social

choice theory, models of electoral competition (including “median voter” models, and extensions to those models that incorporate strategic challenger entry, campaign spending, heterogeneity in voter attentiveness, valence dimensions, and primaries, etc.), the effects of different institutional settings (e.g., competitive versus retention elections) on choices, the incumbency advantage, lobbying, and decision-making in small groups (e.g., issues of deliberation). Course work includes reading and writing assignments.

PLSC 803b, American Politics III: Institutions Kelly Rader

A graduate-level course, open to undergraduates, designed to introduce students to research on American political institutions. We examine different explanations for and models of the sources of institutions, discuss their internal organization and governance, and consider the effects of institutions on outcomes of interest. Topics include alternatives to institutions, agenda-setting models, influences on bureaucratic decisions, the size of government and state building, congressional organization, the presidency, policy feedback and path dependence, and interest groups. Course work includes reading and writing assignments.

PLSC 812a / AMST 752a, Progressivism: Theory and Practice Stephen Skowronek

The progressive reform tradition in American politics. The tradition’s conceptual underpinnings, social supports, practical manifestations in policy and in new governmental arrangements, and conservative critics. Emphasis on the origins of progressivism in the early decades of the twentieth century, with attention to latter-day manifestations and to changes in the progressive impulse over time.

PLSC 837a, Gender Politics Andrea Aldrich

Exploration of theoretical and empirical work in political science to study the relationship between gender and politics in the United States and around the world. Topics include women’s representation in legislative and executive branch politics in democratic regimes; the impact of gender stereotypes on elections and public opinion; conditions that impact the supply and demand of candidates across genders; and the underrepresentation of women in political institutions.

PLSC 842a, The Constitution: History, Philosophy, and Law Bruce Ackerman

An inquiry into the foundations of the American Constitution, at its founding and at critical moments in its historical transformation – most notably in response to the Civil War, the Great Depression, and the Civil Rights Movement. Philosophically speaking, do we still live under the Constitution founded by the Federalists, or are we inhabitants of the Second or Third or Nth Republic? Institutionally, in what ways are the patterns of modern American government similar to, and different from, those in post-Revolutionary (1787–1860) and post-Civil War (1868–1932) America? Legally, what is or was the role of constitutional law in the organization of each of these historical regimes? Through asking and answering these questions, the course tries to gain a critical perspective on the effort by the present Supreme Court to create a new constitutional regime for the twenty-first century. Self-scheduled examination (web) or paper option.

PLSC 853a, U.S. National Elections David Mayhew

An investigation of electoral realignments, voting for president and Congress, voter turnout, incumbency advantage, nominations, and campaign finance. Paper.

PLSC 856b, Constitutional Crisis, Constitutional Reform Bruce Ackerman

Students are invited to write substantial papers responding to America's current constitutional crisis with proposals for reform of the present system of checks and balances. Prerequisites: PLSC 842 or equivalent and permission of the instructor. Students who have not taken PLSC 842 are expected to submit a brief statement explaining why other course work completed at Yale, or in their prior studies, provides them with adequate preparation.

Research Workshops

PLSC 930a and PLSC 931b, American Politics Workshop Deborah Beim

The course meets throughout the year in conjunction with the ISPS American Politics Workshop. It serves as a forum for graduate students in American politics to discuss current research in the field as presented by outside speakers and current graduate students. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

PLSC 932a and PLSC 933b, Comparative Politics Workshop Katharine Baldwin

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 Hélène Landemore and Steven Smith

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 Milan Svolik

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 Alexandre Debs and
Didac Queralt

This workshop engages work in the fields of international security, international political economy, and international institutions. The forum attracts outside speakers, Yale faculty, and graduate students. It provides a venue to develop ideas, polish work in progress, or showcase completed projects. Typically, the speaker would prepare a 35- to 40-minute presentation, followed by a question-and-answer session. More information can be found at <http://irworkshop.yale.edu>. Open only to graduate students in the Political Science department. Can be taken as Satisfactory/Unsatisfactory only.

Psychology

Kirtland Hall, 203.432.4500

<http://psychology.yale.edu>

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

Chair

Frank Keil (203.432.4545, frank.keil@yale.edu)

Director of Graduate Studies

Gregory McCarthy (203.432.9261, gregory.mccarthy@yale.edu)

Professors Woo-kyoung Ahn, Amy Arnsten (*Neuroscience*), John Bargh, Paul Bloom, Thomas Brown, Tyrone Cannon, B.J. Casey, Marvin Chun, Margaret Clark, Ravi Dhar (*School of Management*), John Dovidio, Robert Frank (*Linguistics*), Tamar Gendler (*Philosophy*), Jeannette Ickovics (*Public Health*), Jutta Joormann, Dan Kahan (*Law School*), Alan Kazdin (*Emeritus*), Frank Keil, Robert Kerns (*Veterans Administration Medical Center*), Joshua Knobe (*Philosophy*), Marianne LaFrance (*Women's, Gender, & Sexuality Studies*), Becca Levy (*Public Health*), Linda Mayes (*Child Study Center*), Gregory McCarthy, Nathan Novemsky (*School of Management*), Donald Quinlan (*Psychiatry*), Jennifer Richeson, Peter Salovey, Laurie Santos, Brian Scholl, Jane Taylor (*Psychiatry*), Nicholas Turk-Browne, Tom Tyler (*Law School*), Victor Vroom (*School of Management*), Karen Wynn

Associate Professors Walter Gilliam (*Child Study Center*), Joan Kaufman (*Psychiatry*), Hedy Kober (*Psychiatry*), Maria Piñango (*Linguistics*)

Assistant Professors Arielle Baskin-Sommers, Steve Chang, Molly Crockett, Yarrow Dunham, Dylan Gee, Maria Gendron, Avram Holmes, Julian Jara-Ettinger

Lecturers Nancy Close, Nelson Donegan, Carla Horwitz, Kristi Lockhart, Mary O'Brien, Matthias Siemer

FIELDS OF STUDY

Fields include clinical psychology; cognitive psychology; developmental psychology; neuroscience; and social/personality psychology.

SPECIAL ADMISSIONS REQUIREMENT

The department requires that scores from the GRE General Test accompany an application.

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 courses and one course in data analysis. Two of the three required basic-level courses must be in two different areas of psychology outside the student's main area of concentration. The basic-level 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. 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. However, 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 advisor in Psychology can be identified prior to an admissions decision.

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.

Program materials are available online at <http://psychology.yale.edu>.

COURSES

PSYC 508b, Intergroup Relations: The Psychology of Social Inequality Jennifer Richeson

This course provides a survey of core concepts in social psychology through the lens of societal intergroup relations. Specifically, the perception, cognition, and motivations that give rise to the formation, maintenance, and even acknowledgment of societal inequality are examined. We also examine the effects of societal inequality on perception, cognition, motivation, and health (individual outcomes), as well as how inequality may shape close relationships and even broader sets of interactions between and within societal groups. Prerequisites: PSYC 110 or equivalent; PSYC 150.

PSYC 518a, Multivariate Statistics Julian Jara-Ettinger

Analysis of tabular data arrays arising usually from experiments. Sums of squares, F-tests, and variance components. The method of contrasts. Data transformations. “Nesting,” “crossings,” and Latin square designs. The analysis of covariance. Aspects of Tukey’s *Exploratory Data Analysis* such as box plots and median polish. Introduction to computer program packages. How to think about statistics.

PSYC 530a / INP 530a, Foundations of Neuroscience: Biological Bases of Human Behavior Steve Wohn Chang

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 534a, Developmental Psychopathology Fred Volkmar, Eli Lebowitz, and Denis Sukhodolsky

This course, designed for advanced undergraduates or beginning graduate students, provides an overview of developmental psychopathology during childhood and adolescence. It is team-taught by a child psychiatrist and psychologist and covers aspects of normal development, assessment methods, clinical disorders, treatment, and legal and social policy issues. We begin with a review of normative development and then a discussion of theoretical approaches to understanding developmental aspects of common mental health conditions in childhood. Relevant issues of culture and ethnicity in expression of psychopathology in childhood are also reviewed.

PSYC 539a, Advanced Psychopathology Jutta Joormann

The aim of this course is to have students master information on theory and assessment for major forms of psychopathology using cognitive-behavioral approaches. The focus is on learning how behavior can be conceptualized in cognitive-behavioral terms and to review recent models and empirical findings regarding clinical disorders. Students play an active role in this process by participating in class discussions and making presentations on etiological models and empirical findings for various clinical problems.

PSYC 541b, Research Methods in Psychology Tyrone Cannon

Research design, methodology, and evaluation considered in the context of clinical research. Emphasis on experimental and quasi-experimental designs, threats to validation, confounding, sources of artifact and bias, alternative assessment strategies, and data evaluation methods.

PSYC 553a / MGMT 753a, Behavioral Decision-Making I: Choice Ravi Dhar and Nathan Novemsky

The seminar examines research on the psychology of decision-making, focusing on judgment. Although the normative issue of how decisions should be made is relevant, the descriptive issue of how decisions are made is the main focus of the course. Topics of discussion include judgment heuristics and biases, confidence and calibration, issues of well-being including predictions and experiences, regret and counterfactuals. The goal of the seminar is threefold: to foster a critical appreciation of existing knowledge in behavioral decision theory, to develop the students' skills in identifying and testing interesting research ideas, and to explore research opportunities for adding to that 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 Nicholas 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 601b / HPM 601, The Science of Science Communication Dan Kahan

The simple dissemination of valid scientific knowledge does not guarantee it will be recognized by non-experts to whom it is of consequence. The science of science communication is an emerging, multidisciplinary field that investigates the processes that enable ordinary citizens to form beliefs consistent with the best available scientific evidence, the conditions that impede the formation of such beliefs, and the strategies that can be employed to avoid or ameliorate such conditions. This course surveys, and makes a modest attempt to systematize, the growing body of work in this area. Special attention is paid to identifying the distinctive communication dynamics of the diverse contexts in which non-experts engage scientific information, including electoral politics, governmental policy making, and personal health decision making.

PSYC 604b, Cognition and Emotion Matthias Siemer

The course presents an overview of current research questions and results in the area of cognition and emotion. We explore basic research questions as well as implications of cognitive approaches toward emotions for domains such as emotional disorders and psychological resilience and well-being.

PSYC 605a, Social Emotions Margaret Clark

The nature and function of emotions in social context. How emotions such as happiness, sadness, fear, and anger shape how we relate to others; how the ways in which we relate to others shape our experience and expression of these emotions. The nature and functions of additional emotions that seem to arise only within the context of social relationships: feelings of hurt, guilt, gratitude, empathic joy, and empathic sadness.

PSYC 616b, The Psychology of Group Life Yarrow Dunham

Study of social categorization, the psychological tendency to partition individuals into groups, with attention to cognitive, developmental, social, and evolutionary approaches. The nature and development of social categorization, including its evolutionary advantages and its relation to the phenomenon of categorization more broadly. Ways in which social categorization influences prejudice and discriminatory behavior; methods for reducing such negative effects.

PSYC 617b, Etiology and Treatment of Addiction Arielle Baskin-Sommers

What is considered a drug? Why do some individuals use substances, but others become addicted? Are there effective treatments for addiction? Why and how does society attempt to control substance use and distribution? Exploring questions such as these is a central concern in this interdisciplinary seminar, which highlights research from cognitive neuroscience, psychology, sociology, and public health perspectives. The focus is on examining social, neurobiological, and genetic explanations for addiction, evaluating addiction treatments, and discussing the social construction of substance policies. Students are asked to think critically about material and evaluate its strengths and weaknesses. To foster critical thinking skills, students have ample opportunities to discuss topics in class, analyze arguments in reading assignments, and apply ideas to real-world situations through projects and presentations. Readings consist primarily of journal articles.

PSYC 621a, Cognitive Science of Pleasure Paul Bloom

The appeal of fiction and the imagination. We explore the mysterious appeal of narratives, fantasies, daydreams, nightmares, and other imaginary pursuits. Our approach is eclectic, drawing on fields such as literary criticism, film studies, behavioral economics, evolutionary theory, cognitive psychology, developmental psychology, and analytic philosophy.

PSYC 625b, Social Perception Brian Scholl

When exploring the structure of the mind, we typically think of visual perception as among the earliest and most basic of our cognitive processes, while we think of social cognition as among the most advanced forms of higher-level cognition. In this seminar we explore how these two aspects of the mind connect. Specific topics include the perception of animacy, agency, and goal-directedness; biological motion; face perception (including the perception of facial attractiveness); gaze processing and social

attention; thin-slicing and perceptual stereotypes; and social and cultural influences on perception.

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 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 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 647b, Social Science and Institutional Design: The Empirical Evaluation of Legal Policies and Practices Tom Tyler

The current legal system bases many of its policies and practices upon assumptions concerning human nature. What does research tell us about how those policies and practices actually operate? What alternative social science models are available and how would institutions be different if those models were used? This class considers deterrence models and compares them to models emphasizing legitimacy, morality, and social norms. Policing, the courts, and corrections are examined and evaluated against available empirical evidence. The class also considers alternative models of institutional design and evidence of their potential or actual effectiveness.

PSYC 656b, Developmental Psychopathology and Sensitive Periods of Neural Development BJ Casey

More than one in five children suffer from serious forms of psychopathology that emerge at different developmental times. These different time courses in the emergence of symptoms suggest sensitive periods of neural development for understanding etiological factors and when and how to intervene. This course provides an overview of brain circuitry implicated in psychiatric illnesses from a neurodevelopmental perspective. Evidence from preclinical nonhuman and human imaging empirical studies is evaluated and discussed in terms of its clinical implications. We examine how understanding the biological state of the developing brain may help to optimize and target treatments more effectively for these disorders.

PSYC 671a, The Cognitive Science of Mind Reading Laurie Santos

Examination of theory of mind from a developmental, comparative, and neural perspective. Topics include whether different representational systems underlie theory of mind capacities, how infants come to represent others' mental states, whether nonhuman animals share humanlike theory of mind capacities, and how phenomena like conformity and metacognition can be reconciled with developmental and neural findings in the domain of mind reading.

PSYC 684a or b, 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 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 and Clinical Practice: Legislation and Diversity Issues 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 702a or b, Current Work in Cognition Staff

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 Staff

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 Staff

Basic and applied current research in clinical psychology that focuses on the cognitive, affective, social, biological, and developmental aspects of psychopathology and its treatment is presented by faculty, visiting scientists, and graduate students. This research is examined in terms of theory, methodology, and ethical and professional implications. Students cannot simultaneously enroll in PSYC 718 or 719.

PSYC 721a or b, Research Topics in Infant Cognition Karen Wynn

Investigation of various topics in infant cognition: early mechanisms for representing and reasoning about number; infants' ability to represent time; early object knowledge; foundations of intentional understanding. Prerequisite: permission of the instructor.

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 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 732a or b, Research Topics in Visual Cognitive Neuroscience Marvin Chun

Examines current research in visual cognitive neuroscience, including discussion of proposed and ongoing research projects. Topics include visual attention, perception, memory, and contextual learning.

PSYC 733a or b, Research Methods 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 736a or b, Research Topics in Stereotyping and Prejudice John Dovidio

Explores the nature of prejudice in its traditional and contemporary forms. Although the emphasis is on the causes and consequences of racial bias in the United States, the dynamics of intergroup relations are considered more broadly as well. Emphasis

is on developing critical thinking, reading, and research skills to test ideas relevant to understanding and combating stereotyping, prejudice, and discrimination.

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 Staff

Focus on research approaches in the study of autism and related conditions including both psychological and neurobiological processes. The seminar emphasizes the importance of understanding mechanisms in the developmental psychopathology of autism and related conditions.

PSYC 741a or b, Research Topics in Emotion and Relationships Margaret Clark

Members of this laboratory read, discuss, and critique current theoretical and empirical articles on relationships and on emotion (especially those relevant to the functions emotions serve within relationships). In addition, ongoing research on these topics is discussed along with designs for future research.

PSYC 742a or b, Research Topics in Computation and Cognition Julian Jara-Ettinger

Seminar-style discussion of recently published and unpublished research in cognitive development and computational models of cognition.

PSYC 744a or b, Research Topics in Philosophical Psychology Joshua Knobe

The lab group focuses on topics in the philosophical aspects of psychology.

PSYC 745a or b, Research Topics in Disinhibitory Psychopathology Arielle Baskin-Sommers

This laboratory course focuses on the study of cognitive and affective mechanisms contributing to disinhibition. We discuss various forms of disinhibition from trait (e.g., impulsivity, low constraint, externalizing) to disorder (e.g., antisocial personality disorder, psychopathy, substance use disorders), diverse methods (e.g., psychophysiology, self-report, neuroimaging, interventions), and multiple levels of analyses (e.g., neural, environmental, social). Members of this laboratory read and critique current articles, discuss ongoing research, and plan future studies.

PSYC 752a or b, Research Topics in Neuroscience of Social Behavior Steve Wohn 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 Law and Psychology Tom Tyler

Lab focusing on ongoing research projects in law and psychology.

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 Nicholas Turk-Browne

Seminar-style discussion of recent research in cognitive neuroscience, covering both recent studies from the literature and ongoing research at Yale.

PSYC 766a or b, Research Topics in Perception and Cognition Brian Scholl

Seminar-style discussion of recent research in perception and cognition, covering both recent studies from the literature and the ongoing research in the Yale Perception and Cognition Laboratory.

PSYC 771a or b, Research Topics in Nonconscious Processes John Bargh

The lab group focuses on nonconscious influences of motivation, attitudes, social power, and social representations (e.g., stereotypes) as they impact on interpersonal behavior, as well as the development and maintenance of close relationships.

PSYC 775a or b, Research Topics in Animal Cognition Laurie Santos

Investigation of various topics in animal cognition, including what nonhuman primates know about tools and foods; how nonhuman primates represent objects and number; whether nonhuman primates possess a theory of mind. Prerequisite: permission of the instructor.

PSYC 778a or b, Research Topics in Clinical and Affective Neuropsychology Hedy Kober

Lab meeting is held once a week throughout the year and is attended by undergraduate and graduate students, research staff, postdoctoral fellows, and other researchers interested in the weekly topics. In a rotating fashion, both internal and external

speakers present data and ideas from various research projects, and/or research and methods papers in related areas, including the use of functional magnetic resonance imaging to answer questions in clinical and affective psychology.

PSYC 801a or b, Clinical Internship (Child) Staff

Advanced training in clinical psychology with children. Adapted to meet individual needs with location at a suitable APA-approved internship setting.

PSYC 802a or b, Clinical Internship (Adult) Staff

Advanced training in clinical psychology with adults. Adapted to meet individual needs with location at a suitable APA-approved internship setting.

PSYC 806a or b, Practicum in Childhood Intervention Staff

Advanced supervised work in settings where child and family policies are developed and/or implemented. Adapted to meet individual needs with location at suitable sites.

PSYC 808a or b, Practicum in Child Psychology Staff

The Yale Child Study Center offers a yearlong practicum, which includes assessment of children, psychotherapy, team meetings, supervision, and didactic experiences.

PSYC 809a or b, Practicum in Assessment of School-Aged Children Staff

Students gain practical experience in testing with children.

PSYC 810a or b, Practicum in Developmental Assessment Staff

Practicum in early childhood screening and assessment of infants and toddlers at high risk for social adaptive and emotional developmental problems.

PSYC 811a or b, Mood and Anxiety Disorders Practicum Mary O'Brien

Discussion of current topics in psychopathology and treatment of anxiety disorders. Group supervision of therapy cases involving OCD, panic, social phobia.

PSYC 816a or b, Practicum in Developmental Disabilities and Developmental Assessment Staff

An introduction to approaches in developmental assessment in infants and young children (under age five years) with a range of developmental difficulties. Students observe and/or participate in developmental assessments. Students are exposed to a range of assessment instruments including developmental tests, speech-communication assessments, and psychiatric diagnostic instruments appropriate to this age group. Prerequisite: permission of the instructor.

PSYC 817a or b, Other Clinical Practica Staff

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 883a or b, Practicum in Clinical Assessment Staff

Supervised psychological assessment using measures of intellectual functioning, projective testing, and neuropsychological testing with patients.

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.

Public Health

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<http://publichealth.yale.edu>

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

Dean

Sten Vermund

Senior Associate Dean of Academic Affairs

Melinda Pettigrew

Director of Graduate Studies

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Director of Medical Studies

Mayur Desai

Director of Medical Research

Elizabeth Claus

Professors Serap Aksoy, Michelle Bell (*Forestry & Environmental Studies*), Richard Bucala (*Internal Medicine*), Susan Busch, Michael Cappello (*Pediatrics*), Elizabeth Claus, Paul Cleary, John Dovidio (*Psychology*), Robert Dubrow, David Fiellin (*Internal Medicine*), Erol Fikrig (*Internal Medicine*), Alison Galvani, Alan Gerber (*Psychology*), Robert Heimer, Theodore Holford, Jeannette Ickovics, Melinda Irwin, Amy Justice (*Internal Medicine*), Edward Kaplan (*School of Management*), Trace Kershaw, Jaehong Kim (*Chemical & Environmental Engineering*), Albert Ko, Harlan Krumholz (*Internal Medicine*), Brian Leaderer, Becca Levy, Elan Louis (*Neurology*), Shuangge Ma, Robert Makuch, I. George Miller (*Pediatrics*), Linda Niccolai, A. David Paltiel, Catherine Panter-Brick (*Anthropology*), Peter Peduzzi, Rafael Pérez-Escamilla, Melinda Pettigrew, Jeffrey Powell (*Ecology & Evolutionary Biology*), Harvey Risch, Robert Rosenheck (*Psychiatry*), Peter Salovey (*Psychology*), Mark Schlesinger, Eugene Shapiro (*Pediatrics*), Jody Sindelar, Donna Spiegelman, Mary Tinetti (*Internal Medicine*), Christian Tschudi, Vasilis Vasilou, Sten Vermund, Daniel Zelterman, Heping Zhang, Hongyu Zhao, Julie Zimmerman (*Chemical & Environmental Engineering*)

Associate Professors Rene Almeling (*Sociology*), Ted Cohen, Zack Cooper, Forrest Crawford, J. Lucian Davis, Mayur Desai, Andrew Dewan, Denise Esserman, Josephine Hoh, Judith Lichtman, Haiqun Lin, Xiaomei Ma, Joan Monin, John Pachankis, Sunil Parikh, Virginia Pitzer, Megan Smith (*Psychiatry*), Jeffrey Townsend, Zuoheng (Anita) Wang, Daniel Weinberger, Marney White, Yawei Zhang (*Surgery*), Yong Zhu

Assistant Professors Amy Bei, Xi Chen, Maria Ciarleglio, Nicole Deziel, Leah Ferrucci, Abigail Friedman, Gregg Gonsalves, Nathan Grubaugh, Nicola Hawley, Caroline Johnson, Michael Kane, Danya Keene, Zeyan Liew, Chima Ndumele, Krystal Pollitt, Yusuf Ransome, Jason Schwartz, Jacob Wallace, Katie Wang, Shiyi Wang, Joshua Warren, Reza Yaesoubi

FIELDS OF STUDY

Programs of study are offered in the areas of Biostatistics, Chronic Disease Epidemiology, Social and Behavioral Sciences, Environmental Health Sciences,

Epidemiology of Microbial Diseases, Health Policy and Management, and Health Informatics.

SPECIAL ADMISSIONS REQUIREMENTS

Applicants should have a strong background in the biological and/or social sciences. Students pursuing a Biostatistics specialty should have a strong background in mathematics. The GRE General Test is required. The TOEFL is required of all applicants whose native language is not English. IELTS scores are also accepted in addition to or in lieu of TOEFL scores. This requirement is waived only for applicants who, prior to matriculation at Yale, will have received a baccalaureate degree or its foreign 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 (3) years to receive the waiver. Applicants who do not qualify for a waiver but have taken the TOEFL within the past two years will need to have their TOEFL scores released to the Yale Graduate School of Arts and Sciences (code 3987).

ACADEMIC REQUIREMENTS

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, or 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 are expected to 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 a minimum of two terms, typically during years two and three. With the permission of the director of graduate studies (DGS), the total teaching requirement beyond two terms may be reduced for students who are awarded fellowships supported by outside funding or who are graduate research assistants in year three. Other exceptions may be granted after two terms of teaching are completed, with the approval of the DGS. During the first term of teaching, students must attend a training session conducted by the 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.

Required Course Work

BIOSTATISTICS

Ph.D. students in the Department of Biostatistics (BIS) must complete a minimum of fifteen courses (not including BIS 525, BIS 610, BIS 695, and EPH 600). Course waivers must be recommended by the academic adviser and approved by the DGS.

Required courses (or their equivalents) are: both terms of BIS 525, Seminar in Biostatistics and Journal Club; BIS 557, Computational Statistics; BIS 567, Bayesian Statistics; BIS 610, Applied Area Readings for Qualifying Exams; BIS 628, Longitudinal and Multilevel Data Analysis; BIS 643, Theory of Survival Analysis; BIS 646, Nonparametric Statistical Methods and Their Applications; BIS 678, Statistical Practice I; BIS 681, Statistical Practice II; BIS 691, Theory of Generalized Linear Models; BIS 695, Summer Internship in Biostatistical Research; EPH 508, Foundations of Epidemiology and Public Health; S&DS 610, Statistical Inference; S&DS 612, Linear Models; EPH 600, Research Ethics and Responsibility; and EPH 608, Frontiers of Public Health. 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.

In consultation with their academic adviser, students choose a minimum of three additional electives that will best prepare them for dissertation work.

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 the Department of Chronic Disease Epidemiology (CDE) must complete a minimum of sixteen courses (not including CDE 610 and EPH 600). Course waivers must be recommended by the academic adviser and approved by the DGS. Students must 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. Required courses (or their equivalents) are: CDE 502, Physiology for Public Health; EPH 508, Foundations of Epidemiology and Public Health; 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; and CDE 650, Introduction to Evidence-Based Medicine and Health Care. 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.

SOCIAL AND BEHAVIORAL SCIENCES

Ph.D. students in the Social and Behavioral Sciences (SBS) must complete a minimum of fourteen courses (not including EPH 600 and SBS 610) from the following courses or their equivalents. Course waivers must be recommended by the academic adviser and approved by the DGS. Students must 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. Required

courses (or their equivalents) are: EPH 508, Foundations of Epidemiology and Public Health; CDE 516, Principles of Epidemiology II; CDE 534, Applied Analytic Methods in Epidemiology; CDE 617, Developing a Research Proposal*; SBS 580, Qualitative Research Methods in Public Health; SBS 610, Applied Area Readings for Qualifying Exams; SBS 676, Questionnaire Development; and SBS 699, Advanced Topics in Social and Behavioral Sciences. In addition, in consultation with their dissertation adviser, students choose three advanced-level (600 or above) statistics courses (from Biostatistics, Psychology, Political Science, Sociology, or Statistics and Data Science[†]) as well as three 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 whether there are training-specific requirements with the principal investigator of the grant.

* CDE 617 is not required of students funded by the Interdisciplinary HIV Prevention Training Grant. Those students must take a fourth elective in order to meet the sixteen-course requirement.

[†] S&DS 563, Multivariate Statistical Methods for the Social Sciences, is an option to fulfill the statistics course requirement.

ENVIRONMENTAL HEALTH SCIENCES

Ph.D. students in Environmental Health Sciences must take a minimum of thirteen courses (more may be required by a student's adviser). Students have a choice of two concentrations: Environmental Epidemiology and Exposure Science, and Environmental and Molecular Toxicology. For both concentrations, required courses are: EPH 505, Biostatistics in Public Health; EPH 508, Foundations of Epidemiology and Public Health; EHS 503, Public Health Toxicology; EHS 507, Environmental Epidemiology; EHS 508, Environmental and Occupational Exposure Science; EHS 545, Molecular Epidemiology; EHS 525, Seminar and Journal Club in Environmental 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 and EHS 525 may be assigned additional readings. (EHS 525 and EPH 600 do not count toward the required thirteen courses.)

In addition, all students are required to complete two research rotations during the first year: EHS 620 (total of two units). At the end of the lab rotation students give a presentation and are graded based on their rotation work and presentation.

Students specializing in *Environmental Epidemiology and Exposure Science* must choose a minimum of four electives from the following: BIS 623, Applied Regression Analysis; BIS 625, Categorical Data Analysis; BIS 628, Longitudinal and Multilevel Data Analysis; CDE 516, Principles of Epidemiology II; CDE 520, Case-Based Learning for Genetic and Environmental Diseases; CDE 617, Developing a Research Proposal; EHS 502, Physiology for Public Health; EHS 511, Principles of Risk Assessment; EHS 547, Climate Change and Public Health; EHS 562, Applications in Systems

Biology in Public Health; F&ES 755, Modeling Geographic Space; and F&ES 756, Modeling Geographic Objects.

Students specializing in *Environmental and Molecular Toxicology* must choose a minimum of four electives from the following: EHS 502, Physiology for Public Health; EHS 511, Principles of Risk Assessment; EHS 537, Water, Sanitation, and Global Health; EHS 547, Climate Change and Public Health; EHS 562, Applications in Systems Biology in Public Health; CDE 520, Case-Based Learning for Genetic and Environmental Diseases; and CDE 617, Developing a Research Proposal.

EPIDEMIOLOGY OF MICROBIAL DISEASES

Ph.D. students in the Department of Epidemiology of Microbial Diseases (EMD) must complete a minimum of ten courses (not including EPH 600). Course waivers must be recommended by the academic adviser and approved by 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) are graded and account for three of the required ten courses. Student progress is reviewed at the end of each academic year.

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 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: EMD 538, Quantitative Methods for Infectious Disease Epidemiology; EMD 539, Introduction to Public Health Surveillance; EMD 543, Global Aspects of Food and Nutrition; 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 680, Advanced Topics in Tropical Parasitic Diseases; CDE 617, Developing a Research Proposal; HPM 570, Cost-Effectiveness Analysis and Decision-Making; and S&DS 538, Probability and Statistics.

HEALTH POLICY AND MANAGEMENT

Ph.D. students in the Department of Health Policy and Management (HPM) are required to develop expertise in one of three disciplinary concentrations—Economics; Organizational Theory and Management; or Political and Policy Analysis—and then to apply this discipline to a more specialized area; the latter becomes their area of distinction.

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 eighteen, 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 Student Executive Committee (GSEC), in conjunction with the student's adviser, 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 two of the eighteen courses.

Courses required of all students are: EPH 600, Research Ethics and Responsibility (does not count toward the total number of required courses); both terms of HPM 617, Colloquium in Health Services Research (does not count toward the total number of required courses); EPH 508, Foundations of Epidemiology and Public Health; and EPH 608, Frontiers of Public Health. Students entering the program with an M.P.H. degree may be exempt from EPH 508 and EPH 608.

HPM 610, Applied Area Readings, is required of all second-year students. Students are also expected to attend the departmental research seminar for faculty and the doctoral research seminar.

In Methods and Statistics, a minimum of four courses are required from the following: BIS 623, Applied Regression Analysis; BIS 625, Categorical Data Analysis; BIS 628, Longitudinal and Multilevel Data Analysis; SBS 580, Qualitative Research Methods in Public Health; ECON 556, Topics in Empirical Economics and Public Policy; ECON 558, Econometrics; HPM 583, Methods in Health Services Research; PLSC 500, Quantitative Methods I: Research Design and Data Analysis; PLSC 503, Quantitative Methods II: Foundations of Statistical Inference; PLSC 504, Advanced Quantitative Methods; 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; S&DS 565, Applied Data Mining and Machine Learning.

In Health Policy and Management, a minimum of four courses, all with Ph.D. readings, are required from the following: 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 561, Managing Health Care Organizations; HPM 570, Cost-Effectiveness Analysis and Decision-Making; HPM 573, Advanced Topics in Modeling Health Care Decisions; HPM 587, Advanced Health Economics; HPM 590, Addiction, Economics, and Public Policy; and HPM 597, Capstone Course in Health Policy.

Disciplinary Concentrations

Students in HPM must complete a minimum of four courses, all with Ph.D. readings, in their chosen disciplinary concentration.

In *Economics*, required courses are: ECON 545, Microeconomics; and ECON 558, Econometrics (which may count as a Methods and Statistics class or as a disciplinary concentration 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 554, Behavioral Decision-Making II: Judgment. 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 disciplinary concentration. Typically these are taken in the summer after two years of course work.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

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 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 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 Graduate Studies Executive Committee. Students who have been admitted to candidacy are required by the Graduate School to complete an annual Dissertation Progress Report.

Each DAC is expected 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 to the DAC and other invited faculty. 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 Graduate Studies Executive Committee are required to attend the presentation.

MASTER'S DEGREES

M.Phil. (en route to the Ph.D.) The M.Phil. is awarded to 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 three specialty areas: Biostatistics (a two-year program), Health Informatics (a two-year program), and Chronic Disease Epidemiology (a one-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 program in Chronic Disease Epidemiology) or in at least two full-term graduate courses (for students enrolled in the two-year program in Biostatistics or in 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 or Chronic Disease Epidemiology 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. IN BIOSTATISTICS

Faculty in the Biostatistics department of the School of Public Health offer a two-year terminal Master of Science degree. Fields include clinical trials, epidemiologic methodology, statistical genetics, and mathematical models for infectious diseases.

Special Admissions Requirements

Applicants should have a strong background in quantitative sciences such as mathematics. In addition, it is recommended that applicants have undergraduate course work in the biological and social sciences. At a minimum, applicants would have taken one year of calculus and a course in linear algebra prior to enrolling in this program. The GRE General Test is required. The TOEFL is required of all applicants whose native language is not English. This requirement is waived only for applicants who, prior to matriculation at Yale, will have received a baccalaureate degree or its foreign equivalent from a college or university where English is the primary language of

instruction. If you do not qualify for a waiver but have taken the TOEFL within the past two years, you will need to have your TOEFL scores released to us (code 3987).

Course Requirements

The M.S. in Biostatistics track requires the completion of fifteen required courses (not including EPH 600, BIS 695, and BIS 525). Required courses are: BIS 525, Seminar in Biostatistics and Journal Club; BIS 540, Fundamentals of Clinical Trials; BIS 623, Applied Regression Analysis; BIS 625, Categorical Data Analysis; BIS 628, Longitudinal and Multilevel Data Analysis; BIS 630, Applied Survival Analysis; BIS 678, Statistical Practice I; BIS 679, Advanced Statistical Programming in SAS and R; BIS 681, Statistical Practice II; BIS 695, Summer Internship in Biostatistical Research; EPH 508, Foundations of Epidemiology and Public Health; EPH 600, Research Ethics and Responsibility; S&DS 541, Probability Theory; and S&DS 542, Theory of Statistics. Students entering the program with an M.P.H. may be exempt from EPH 508.

Students must complete two Statistics electives at the 600 level. Students will also be required to attend a Professional Skills Seminar (details provided in the first term).

Additionally students must choose two Biostatistics electives from these courses: BIS 557, Computational Statistics; BIS 567, Bayesian Statistics; BIS 643, Theory of Survival Analysis; BIS 646, Nonparametric Statistical Methods and Their Applications; BIS 651, Spatial Statistics in Public Health; and BIS 691, Theory of Generalized Linear Models. Students demonstrating a mastery of topics covered by the required courses may replace them with more advanced courses but must receive written permission from their adviser and the DGS prior to enrolling in the substitute courses.

Students wishing to complete a thesis may enroll in BIS 650 (1 course unit). 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. IN HEALTH INFORMATICS

This two-year M.S. provides a 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.

Special Admissions Requirements

Applicants should typically have an undergraduate degree with a focus in health, computer science, and mathematics/statistics. Applicants must submit scores from either the MCAT or the GRE General Test. Students whose native language is not English must take the TOEFL examination. Part-time enrollment is not permitted.

Course Requirements

The M.S. in Health Informatics consists of a total of fourteen courses (excluding EPH 600, Research Ethics and Responsibility): eight required courses, four electives, and satisfactory completion and presentation of a yearlong capstone project.

Six of the eight required courses are: CB&B 740, Clinical and Translational Informatics; CB&B 750, Core Topics in Biomedical Informatics; EPH 505, Biostatistics in Public Health; EPH 508, Foundations of Epidemiology and Public Health; EPH 608, Frontiers of Public Health; and S&DS 565, Applied Data Mining and Machine Learning. New courses for this program are in development; as they are approved, the DGS will inform students of the two additional required courses. Students who have demonstrated a mastery of topics covered by the required courses may substitute more advanced courses. Students must receive written permission from the DGS and their adviser prior to enrolling in the substitute courses.

Four electives are required. Suggested electives are: BIS 540, Fundamentals of Clinical Trials; BIS 557, Computational Statistics; BIS 623, Applied Regression Analysis; BIS 625, Categorical Data Analysis; BIS 643, Theory of Survival Analysis; BIS 651, Spatial Statistics in Public Health; BIS 679, Advanced Statistical Programming in SAS and R; CB&B 645, Statistical Methods in Computational Biology; CB&B 760, Population Health Informatics; CPSC 477, 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 534, Personal Leadership: Leading the Self Before Others; MGT 656, Management of Software Development; and NURS 922, Introduction to Clinical Research Informatics.

In the second year of the program, students are required to complete an independent capstone project under the direction of a faculty member. This project may fall into one of the main areas – clinical informatics; clinical research informatics; population health informatics; and implementation of new methods and technology – and may include elements from several of these areas. Students are required to prepare a carefully written report and make an oral presentation of the work to the faculty and students. A capstone committee consisting of two faculty and one outside reader will provide guidance to the candidate as to the suitability of the project and monitor its progress.

TERMINAL M.S. IN CHRONIC DISEASE EPIDEMIOLOGY

Faculty in the Chronic Disease Epidemiology department of the School of Public Health offer a one-year terminal Master of Science degree. 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.

Special Admissions Requirements

Applicants should have a basic understanding of quantitative science and statistics. It is recommended that candidates have strong science backgrounds and demonstrated competency in statistical analysis and logical thinking. Applicants from rigorous programs in the biological or social sciences will be given preference. At a minimum, applicants should have one year of course work in statistics or equivalent prior to enrolling in this program. Applicants must submit scores from either the MCAT or the GRE General Test. Students whose native language is not English must take the TOEFL or IELTS examination.

Course Requirements

The M.S. track in Chronic Disease Epidemiology requires the completion of ten courses (excluding the Ethics course, EPH 600; and Seminar, CDE 525), including a capstone course.* Required courses are: BIS 623, Applied Regression Analysis; BIS 625, Categorical Data Analysis; BIS 630, Applied Survival Analysis; EPH 508, Foundations of Epidemiology and Public Health; CDE 516, Principles of Epidemiology II; CDE 525, Seminar in Chronic Disease Epidemiology; CDE 617, Developing a Research Proposal; and EPH 600, Research Ethics and Responsibility.

In addition, students must complete three electives. Suggested electives are: BIS 540, Fundamentals of Clinical Trials; BIS 561, Advanced Topics and Case Studies in Multicenter Clinical Trials; BIS 621, Regression Models; BIS 643, Theory of Survival Analysis; BIS 645, Statistical Methods in Human Genetics; CDE 520, Case-Based Learning for Genetic and Environmental Diseases; CDE 532, Epidemiology of Cancer; CDE 533, Topics in Perinatal 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; CDE 600, Directed Readings (one term); CDE 650, Introduction to Evidence-Based Medicine and Health Care; and SBS 531, Health and Aging.

* 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.

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 timeframe outlined. The DGS must approve any variations to these requirements.

Teaching

One term of teaching is required. If students teach beyond this requirement, they can be compensated. 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 lab technique and/or to allow the student time to determine if the PI'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 course work. 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 may 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 doctoral courses in years one and two before they affiliate 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 can sometimes be done earlier with approval of the Ph.D. adviser and DGS.

Prospectus Timeline

Following completion of the qualifying exam, students should focus on the prospectus, which has to be approved by the Public Health Graduate Studies Executive Committee (GSEC) before the end of their 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 Graduate Studies Executive Committee. All 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).

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; e-mail, melanie.elliott@yale.edu.

REQUIRED COURSES

For a complete list of Public Health courses, see the School of Public Health bulletin, available online at <http://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 600a, Research Ethics and Responsibility Christian Tschudi

This course seeks to introduce major concepts in the ethical conduct of research and some of the personal and professional issues that researchers encounter in their work.

Sessions are run in a seminar/discussion format. Prerequisite: doctoral student or postdoctoral status only. o Course cr

EPH 6o8b, Frontiers of Public Health Albert Ko

This course is designed for Ph.D. and Advanced Professional M.P.H. students. It explores the major public health achievements in the last century in order to provide students with a conceptual interdisciplinary framework by which effective interventions are developed and implemented. Discussions examine the advances across disciplines of biomedical research, epidemiology and biostatistics, environmental and behavioral sciences, and health policy and management services that led to these major public health achievements. The course examines global and national trends in the burden of disease and underlying determinants of disease, which pose new challenges; and it covers new approaches that are on the forefront of addressing current and future public health needs.

Religious Studies

451 College Street, 203.432.0828
<http://religiousstudies.yale.edu>
 M.A., M.Phil., Ph.D.

Chair

Kathryn Lofton

Acting Chair (2018–2019)

Harry Stout

Director of Graduate Studies

Christine Hayes

Professors Harold Attridge (*Divinity*), Joel Baden (*Divinity*), Gerhard Böwering, John J. Collins (*Divinity*), Stephen Davis, Carlos Eire, Steven Fraade, Paul Franks (*Philosophy*), Bruce Gordon (*Divinity*), Philip Gorski (*Sociology*), Phyllis Granoff, Frank Griffel, John Hare (*Divinity*), Christine Hayes, Jennifer Herdt (*Divinity*), Noel Lenski (*Classics*), Kathryn Lofton, Ivan Marcus, Andrew McGowan (*Divinity*), Sally Promey (*American Studies*), Gregory Sterling (*Divinity*), Harry Stout, Kathryn Tanner (*Divinity*), Shawkat Toorawa (*Near Eastern Languages & Civilizations*), Miroslav Volf (*Divinity*), Robert Wilson

Associate Professors Zareena Grewal (*American Studies*), Willie Jennings (*Divinity*), Noreen Khawaja, Hwansoo Kim, Nancy Levene, Chloë Starr (*Divinity*), Eliyahu Stern, Tisa Wenger (*Divinity*), Travis Zadeh

Assistant Professors Maria Doerfler, Eric Greene

Senior Lecturers Supriya Gandhi, John Grim (*Forestry & Environmental Studies*), Margaret Olin, Mary Evelyn Tucker (*Forestry & Environmental Studies*)

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, Hebrew Bible/Old Testament, History of Ancient Christianity, Islamic Studies, Judaic Studies, New Testament, Religious Ethics, Theology, Religion and Modernity, and Philosophy of Religion.

SPECIAL ADMISSIONS REQUIREMENTS

The department requires the scores of the GRE General Test; previous study in areas relevant to the chosen field of study, including ancient languages where applicable; and a writing sample of 20–30 pages, which will be evaluated for both content and style. Prospective students must apply in one of the ten fields of study, and when requesting information they should specify their particular field of interest.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Students are required to take 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. 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 at least two years 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 Travis Zadeh

Required seminar for doctoral students in Religious Studies. Others admitted with instructor's permission.

RLST 522b, 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 567a / SAST 562a, Readings in Pali Texts Phyllis Granoff

In this course we read a selection of ritual texts from India's three classical religions, Buddhism, Jainism, and Hinduism. Prerequisite: a knowledge of Sanskrit.

RLST 592b / HIST 888b, Society and Religion on the Silk Road Eric Greene

An introduction to artifacts and documents pertaining to social history and religion from the most important sites on the Northern and Southern Silk Roads in China, including Niya, Kizil, Turfan, and Dunhuang. Assigned readings are in English.

Readers of Chinese also participate in a separate section reading documents in classical Chinese from Turfan and Dunhuang.

RLST 594a / EALL 700a, The Three Teachings in Medieval China Lucas Bender and Eric Greene

This course explores intersections between the Three Teachings – Buddhism, Daoism, and Confucianism – in late medieval China, focusing on the seventh through the ninth century. Too often studied in isolation from one another, these religious and intellectual teachings were deeply intertwined throughout this period, and scholars aiming to understand the religious, intellectual, and literary history of the Tang need to be able to read broadly across their boundaries. All primary readings are in classical/literary Chinese. Open to undergraduates with sufficient language skills. Prerequisite: reading ability in classical/literary Chinese.

RLST 595a, Readings in Indian Philosophy Phyllis Granoff

In this course we read selections from a variety of Sanskrit texts, the *Samkhya-tatva-kauṇḍīya*, *Madhyamika-kārikā*, *Brahmasūtra-bhāṣya*, and *Prāmaṇya-tattva-lokānka*.

RLST 598b / EAST 511b, Modern Korean Buddhism in the Global Context 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 613a / CLSS 877a / CPLT 556a, Rhetorics of the Ancient World Michal Beth Dinkler and Irene Peirano

This interdisciplinary course takes as its starting point Greco-Roman rhetoric as a codified system and explores its relevance for contemporary interpretation of ancient texts. Moving back and forth between rhetoric as a set of norms and rhetoric as a condition of discourse, we engage with contemporary rhetorical studies in Classics and Biblical studies. Topics include rhetoric and narrative, exemplarity and imitation across the literary and spiritual realms, “anti-rhetoricism,” embedded rhetorical performances (e.g., speeches, oratory, etc.), and nonverbal forms of persuasion (e.g., visual, emotional, etc.).

RLST 649a, Jesus to Muhammad: Ancient Christianity to the Rise of Islam Stephen Davis

The history of Christianity and the development of Western culture from Jesus to the early Middle Ages. The creation of orthodoxy and heresy; Christian religious practice; philosophy and theology; politics and society; gender; Christian literature in its various forms, up to and including the early Islamic period.

RLST 653a / EGYPT 514a, Gnostic Texts in Coptic Harold Attridge

The course reads selected portions of important texts from the Nag Hammadi collection, including the Apocryphon of John, the Gospel of Thomas, the Gospel of Truth, Thunder, the Treatise on Resurrection, the Tripartite Tractate, as well as other

noncanonical texts preserved in Coptic, including the Gospel of Mary and the Gospel of Judas. Prerequisite: EGY 510 or equivalent.

RLST 658b / EGY 512b, Egyptian Monastic Literature in Coptic Stephen Davis
Readings in the early Egyptian classics of Christian ascetism in Sahidic Coptic, including the Desert Fathers and Shenoute. Prerequisite: EGY 510b or equivalent.

RLST 691a, Society and the Supernatural in Early Modern Europe Carlos Eire
Readings in primary texts from the period 1500–1700 that focus on definitions of the relationship between the natural and supernatural realms, both Catholic and Protestant. Among the topics to be covered: mystical ecstasy, visions, apparitions, miracles, and demonic possession. All assigned readings in English translation.

RLST 703a / AMST 719a, Interrogating the Crisis of Islam Zareena Grewal
In official and unofficial discourses in the United States, diagnoses of Islam's various "crises" are ubiquitous, and Muslim "hearts and minds" are viewed as the "other" front in the War on Terror. Since 9/11, the U.S. State Department has made the reform of Islam an explicit national interest, pouring billions of dollars into USAID projects in Muslim-majority countries, initiating curriculum development programs for madrasas in South Asia, and establishing the Arabic Radio Sawa and the satellite TV station Al-Hurra to propagate the U.S. administration's political views as well as what it terms a "liberal" strain of Islam. Muslim Americans are also consumed by debates about the "crisis" of Islam, a crisis of religious authority in which the nature and rapidity of change in the measures of authority are felt to be too difficult to assimilate. This course maps out the various and deeply politically charged contemporary debates about the "crisis of Islam" and the question of Islamic reform through an examination of official U.S. policy, transnational pulp Islamic literature, fatwas and essays authored by internationally renowned Muslim jurists and scholars, and historical and ethnographic works that take up the category of crisis as an interpretive device.

RLST 705b / AMST 705b / HIST 582b, Readings in Religion in American Society, 1600–2018 Tisa Wenger

This seminar explores intersections of religion and society in American history from the colonial period to the present as well as methodological problems important to their study. It is designed to give graduate students a working knowledge of the field, ranging from major recent studies to bibliographical tools. In short, the seminar is a broad readings course surveying religion in American history from colonization to the present. It is not a specialized research seminar, but it does require a basic understanding of historiography.

RLST 715a, The Theology and Philosophy of Fakhr al-Din al-Razi Frank Griffel
Recent research has shown that Fakhr al-Din al-Razi was the most influential Muslim theologian in the so-called postclassical period in Islam after 1100. In his works, Islamic theology and philosophy reached a mature state that brings together several intellectual traditions, among them that of classical Ash'arism, of Aristotelian philosophy (*falsafa*), of al-Ghazali's critique of *falsafa*, and of Sufism. The kind of synthesis that Fakhr al-Din al-Razi created dominated the education of Sunni theologians up to the mid-eighteenth century, when the confrontation with modernity created new priorities. This seminar takes a close look at this understudied thinker. The goal is to understand the most widespread kind of Islamic theology of the centuries between 1200 and 1750, a time that is not yet covered in textbooks on Islamic intellectual history. We read selections of

Fakhr al-Din's work in the Arabic original. Prerequisites: a firm grounding in classical Arabic and permission of the instructor.

RLST 716b, Theories and Methods in Islamic Studies Travis Zadeh

RLST 717a, Islamic Theology and Philosophy Frank Griffel

Historical survey of major themes in Muslim theology and philosophy, from teachings of the Qur'an to contemporary Muslim thought. The systematic character of Muslim thought and of the arguments given by thinkers; reason vs. revelation; the emergence of Sunnism in the tenth through eleventh centuries; the reaction of Muslim theology (from 1800) to the challenges of the West; and contemporary Muslim thought.

RLST 720b, The Qur'an and Its Interpretation Gerhard Böwering

Intensive study of the Qur'an with special emphasis on its biblical roots. Readings in Arabic commentaries on the Qur'an. Prerequisites: advanced knowledge of Arabic and permission of the instructor.

RLST 731a, Islam, Conquest, and Conversion Travis Zadeh

Through examination of conquest and religious conversion in the formative periods of Islamic history, this course interrogates the idea that Islam was spread by violent domination. Case studies are drawn from the Middle East, South and Southeast Asia, the Indian Ocean, Iberia, and West Africa.

RLST 733a, Seminar on Sufism Gerhard Böwering

A study of Islamic asceticism and mysticism with emphasis on the early development of Sufism. Readings in Arabic Sufi sources of the ninth to eleventh century. Prerequisites: reading knowledge of classical Arabic and permission of the instructor.

RLST 739b, Jonathan Edwards and American Puritanism Harry Stout and Kenneth Minkema

This course offers students an opportunity for intensive reading in and reflections upon the significance of early America's premier philosophical theologian through an examination of the writings of the Puritans, through engagement with Edwards's own writings, and through selected recent studies of Euro-Indian contact. Through primary and secondary literature, the course familiarizes students with the life and times of Edwards and encourages reading and discussion about his background, historical and intellectual contexts, and legacy.

RLST 746a / JDST 736a / NELC 701a, Midrash Seminar: The Revelation at Sinai

Steven Fraade

The giving of the Torah to Israel as seen through rabbinic eyes. Close readings of midrashic texts. Views of revelation, tradition, interpretation, law, and commandment in their literary and historical contexts. Interpretations and interpretive strategies compared and contrasted with those of other ancient biblical exegetes (Jewish and non-Jewish). Prerequisite: reading fluency in ancient Hebrew.

RLST 751b / JDST 721b / NELC 703b, Introduction to Judaism in the Ancient World:

From Temple to Talmud Steven Fraade

The emergence of classical Judaism in its historical setting. Jews and Hellenization; varieties of early Judaism; apocalyptic and postapocalyptic responses to suffering and catastrophe; worship and atonement without sacrificial cult; interpretations of scriptures; law and life; the rabbi; the synagogue; faith in reason; Sabbath and festivals; history and its redemption.

RLST 752a / JDST 727a / NELC 702a, Mishnah Seminar: Tractate Ta'anit on Fasting

Steven Fraade

Close study of a section of the Mishnah, the earliest digest of Jewish law, treating procedures for public fasts in response to drought and other forms of collective adversity. Particular attention to the textual practices of rabbinic legal discourse in relation to its social function, and to the interplay of law and narrative. Prerequisite: reading fluency in ancient Hebrew.

RLST 763a / JDST 701a, The Bible Christine Hayes

This course introduces students to the writings common to both Jewish and Christian scripture (the twenty-four books of the Hebrew Bible or Tanakh found in all Bibles) and examines these writings as diverse and often conflicting expressions of the religious life and thought of ancient Israel as well as a foundational element of Western civilization. Special emphasis on the writings' cultural and historical setting in the ancient Near East; close reading of selected passages; the interpretive history of selected passages influential in Western culture. Students are also introduced to a wide range of critical and literary approaches to biblical studies, including source criticism, tradition criticism, redaction criticism, and contemporary literary criticism. Students view course lectures, which survey the entire Bible, online; class time focuses on comparative materials, close readings, and the interpretation of specific biblical passages in Jewish and Christian culture.

RLST 774b / JDST 781b, History of Jewish Culture, 1500 to the Present Staff

A broad introduction to the history of Jewish culture from the late Middle Ages until the present. Emphasis on the changing interaction of Jews with the larger society as well as the transformation of Judaism in its encounter with modernity.

RLST 775a / CPLT 688a / JDST 842a, Political Theology Hannan Hever

This course investigates the theological aspects of modern political ideologies. Subjects include sovereignty, universalism, law, election, commandment, and messianism. Primary readings include Carl Schmitt, Martin Buber, Alain Badiou, Slavoj Žižek, Daniel Boyarin, and Giorgio Agamben.

RLST 776a / HIST 601a / JDST 790a, Jewish History, Thought, and Narratives in Medieval Societies Ivan Marcus

Research seminar that focuses on the two medieval Jewish subcultures of Ashkenaz (northern Christian Europe) and Sefarad (mainly Muslim and Christian Spain).

RLST 782a / JDST 654a, Biblical Interpretation in Ancient Judaism John Collins

This course explores various forms of early biblical interpretation in the Second Temple period, including Philo and the Dead Sea Scrolls, and implicit interpretations in biblical paraphrases. Prerequisites: Hebrew and Greek.

RLST 797a / HIST 597a / JDST 861a, Twentieth-Century Jewish Politics: Holocaust, Israel, and American History David Sorkin

This course explores the changing nature of Jewish politics in relationship to three of the twentieth century's major events. First we examine Jewish political behavior during the Holocaust, especially the notion of "resistance" vis-à-vis the so-called Jewish councils and the controversy surrounding Hannah Arendt's book *Eichmann in Jerusalem*. Second, we probe the continuities and discontinuities in the establishment of the State of Israel, focusing on the politics of the "Yishuv" (Jewish settlement in Mandatory Palestine) and its relationship to British imperialism. Third, we analyze

shifts in the domestic and foreign policies of the organized American Jewish community during the era of the civil rights movement (1946–64).

RLST 800a, Hebrew Bible Seminar: Problems in the History of Israelite Religion

Robert Wilson

An intensive study of important features of ancient Israelite religion, including the origins of monotheism, the priesthood, worship, prophecy, and apocalyptic.

RLST 803b / ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HIST 502b / HSAR 564b / JDST 653b / NELC 533b, Sensory Experiences in Ancient Ritual

Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

RLST 833a / ARCG 611a / CLSS 811a / NELC 611a, The Ancient Egyptian Temple as Cosmos: Correlation of Architecture and Decoration Program Christina Geisen

The course focuses on the correlation of archaeology, iconography, and philology by analyzing ancient Egyptian temples under the specific consideration of the interplay of architecture and decoration program. The different types of temples and their developments over time are discussed. The main focus is the function of each temple type, which can only be understood by analyzing the architecture of the monument, its decoration program, related texts (such as rituals, myths, and festival description, but also historical texts), and its place in the cultic landscape of the specific location. The class also provides an overview of rituals performed and festivals celebrated in the temples, as well as of the administrative sphere of the temple. Optional field trip to the Metropolitan Museum of Art in New York to see the Temple of Dendur. No previous knowledge of ancient Egyptian culture or languages is necessary; all texts are read in translation.

RLST 890a or b, Advanced Topics in Religion and Modernity Staff

Advanced seminar for doctoral students working at the intersection of religion, philosophy, and politics in the modern period. Readings and topics change from year to year.

RLST 892b / ENGL 959b, Interdisciplinary Philosophy Noreen Khawaja

Seminar for humanities doctoral students who have theoretical interests and who are seeking to explore and strengthen the philosophical dimension of their work. Part I of the course is reading and discussion, including philosophical works and works of recent scholarship across disciplines which have something to teach scholars in literary studies, cultural studies, religious studies, and science studies about how to link, for example, the ethnographic and ontological, history and theory of mind, close reading and phenomenology, affect and aesthetics. Part II centers on students' own research projects. Collaborative development, discussion, critique.

RLST 905a, Theology Doctoral Seminar Linn Tonstad

Spurred by contemporary criticisms of systematic theology, this course considers the various literary forms that theological writing takes, their theological presuppositions and theological effects, with attention to the influence of differences in historical and cultural contexts. Required of Ph.D. students in Theology.

Renaissance Studies

53 Wall Street, Rm. 310, 203.432.0672

<http://renaissance.yale.edu>

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

Chair and Director of Graduate Studies

Carlos Eire

Executive Committee Rolena Adorno, Edwin Duval, Carlos Eire, Roberto González Echevarría, Bruce Gordon, David Scott Kastan, Christina Kraus, Lawrence Manley, Giuseppe Mazzotta, Robert Nelson, David Quint, John Rogers, Keith Wrightson

Faculty associated with the program Rolena Adorno, Emily Bakemeier, Marisa Bass, Paola Bertucci, R. Howard Bloch, Leslie Brisman, Paul Bushkovitch, Ardis Butterfield, Judith Colton (*Emerita*), Edwin Duval, Carlos Eire, Paul Freedman, Roberto González Echevarría, Bruce Gordon, Emily Greenwood, K. David Jackson, Maija Jansson, Jacqueline Jung, David Scott Kastan, Christina Kraus, Noel Lenski, Lawrence Manley, John Matthews, Giuseppe Mazzotta, Mary Miller, Isaac Nakhimovsky, Robert Nelson, Catherine Nicholson, David Quint, Ayesha Ramachandran, John Rogers, Ellen Rosand, Nicola Suthor, Anders Winroth, Keith Wrightson

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.

SPECIAL ADMISSIONS REQUIREMENTS

Only candidates wishing to proceed to a doctorate should apply. Application should be made to the department of concentration, with an indication that the candidate seeks nomination to the combined degree in Renaissance Studies. Applications should be accompanied by scores from the GREs and one research or critical paper.

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 (Introduction to 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 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 — and a third language chosen by the student.

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. 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, 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 684a / CPLT 684a / ENGL 574a / ITAL 720a, Renaissance Epic David Quint and Jane Tylus

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 *De bello civili*, Dante's *Purgatorio*, Tasso's *Gerusalemme liberata*, Camões's *Os Lusíadas*, and Spenser's *Faerie Queene*.

Slavic Languages and Literatures

Arnold Hall, 304 Elm Street, 203.432.1300, slavic.department@yale.edu

<http://slavic.yale.edu>

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

Chair

John MacKay

Director of Graduate Studies

Katerina Clark

Professors Edyta Bojanowska, Katerina Clark, Harvey Goldblatt, John MacKay

Associate Professor Molly Brunson

Assistant Professor Marijeta Bozovic

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 ADMISSIONS REQUIREMENTS

An advanced-level command of the Russian language is required. A ten- to twenty-page writing sample, written in English, should be submitted with the application.

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, Old Church Slavonic, and RUSS 834, Aspects of Russian Grammar and Teaching Methodologies, 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.

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 603a / HSAR 605a, Russian Realist Literature and Painting Molly Brunson

An interdisciplinary examination of the development of nineteenth-century Russian realism in literature and the visual arts. Topics include the Natural School and the formulation of a realist aesthetic; the artistic strategies and polemics of critical realism; narrative, genre, and the rise of the novel; the Wanderers and the articulation of a Russian school of painting; realism, modernism, and the challenges of periodization. Readings include novels, short stories, and critical works by Dostoevsky, Turgenev, Goncharov, Tolstoy, Chekhov, and others. Painters of focus include Fedotov, Perov, Shishkin, Repin, and Kramskoy. Special attention is given to the particular methodological demands of inter-art analysis.

RUSS 651b, 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 696a / FILM 775a, Post-Stalin Literature and Film Katerina Clark

The main developments in Russian and Soviet literature and film from Stalin's death in 1953 to the present.

RUSS 699b / CPLT 677b, The Performing Arts in Twentieth-Century Russia Staff

Covers ballet, opera, theater, mass spectacle, and film. Theory of the performing arts, including selections from the writings of some of the most famous Russian directors, such as Stanislavsky, Meyerhold, Eisenstein, and Balanchine. Their major productions and some of the major Russian plays of the twentieth century (e.g., by Chekhov, Mayakovsky, Bulgakov, and contemporary dramatists). No knowledge of Russian required. Students taking the course for credit in Comparative Literature can write their papers on texts in other languages.

RUSS 714b / FILM 630b, Soviet Cinema and the Distribution of Perception John MacKay

Soviet filmmakers and theorists in the 1920s were preoccupied with the way that the established cinema harnessed perception in socially determined, class-specific ways, and sought a variety of alternatives. This course examines those alternatives and their limitations, as postulated in theory and realized on film, as well as their long-term, global influence on theoretical and moving image practice. We examine films and writings by such figures as Vertov, Eisenstein, Shub, Pudovkin, Kuleshov, Room, Ruttmann, Liu Na'ou, Grierson, Buñuel, Cavalcanti, Peixoto, Deren, Jacobs, Dorsky, Godard, Farocki, Burnett, Akerman, and Wang Bing.

SLAV 752a, The Slavic Peoples and Their Languages: From Unity to Diversity

Harvey Goldblatt

Examination of the linguistic and cultural history of the Slavs from their prehistoric period up to the formation of the diverse Slavic languages, the individual Slavic states, and their national literatures.

SLAV 754a, Church Slavonic Harvey Goldblatt

A study of the long history of Church Slavonic, with special attention given to “New” or “Synodal” Church Slavonic, the language used in the “Elizabeth” or “Synodal” Bible (first published in 1751), which remains even today the authorized version of the Russian Orthodox Church. Special emphasis is placed on the reading of representative New Testament excerpts from this Synodal Bible, comparing them to equivalent textual portions written in both earlier forms of Russian Church Slavonic and Modern Russian. Prerequisite: knowledge of Modern Russian. Conducted in English.

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, Ron Eyerman, Philip Gorski, Grace Kao, Philip Smith

Associate Professors Rene Almeling, Emily Erikson, Jonathan Wrytzen

Assistant Professors Lloyd Grieger, Alka Menon

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. DEGREE IN 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.

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. A student may petition for the M.A. degree in the term following the one in which the student completes the course requirements.

Program materials are available at <http://sociology.yale.edu>.

COURSES

SOCY 506a / MGMT 734a, Designing Social Research Balazs Kovacs

This is a course in the design of social research. The goal of research design is “to ensure that the evidence obtained enables us to answer the initial [research] question as unambiguously as possible” (de Vaus 2001: 9). A good research design presupposes a well-specified (and hopefully interesting) research question. This question can be stimulated by a theoretical puzzle, an empirical mystery, or a policy problem. With the research question in hand, the next step is to develop a strategy for gathering the empirical evidence that will allow you to answer the question “as unambiguously as possible.”

SOCY 508b / PLSC 505b, Qualitative Field Research Daniel Mattingly

In this seminar we discuss and practice qualitative field research methods. The course covers the basic techniques for collecting, interpreting, and analyzing ethnographic data, with an emphasis on the core ethnographic techniques of participant observation and in-depth interviewing. All participants carry out a local research project. Open to undergraduates with permission of the instructor.

SOCY 542a, Sociological Theory Emily Erikson

The course seeks to give students the conceptual tools for a constructive engagement with sociological theory and theorizing. We trace the genealogies of dominant theoretical approaches and explore the ways in which theorists contend with these approaches when confronting the central questions of both modernity and the discipline.

SOCY 560a or b / PLSC 734a or b, Comparative Research Workshop Julia Adams

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 take the course for a letter grade are expected to present a paper-in-progress the term that they are enrolled for credit.

SOCY 576b, Civil Sphere and Democracy Jeffrey Alexander

In dialogue with normative and empirical approaches to civil society (Habermas, Putnam), this course introduces “civil sphere theory,” starting from Alexander’s *The Civil Sphere* (2006) and its critics. The sacred and profane binaries that animate the civil sphere are examined, as are such civil sphere organizations as polls, mass media, electoral systems, law and office. We read works about U.S. presidential elections, immigration and its controversies, the civil rights movements, the crisis of contemporary journalism, and recent controversies over church pedophilia, the financial system, and telephone hacking. We consider the challenge of deprovincializing civil sphere theory, looking at civil spheres in Latin America and East Asia. Regarding the

possibility of a cosmopolitan or global civil society, we examine the struggle against apartheid in South Africa.

SOCY 580a, Introduction to Methods in Quantitative Sociology Staff

Introduction to methods in quantitative sociological research. Covers data description; graphical approaches; elementary probability theory; bivariate and multivariate linear regression; regression diagnostics. Includes hands-on data analysis using Stata.

SOCY 581b, Intermediate Methods in Quantitative Sociology Staff

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 595a or b, Inequality and Life Course Workshop Staff

In this workshop we present and discuss ongoing research work, primarily but not exclusively quantitative analyses. In addition, we address theoretical and methodological issues in the areas of the life course (education, training, labor markets, aging, as well as family demography), social inequality (class structures, stratification, and social mobility), and related topics.

SOCY 598a and SOCY 599b, Independent Study Philip Gorski

By arrangement with faculty. When students register for the course online, the dropdown menu should be completed.

SOCY 602b, Poverty and Social Welfare Policy in the United States Lloyd Grieger

Who is poor in America? How has the social safety net evolved over time in the United States? Who is “deserving” of federal assistance? In this course we examine the formation and effectiveness of anti-poverty policies in the United States from a sociological and public policy perspective. Topics include the origins of the modern social safety net, the role of the federal government in constructing and implementing anti-poverty policy, the realities of low-wage work, and the “culture of poverty.” Employment- and family-based policy strategies for alleviating poverty are considered. Applied understanding of quantitative social science research methods is helpful, but not required.

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 Jeffrey Alexander

This workshop is designed to be a continuous part of the graduate curriculum. Meeting weekly throughout both the fall and spring terms, it constitutes an ongoing, informal seminar to explore areas of mutual interest among students and faculty, both visiting and permanent. The core concern of the workshop is social meaning and its forms and processes of institutionalization. Meaning is approached as both structure and performance, drawing not only on the burgeoning area of cultural sociology but on the humanities, philosophy, and other social sciences. Discussions range widely among methodological, theoretical, empirical, and normative issues. Sessions alternate between presentations by students of their own work and by visitors. Contents of the workshop vary from term to term, and from year to year. Enrollment is open to auditors who fully participate and for credit to students who submit written work.

SOCY 629b / WGSS 629b, Politics of Reproduction Rene Almeling

Reproduction as a process that is simultaneously biological and social, involving male and female bodies, family formation, and powerful social institutions such as medicine, law, and the marketplace. Sociological research on reproductive topics such as pregnancy, birth, abortion, contraception, infertility, reproductive technology, and aging. Core sociological concepts used to examine how the politics of reproduction are shaped by the intersecting inequalities of gender, race, class, and sexuality.

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 Staff

This required seminar aims at introducing incoming sociology graduate students to the department and the profession. Yale Sociology faculty members are invited to discuss their research. There are minimum requirements, such as writing a book review. No grades are given; students should take for Audit. Held biweekly.

SOCY 660a / AFAM 825a, Black Urban America As Sociological Memoir Gerald Jaynes

This interdisciplinary course traces formation of contemporary African American class and family structures through investigation of how evolving racialized class-gender relations shaped twenty-first-century populations of poor and affluent blacks. Sources drawn from social sciences, history, literature to explore relationships between social behavior (agency) and blocked opportunity (structure).

Spanish and Portuguese

82-90 Wall Street, 203.432.5439, 203.432.1151

<http://span-port.yale.edu>

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

Chair

R. Howard Bloch

Director of Graduate Studies

Rüdiger Campe

Professors Rolena Adorno, Roberto González Echevarría, Aníbal González-Pérez, K. David Jackson, Noël Valis

Associate Professor Leslie Harkema

Senior Lector I Ame Cividanes

FIELDS OF STUDY

Fields include Spanish Peninsular literature, Spanish American literature, Portuguese and Brazilian literatures.

The doctoral program offers: (1) a concentration in Spanish specializing in a single field of study (medieval, Renaissance/Golden Age, modern Spanish Peninsular, colonial Spanish American, contemporary Spanish American); (2) a joint concentration in Spanish and Portuguese offering the student the opportunity to work in both the Luso Brazilian and Spanish/Spanish American fields, with a specialization in either of the two fields. In addition, the department participates in (1) a combined Ph.D. program in Spanish and Portuguese and African American Studies offered in conjunction with the Department of African American Studies and (2) a combined Ph.D. program in Spanish and Portuguese and Renaissance Studies offered in conjunction with the Renaissance Studies Program.

SPECIAL ADMISSIONS REQUIREMENTS

Thorough command of the language in which the student plans to specialize and a background in its literature, as well as command of at least one of the two additional languages in which the student will need to fulfill requirements, are required.

Application must include GRE scores, a personal statement, and an academic writing sample in the language of the proposed specialization, not to exceed twenty-five pages in length. Students whose native language is not English must submit scores of the Test of English as a Foreign Language (TOEFL).

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

The department requires two years of course work, sixteen term courses, a grade of Honors in at least two of these courses each year, and a minimum grade average of High Pass. Course work includes two required courses, SPAN 500, History of the Spanish Language, and SPAN 790, Methodologies of Modern Language Teaching, and four courses taken outside the department. Also required are a reading knowledge of Latin and a second language, which may be Portuguese or another language-literature. 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 course SPAN 790 in the second year and teaching four courses during the third and fourth years of study. At least three of these must be courses in the beginning language sequence; viewed as an integral part of the course of study for the doctorate, this program includes supervision by the director of the language program and course directors. The fourth course may be a literature or culture course taught through a teaching fellowship.

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 two of the three language requirements (Latin and one other language).

COURSES

PORT 922a, Brazil's Modern Art Movement K. 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 925b, Brazilian Modernist Poetry K. David Jackson

This course studies the generation of major poets who were part of Brazilian modernism, centered on the "Modern Art Week" of 1922 and the poetry written to express the individuality and character of Brazil's language and culture at the onset of modernization, urbanization, and industrialization. Major poets include Manuel Bandeira, Carlos Drummond de Andrade, Cecília Meireles, Murilo Mendes, Mário de

Andrade, Raul Bopp, Luís Aranha, Oswald de Andrade, Jorge de Lima, and Vinícius de Moraes. Points of analysis include form, use of language, themes of memory and modernization, cultural characterization, humor, and ethical and existential concerns.

PORT 975a, Experimental, Visual, and Concrete Poetry in Perspective K. David Jackson

Brazilian concrete poetry in international perspective; production and theory of concrete poetry, translation, and criticism during the second half of the twentieth century. Brazilian concrete poets in the context of visual and concrete poetics. Representative works include “Pilot Plan” and *Theory of Concrete Poetry*, graphic and spatial poems, and public expositions of works. Brazilian concrete poets were among the leaders of an international neo-vanguard movement in the mid-twentieth century related to geometrical abstraction in painting. In the journals *Noigãndres* and *Invenção*, and in *Theory of Concrete Poetry*, the Brazilians link their poetics to Pound, Mallarmé, Cummings, and other inventive figures in world poetry, while relating poetry to graphic arts through reference to painting and to semiotics, including Fenollosa’s essay on use of the Chinese character. The exhibit in S. Paulo’s Museum of Modern Art in December 1956 was the beginning of the public exhibition of concrete poetry, now the topic of anthologies, websites, criticism, and museum retrospectives. Concrete poetics dominated the production of poetry in Brazil for half a century with a major effect on cultural and intellectual life. Prerequisite: PORT 140 or equivalent.

SPAN 688a / CPLT 676a, Law and Literature in Modern Latin America Roberto González Echevarría

A study of major modern narrative works in Latin America from the independence and post-independence period in the nineteenth century to the age of drug trafficking and the AIDS epidemic today. The course begins with the Cuban Cirilo Villaverde’s antislavery novel *Cecilia Valdés* (1880); moves on to the regionalist classic *Doña Bárbara* (1929) by the Venezuelan Rómulo Gallegos and the dictator novel *El señor presidente* (1946) by the Guatemalan Miguel Ángel Asturias; peaks with Gabriel García Márquez’s total novel *Cien años de soledad* (1967); and ends with the Colombian Fernando Vallejo’s *La virgen de los sicarios* (1994) and the Mexican Mario Bellatin’s *Salón de belleza* (2009). The course follows the thematics of the law, particularly Roman Law, and the way in which the characters are controlled or driven by civil and criminal law issues that constitute the plots of the novels. In Spanish.

SPAN 711b, Clarín/Galdós: *La Regenta* and *Fortunata y Jacinta* Noël Valis

An in-depth reading of two nineteenth-century Spanish narrative masterpieces. We analyze the texts as literary aesthetic achievements and explore their cultural-historical contexts. In Spanish.

SPAN 790b, Methodologies of Modern Language Teaching Ame 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 812a, The Polemics of Possession in Early Spanish American Narrative Rolena Adorno

Fundamental writings on the Spanish Indies from Columbus’s “Letter of Discovery” of 1493 to the writings by authors of indigenous American heritage in the first quarter of the seventeenth century: their observations of New World realities, their debates

about the meanings and rights of Spanish sovereignty, and their literary relationships to one another. The concept of “the polemics of possession” – their varied claims to territorial, political, cultural, and/or literary authority – orients the readings of the seminar. Prose texts by Cristóbal Colón, Hernán Cortés, Bartolomé de las Casas, Juan Ginés de Sepúlveda, Hernán Pérez de Oliva, Álar Núñez Cabeza de Vaca, Bernal Díaz del Castillo, El Inca Garcilaso de la Vega, and Felipe Guaman Poma de Ayala are complemented by Alonso de Ercilla’s enduring narrative epic poem. In Spanish.

SPAN 904a / CPLT 965a, Latin American Thought Moira Fradinger

This seminar introduces students to two centuries of Latin American political thought in the form of social and literary essays produced since the times of independence. It studies how Latin American writers have thought of their identity and how they have theorized the political/cultural heritage of the colony. The seminar starts with the Haitian constitution and contemporary Haitian authors who assess the legacy of the Haitian revolution. It ends with writings on current indigenous movements across the region. The first unit engages nineteenth-century debates over “American identity” that were foundational to the newly constituted nation-states (authors include Bolívar, Lastarria, Alamán, Martí, Sarmiento, Echeverría, Montalvo). The second explores twentieth-century debates over cultural independence, the movement of “indigenismo,” *mestizaje*, transculturation and heterogeneity, the Caribbean movement of “negritude,” the metaphor of “cannibalism” to account for the cultural politics of the region, concepts such as “internal colonialism” and “motley society,” and the polemics over the region’s capitalist modernity and postmodernity (authors include Rodó, da Cunha, Ortiz, Moreno Fragnals, Lezama Lima, Vasconcelos, Reyes, de Andrade, González Prada, Mariátegui, Antenor Orrego, Zapata, J.L. Borges, J.M. Arguedas, Sérgio Buarque de Holanda, Caio Prado Júnior, Jean Price-Mars, Jacques Roumain, Aimé Césaire, George Lamming, C.L.R. James, Fanon, Léon Damas, Paulo Freire, Angel Rama, Retamar, Edmundo O’Gorman, Antonio Candido, Darcy Ribeiro). The third explores recent debates over indigenous cosmologies, coloniality, and other ways of knowing (authors include Pablo González Casanova, León-Portilla, R. Kusch, René Zavaleta Mercado, A. Quijano, Bolívar Echeverría, Silvia Rivera Cusicanqui, Viveiros de Castro). There is an extra session on the tradition of Latin American feminist thought depending on the interests of the group. Weekly sessions are conducted in Spanish, and most of the readings are Spanish, French, and Portuguese materials (with a few Anglo-Caribbean sources). Students will be provided with English translations if they prefer and will be allowed to write their papers in English.

SPAN 912a / CPLT 942a, The Borges Effect Roberto González Echevarría

Since the publication of *Ficciones* in 1944 and especially since achieving worldwide acclaim after receiving *ex-aequo* with Samuel Beckett the Formentor Group’s Prix International in 1961, Jorge Luis Borges has become one of the most influential modern writers. He is a recognizable and often acknowledged presence in the work of novelists and short-story writers, as well as in that of philosophers and literary theorists. A Borges “effect” can be perceived in John Barth, Julio Cortázar, Gabriel García Márquez, Italo Calvino, and Umberto Eco, and in Maurice Blanchot, Michel Foucault, Gérard Genette, and Jacques Derrida, among others. That effect is also projected retrospectively in Borges’s particular way of reading classics like Homer, Dante, and Cervantes. An elegant, playfully ironic skepticism, together with a fondness for aporias, enigmas, puzzles, and labyrinths as well as for minor genres such as the detective story, are the

most recognizable components of Borges's style and thought. Taken together these components suggest theories about writing and reading. We read closely Borges's most influential stories, such as "Tlön, Uqbar, Orbis Tertius," "Pierre Menard, Author of the *Quijote*," and "The Garden of Forking Paths," as well as his essays on Homer, Dante, and Cervantes. We then follow his track in the writers mentioned. Class discussions in English; readings in English or the French, Spanish, or Italian originals.

SPAN 978a, Religion and the Novel in Contemporary Spanish American Narrative

Aníbal González Perez

This seminar examines the many ways in which religious discourse has been appropriated in the twentieth-century Spanish American novel, often with the aim of turning novels into "sacred texts." We also consider the meaning of the "literary theology" that Spanish American literature has generated by creatively adapting into its makeup a variety of religious concepts, such as "the holy," the notion of an afterlife, reincarnation, salvation, canonization, and the various theories about the nature of God. Primary readings include works ranging from Federico Gamboa's *Santa* (1903), María Luisa Bombal's *La amortajada* (1938), and selected essays and stories by Jorge Luis Borges in *Discusión* (1932) and *El Aleph* (1949), to Gabriel García Márquez's *Cien años de soledad* (1967), Severo Sarduy's *Maitreya* (1978), Mario Vargas Llosa's *La guerra del fin del mundo* (1981), and Tomás Eloy Martínez's *Santa Evita* (1995). Secondary texts include Longinus, Rudolf Otto, and James Thrower. In Spanish.

SPAN 991a, Tutorial Staff

By arrangement with faculty.

SPAN 999a, Tutorial Staff

Statistics and Data Science

24 Hillhouse Avenue, 203.432.0666
<http://statistics.yale.edu>
 M.A., Ph.D.

Chair

Harrison Zhou

Acting Chair (2018–2019)

Daniel Spielman

Directors of Graduate Studies

Andrew Barron (24 Hlh, andrew.barron@yale.edu)

David Pollard (24 Hlh, david.pollard@yale.edu)

Professors Donald Andrews (*Economics*), Andrew Barron, 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*), John Hartigan (*Emeritus*), Theodore Holford (*Public Health/Biostatistics*), Edward Kaplan (*School of Management/Operations Research*), Harlan Krumholz (*Internal Medicine*), John Lafferty, Peter Phillips (*Economics*), David Pollard, Daniel Spielman, Hemant Tagare (*Radiology & Biomedical Engineering*), Van Vu (*Mathematics*), Heping Zhang (*Public Health/Biostatistics*), Hongyu Zhao (*Public Health/Biostatistics*), Harrison Zhou, Steven Zucker (*Computer Science*)

Associate Professors Peter Aronow (*Political Science*), Donald Lee (*School of Management; Operations*), Sekhar Tatikonda

Assistant Professors Timothy Armstrong (*Economics*), Jessi Cisewski, Zhou Fan, Amin Karbasi (*Electrical Engineering*), Roy Lederman, Vahideh Manshadi (*School of Management/Operations*), Sahand Negahban, Fredrik Savje (*Political Science*), Yihong Wu

Senior Lecturer Jonathan Reuning-Scherer

Lecturers Russell Barbour, William Brinda, Derek Feng, Winston Lin, Susan Wang

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 ADMISSIONS REQUIREMENTS

GRE scores for the General Test are required. A GRE Subject Test in the area closest to the undergraduate major is recommended for the Ph.D. program and encouraged for the M.A. program. All applicants should have a strong mathematical background,

including advanced calculus, linear algebra, elementary probability theory, and at least one course providing an introduction to mathematical statistics. An undergraduate major may be in statistics, mathematics, computer science, or in a subject in which significant statistical problems may arise. For those whose native language is not English, the Test of English as a Foreign Language (TOEFL) scores are required. This requirement is waived only for applicants who, prior to matriculation at Yale, will have received a baccalaureate degree or its international equivalent with three years of residency from a college or university where English is the primary language of instruction.

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), 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 (at level 20 or the equivalent) during four terms to acquire professional training. Although this may be completed during the third and fourth years, most students satisfy part of this requirement in the earlier years of study, with approval of the DGS and their adviser, in areas contributing to their professional development.

MASTER'S DEGREES

M.A. (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.

Terminal Master's Degree Program in Statistics Students are also admitted directly to a terminal master's degree program in Statistics. To qualify for the M.A., the student must successfully complete an approved program of eight term courses in Statistics with an average grade of HP or higher, 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's degree program. See 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 Xiaofei Wang

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 and William Brinda

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 520b, Intensive Introductory Statistics William Brinda

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 Jessica Cisewski and Staff
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.

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: differential calculus of several variables; some acquaintance with matrix algebra and computing is assumed.

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

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, Stochastic Processes Yihong Wu

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 Staff

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 or b, Applied Data Mining and Machine Learning Staff

Techniques for data mining and machine learning are covered from both a statistical and a computational perspective, including support vector machines, bagging, boosting, neural networks, and other nonlinear and nonparametric regression methods. The course gives 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. Prerequisite: after or concurrent with S&DS 542.

S&DS 600b, 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 625a, Statistical Case Studies Xiaofei Wang

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.

S&DS 626b, Practical Work Staff

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 Staff

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. ½ Course cr per term

S&DS 630a, Optimization Techniques Sekhar Tatikonda

Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton's method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the sciences.

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

Introduction to problems, algorithms, and data analysis approaches in computational biology and bioinformatics. We discuss statistical issues arising in analyzing population genetics data, gene expression microarray data, next-generation sequencing data, microbiome data, and network data. Statistical methods include maximum likelihood, EM, Bayesian inference, Markov chain Monte Carlo, and methods of classification and clustering; models include hidden Markov models, Bayesian networks, and graphical models. Prerequisite: S&DS 538, S&DS 542, or S&DS 661. Prior knowledge of biology is

not required, but some interest in the subject and a willingness to carry out calculations using R is assumed.

S&DS 661b, Data Analysis William Brinda

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 674b, Applied Spatial Statistics Timothy Gregoire

An introduction to spatial statistical techniques with computer applications. Topics include modeling spatially correlated data, quantifying spatial association and autocorrelation, interpolation methods, variograms, kriging, and spatial point patterns. Examples are drawn from ecology, sociology, public health, and subjects proposed by students. Four to five lab/homework assignments and a final project. The class makes extensive use of the R programming language as well as ArcGIS.

S&DS 690a or b, Independent Study Staff

By arrangement with faculty. Approval of DGS required.

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 Coordinators

Edward Kamens (143 Elm St.; *East Asian Languages & Literatures*)

J.G. Manning (311 Phelps Hall; *Classics; History*)

Steering Committee (2015–18) Joel Baden (*Divinity*), Ruth Barnes (*Yale University Art Gallery*), Oswald Chinchilla (*Anthropology*), John J. Collins (*Divinity*), Stephen Davis (*Religious Studies*), Steven Fraade (*Religious Studies; Judaic Studies*), Eckart Frahm (*Near Eastern Languages & Civilizations*), Milette Gaifman (*Classics; History of Art*), Michael Hunter (*East Asian Languages & Literatures*), Edward Kamens (*East Asian Languages & Literatures*), Noel Lenski (*Classics; History*), J.G. Manning (*Classics; History*), Susan Matheson (*Yale University Art Gallery*), Irene Peirano Garrison (*Classics*)

Archaia: 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 qualification. 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 qualification 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 qualification 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 qualification en route to the doctorate. The qualification in Archaia is open to Yale Ph.D. students and to students at the Divinity School.

A program of study for completion of the qualification 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 QUALIFICATION

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 pre-approved courses, of which at least two must be seminar or seminar-type courses, chosen in consultation with Archaia's graduate coordinator and 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 a graduate coordinator of Archaia 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 DGS of the Classics department, indicating that they have completed the work for the qualification.

CORE SEMINAR

ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HIST 502b / HSAR 564b / JDST 653b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual

Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

Atmospheric Science

Advisory Committee Sarbani Basu (*Astronomy*), Michelle Bell (*Forestry & Environmental Studies*), Alexey Fedorov (*Geology & Geophysics*), Debra Fischer (*Astronomy*), Gary Haller (*Emeritus, Chemical & Environmental Engineering*), Xuhui Lee (*Forestry & Environmental Studies*), Ronald Smith (*Geology & Geophysics*), Mitchell Smooke (*Mechanical Engineering & Materials Science; Applied Physics*), Mary-Louise Timmermans (*Geology & Geophysics*), John Wettlaufer (*Geology & Geophysics; 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. The Department of Geology and Geophysics 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

Anthony Koleske

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.

SPECIAL ADMISSIONS REQUIREMENTS

Entrance requirements to BBS are track-specific but include the following: GRE General Test scores; relevant GRE Subject Test scores (strongly recommended but not a strict requirement); undergraduate major in a relevant biological, chemical, or physical science; three letters of recommendation addressing the student's academic performance and/or laboratory training; and TOEFL exam scores for students whose native language is not English. Track-specific requirements are listed below.

Biochemistry, Quantitative Biology, Biophysics, and Structural Biology

All applicants are expected to meet general BBS requirements for entrance. Successful applicants will have a firm foundation in the sciences. Desirable courses include biology; biochemistry; general, organic, and physical chemistry; physics; and math. A pertinent GRE Subject Test is strongly recommended.

Computational Biology and Bioinformatics

All applicants are expected to meet general BBS requirements for entrance. In addition, successful applicants will have a strong foundation in the basic sciences such as biology, chemistry, and mathematics. Training in computing/informatics is also essential and should include significant computer programming experience. The GRE Subject Test in Biology, Chemistry, or other relevant discipline is recommended. The MCAT is also accepted.

Immunology

All applicants are expected to meet general BBS requirements for entrance. In addition, successful applicants are expected to have a firm foundation in the biological and physical sciences. It is preferred that students have taken courses in biology, organic chemistry, biochemistry, genetics, cell biology, physics, and mathematics. Actual course requirements are not fixed, however, and students with outstanding records in any area of the biological sciences may qualify for admission. There are no specific grade requirements for prior course work, but a strong performance in basic science courses is

of great importance for admission. In special cases the Medical College Admission Test (MCAT) may be substituted.

Microbiology

No additional requirements or recommendations.

Molecular Cell Biology, Genetics, and Development

In addition to general BBS requirements, the GRE Subject Test in Biology or Chemistry is recommended.

Molecular Medicine, Pharmacology, and Physiology

All applicants are expected to meet general BBS requirements for entrance. Successful applicants should have a strong background in the biological, chemical, and/or physical sciences. For example, an undergraduate major/degree in biology, biochemistry, physiology, genetics, chemistry, physics, mathematics, engineering, or computer science could be appropriate. Courses in biology, biochemistry, organic and physical chemistry, and mathematics through elementary calculus are strongly recommended.

Neuroscience

All applicants are expected to meet general BBS requirements for entrance. Successful applicants will have a firm foundation in the sciences. The Neuroscience track will accept the Medical College Admission Test (MCAT) in lieu of the Graduate Record Examination (GRE) General Test.

Plant Molecular Biology

All applicants are expected to meet general BBS requirements for entrance.

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; e-mail, bbs@yale.edu; website, <https://medicine.yale.edu/bbs>.

COURSES

B&BS 501b, Responsible Conduct of Research Barbara Kazmierczak and John Forrest

The course is held in six (6) 1.5 hour sessions, with the participation of Yale faculty members. The course format is lecture with group discussion and case studies.

o Course cr

B&BS 640a / PATH 640a, Developing and Writing a Scientific Research Proposal

Katarina Politi

The course covers the intricacies of scientific writing and guides students in the development of a scientific research proposal on the topic of their research. All elements of an NIH fellowship application are covered, and eligible students submit their applications for funding. Enrollment limited to fifteen. Required of second-year graduate students in Experimental Pathology. Registration allowed by prior authorization from course directors only.

B&BS 680b / IMED 680b, Topics in Human Investigation Joseph Craft

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 681a / PATH 681a, Advanced Topics in Cancer Biology Ryan Jensen

This advanced course focuses on readings and discussion on three or four major topics in cancer biology, such as targeted therapy, tumor immunology, tumor metabolism, and genomic evolution of cancer. For each topic, the class starts with an interactive lecture,

followed by critical analysis of primary research literature. Recent research articles are assigned, and a student leads discussions with input from faculty who are experts in the topic area. Prerequisite: PATH 650 or permission of the instructor. Open to all Ph.D., M.D./Ph.D., and M.P.H. students and to advanced undergraduates at the discretion of the instructor.

B&BS 879a, Theory and Practice of Scientific Teaching Elizabeth Luoma

The Cowles Foundation

30 Hillhouse Avenue, 203.432.3702

<http://cowles.yale.edu>

Director

Larry Samuelson

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.

The Economic Growth Center

27 Hillhouse Avenue, 203.432.3610

www.econ.yale.edu/~egcenter

Director

Mark Rosenzweig

The Economic Growth Center is a research organization within the Yale Department of Economics that was created in 1961 to analyze, both theoretically and empirically, economic growth and development. The research program emphasizes the search for regularities in the process of growth and changes in economic structure. In recent years the center has also undertaken new and continuing long-term panel studies and is carrying out randomized field experiments in a number of countries to provide new information on and analyses of the consequences and mechanisms of development. An increasing share of the research involves historical analysis of long-term processes as part of the Economic History Program that is housed in the Economic Growth Center. Current projects in the center include research on technology adoption; microfinance and credit markets; formal insurance; scaling up from randomized control trial; studies of external validity; household consumption; investment and demographic behavior; the role of networks; agricultural research and productivity growth; labor markets and the returns to education of women and men; entrepreneurship; general-equilibrium effects of program interventions; income distribution; domestic and international migration; the relationship between trade and development; production scale; and international political economy. The center's research faculty hold appointments in the Department of Economics and other departments and schools at Yale, and accordingly have teaching as well as research responsibilities.

The center sponsors a number of activities, including a regular series of workshops on development, trade, and economic history, and provides competitive research grants to graduate students and faculty as well as graduate student fellowships.

The Economic Growth Center Collection, housed in a separate facility at the Center for Science and Social Science Information, is a special collection focused on the statistical, economic, and planning documents of developing countries, including government documents.

The center administers, jointly with the Department of Economics, the Yale master's degree program in International and Development Economics.

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 2019, 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 Richard Sleight

The purpose of this course is to provide students with the opportunity of gaining 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 Richard Sleight

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 and 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

Jacob Hacker

Executive Committee Nicholas Christakis, John Dovidio, Heather Gerken, James Levinsohn, Jennifer Richeson, Frances Rosenbluth, Ian Shapiro, Jody Sindelar, Ebonya Washington

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, the Center for the Study of Inequality, and ISPS Health—a University-wide health policy center. 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.

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

Nuno Monteiro

International Security Studies (ISS) at Yale was founded in 1988 and is supported by the Smith Richardson Foundation and the Friends of ISS. The Brady-Johnson Program in Grand Strategy, directed by Beverly Gage, also falls under the auspices of ISS.

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 global life.

ISS organizes an array of extracurricular activities each academic year. It hosts lectures, dinner debates, conferences, colloquia, and discussion groups. In addition to hosting a running graduate and faculty forum on the historical roots of contemporary issues, ISS 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. ISS also provides academic fellowships and visiting affiliations 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/faculty>.

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.

As of 2015, 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>, e-mail jackson.institute@yale.edu, or call 203.432.6253.

Judaic Studies

451 College Street, 203.432.0843
<http://judaicstudies.yale.edu>

Chair and Director of Graduate Studies

Steven Fraade

Professors Joel Baden (*Divinity*), John J. Collins (*Divinity; Religious Studies*), Joseph (Yossi) David (*Visiting*), Steven Fraade (*Religious Studies*), Paul Franks (*Philosophy*), Warren Zev Harvey (*Visiting*), Christine Hayes (*Religious Studies*), Hannan Hever (*Comparative Literature*), Ivan Marcus (*History; Religious Studies*), Paul North (*German*), Maurice Samuels (*French*), David Sorkin (*History*), Laura Wexler (*Women's, Gender, & Sexuality Studies; American Studies*), Robert Wilson (*Divinity; Religious Studies*)

Associate Professor Eliyahu Stern (*Religious Studies; History*)

Senior Research Scholar Margaret Olin (*Divinity; History of Art; Religious Studies*)

Senior Lecturer Peter Cole (*Comparative Literature*)

Lecturers Asaf Angermann (*Philosophy*), Yair Assulin (*Visiting*), Micha Perry (*Visiting*)

Senior Lector II Shiri Goren (*Near Eastern Languages & Civilizations*)

Senior Lector I Dina Roginsky (*Near Eastern Languages & Civilizations*)

Lectors Josh Price, 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 653b / ANTH 531b / ARCG 531b / CLSS 815b / EALL 773b / HIST 502b / HSAR 564b / NELC 533b / RLST 803b, Sensory Experiences in Ancient Ritual

Carolyn Laferriere and Andrew Turner

A comparative exploration of the role the senses played in the performance of ancient and premodern ritual, drawing from a range of ancient traditions including those of Greece, Rome, and Egypt, and from cultural traditions of the Near East, India, China, and the New World. Placing particular emphasis on the relationship between art and ritual, we discuss the methods available for reconstructing ancient sensory experience, how the ancient cultures conceived of the senses and perception, and how worshippers' sensory experiences, whether visual, sonic, olfactory, gustatory, or haptic, were integral aspects in their engagement with the divine within religious ritual. This seminar incorporates material in the Yale Art Gallery.

JDST 654a / RLST 782a, Biblical Interpretation in Ancient Judaism John Collins

This course explores various forms of early biblical interpretation in the Second Temple period, including Philo and the Dead Sea Scrolls, and implicit interpretations in biblical paraphrases. Prerequisites: Hebrew and Greek.

JDST 686b / CPLT 679b, Major Modern Jewish Poets Peter Cole

This course introduces students to a diverse group of modern Jewish poets, from Gertrude Stein, Moyshe-Leyb Halpern, and Adrienne Rich to Muriel Rukeyser, Yehuda Amichai, Paul Celan, Edmond Jabès, Leonard Cohen, and others. Writing in English, Yiddish, German, Hebrew, and French, these poets gave seminal expression to Jewish life in a variety of modes and permutations, and in the process produced poems of lasting and universal value. The class explores work as art and considers pressing questions of cultural, historical, and political context. All readings are in English. Permission of the instructor required.

JDST 701a / RLST 763a, The Bible Christine Hayes

This course introduces students to the writings common to both Jewish and Christian scripture (the twenty-four books of the Hebrew Bible or Tanakh found in all Bibles) and examines these writings as diverse and often conflicting expressions of the religious life and thought of ancient Israel as well as a foundational element of Western civilization. Special emphasis on the writings' cultural and historical setting in the ancient Near East; close reading of selected passages; the interpretive history of selected passages influential in Western culture. Students are also introduced to a wide range of critical and literary approaches to biblical studies, including source criticism, tradition criticism, redaction criticism, and contemporary literary criticism. Students view course lectures, which survey the entire Bible, online; class time focuses on comparative materials, close readings, and the interpretation of specific biblical passages in Jewish and Christian culture.

JDST 721b / NELC 703b / RLST 751b, Introduction to Judaism in the Ancient World: From Temple to Talmud Steven Fraade

The emergence of classical Judaism in its historical setting. Jews and Hellenization; varieties of early Judaism; apocalyptic and postapocalyptic responses to suffering and catastrophe; worship and atonement without sacrificial cult; interpretations

of scriptures; law and life; the rabbi; the synagogue; faith in reason; Sabbath and festivals; history and its redemption.

JDST 727a / NELC 702a / RLST 752a, Mishnah Seminar: Tractate Ta'anit on Fasting

Steven Fraade

Close study of a section of the Mishnah, the earliest digest of Jewish law, treating procedures for public fasts in response to drought and other forms of collective adversity. Particular attention to the textual practices of rabbinic legal discourse in relation to its social function, and to the interplay of law and narrative. Prerequisite: reading fluency in ancient Hebrew.

JDST 736a / NELC 701a / RLST 746a, Midrash Seminar: The Revelation at Sinai

Steven Fraade

The giving of the Torah to Israel as seen through rabbinic eyes. Close readings of midrashic texts. Views of revelation, tradition, interpretation, law, and commandment in their literary and historical contexts. Interpretations and interpretive strategies compared and contrasted with those of other ancient biblical exegetes (Jewish and non-Jewish). Prerequisite: reading fluency in ancient Hebrew.

JDST 781b / RLST 774b, History of Jewish Culture, 1500 to the Present Staff

A broad introduction to the history of Jewish culture from the late Middle Ages until the present. Emphasis on the changing interaction of Jews with the larger society as well as the transformation of Judaism in its encounter with modernity.

JDST 790a / HIST 601a / RLST 776a, Jewish History, Thought, and Narratives in Medieval Societies Ivan Marcus

Research seminar that focuses on the two medieval Jewish subcultures of Ashkenaz (northern Christian Europe) and Sefarad (mainly Muslim and Christian Spain).

JDST 801a / HIST 599a, Medieval Jewish History: 800–1500 CE Staff

This course is an introduction to some of the major themes in the history of the Jewish people from late antiquity to 1500. We trace the development of Jewish communities in Muslim and Christian lands, focusing on the complex relationship that Jews had with their host societies. Other topics include Jewish self-government and communal organization and major currents in Jewish intellectual culture. The course follows a thematic line, moving from demographics to economics, from legal issues to intellectual and social questions.

JDST 802b / HIST 600b, Jewish Everyday Life in the Middle Ages Staff

Medieval Jewish history has been based primarily on written sources and hence has tended to concentrate on the intellectual male elite, institutions, and events. In recent years, historians are increasingly interested in everyday, or quotidian, history, looking beyond the intellectual elite to society as a whole and using, alongside texts, archaeology and the material world. Following the “material turn,” this seminar focuses on Jewish material culture, using archaeology and art history in the service of cultural history. Among the subjects considered are the Jewish quarter and street; the synagogue; the ritual bath (mikve); the cemetery and gravestone; book culture; charters; jewelry; fashion; and food.

JDST 842a / CPLT 688a / RLST 775a, Political Theology Hannan Hever

This course investigates the theological aspects of modern political ideologies. Subjects include sovereignty, universalism, law, election, commandment, and messianism.

Primary readings include Carl Schmitt, Martin Buber, Alain Badiou, Slavoj Žižek, Daniel Boyarin, and Giorgio Agamben.

JDST 861a / HIST 597a / RLST 797a, Twentieth-Century Jewish Politics: Holocaust, Israel, and American History David Sorkin

This course explores the changing nature of Jewish politics in relationship to three of the twentieth century's major events. First we examine Jewish political behavior during the Holocaust, especially the notion of "resistance" vis-à-vis the so-called Jewish councils and the controversy surrounding Hannah Arendt's book *Eichmann in Jerusalem*. Second, we probe the continuities and discontinuities in the establishment of the State of Israel, focusing on the politics of the "Yishuv" (Jewish settlement in Mandatory Palestine) and its relationship to British imperialism. Third, we analyze shifts in the domestic and foreign policies of the organized American Jewish community during the era of the civil rights movement (1946–64).

The Whitney and Betty MacMillan Center for International and Area Studies at Yale

Luce Hall, 203.432.0694
<http://macmillan.yale.edu>

Director

Ian Shapiro (*Political Science*)

For more than half a century the Whitney and Betty MacMillan Center for International and Area Studies at Yale has been the University's principal institution for encouraging and coordinating teaching and research on all aspects of international affairs, societies, and cultures 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 Forestry & Environmental Studies, 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, British Historical Studies, Canadian Studies, East Asian Studies, European Studies, Stavros Niarchos Foundation Center for Hellenic Studies, Himalaya Initiative, Iranian Studies Program, Japan at the Crossroads Project, Latin American and Iberian Studies, Middle East Studies, Religious Freedom and Society in Africa Project, Russian Studies Project, 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; Program on Democracy; European Union Studies; Genocide Studies; Gilder Lehrman Center for the Study of Slavery, Resistance, and Abolition; Global Justice; Center for Historical Enquiry & the Social Sciences; InterAsia Initiative; Georg Leitner Program in International and Comparative Political Economy; Program on Order, Conflict, and Violence; Political Violence FieldLab; Religion, Politics, and Society; and Program on Refugees, Forced Displacement, and Humanitarian Responses.

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 another sixty-four 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 Bengali, Modern Greek, Romanian, Tamil, Yorùbá, and Zulu.

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 nineteen world-renowned academic partners. Through the Programs in International Educational Resources (PIER), the MacMillan Center brings international education and training to educators, K–12 students, and the community at large. 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. Webisodes can be viewed at <http://macmillanreport.yale.edu>. The MacMillan Center is also home to *Yale Global Online*.

For details on degrees, programs, and faculty leadership, please consult <http://macmillan.yale.edu>.

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

136 Rosenkranz Hall, 203.432.1425

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

Graduate Certificate of Concentration in African Studies

Chair

Michael Cappello (*Pediatrics; Microbial Pathogenesis; Public Health*)

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 764, Topics in African Studies, or AFST 501, Research Methods in 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 director of graduate studies (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.

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

Jing Tsu (*East Asian Languages & Literatures; Comparative Literature*)

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 nearly 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 nearly thirty core faculty and more than twenty language instructors spanning ten 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.

European Studies Council

The MacMillan Center

332 Luce Hall, 203.432.3423

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

Graduate Certificate of Concentration in European Studies

Chair

Edyta Bojanowska (*Slavic Languages & Literatures*)

Acting Chair [F]

Julia Adams (*Sociology*)

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 promotes research programs on European politics, culture, economy, society, and history. 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.

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, English, History, History of Art, Political Science, Slavic Languages and Literatures, and Sociology regularly offer courses with a European focus. These are complemented by the rich offerings and faculty strength of the French, German, Italian, Slavic, and Spanish and Portuguese language and literature 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; Russian, East European, and Eurasian Studies; and Hellenic Studies; as well as a Polish cultural initiative.

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 and Slavic languages and literatures; economics; history; music; political science; law; 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, Eastern Europe, Eurasia or (2) Central and Western 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 two modern European languages, in addition to English. Students wishing to focus on Russia and Eastern Europe must demonstrate knowledge of Russian or an Eastern European language; those focusing on Central and Western 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, and
 - b. of the remaining three courses, students focusing on Russia and Eastern Europe must take at least one course concerning the nations of Central and Western Europe. For those focusing on Central and Western Europe, at least one course must concern Russia and Eastern Europe.

3. Interdisciplinary research qualifying paper written either in the context of one of the six courses in the area of concentration, or as independent work under faculty supervision. The paper is required to demonstrate field-specific research ability in the area of concentration. After they have completed substantial course work in the area, students must seek approval from the council faculty adviser for the research project they propose as the qualifying paper. Normally, students will submit their proposals no later than the fourth week of the term in which they plan to submit the qualifying paper.

For more information, contact the European Studies Council, Yale University, PO Box 208206, New Haven CT 06520-8206; european.studies@yale.edu; 203.432.3423.

For course listings, see European and Russian Studies under Degree-Granting Departments and Programs in this bulletin.

Council on Latin American and Iberian Studies

The MacMillan Center

232 Luce Hall, 203.432.3422

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

Graduate Certificate of Concentration in Latin American and Iberian Studies

Chair

To be announced

Professors Rolena Adorno (*Spanish & Portuguese*), Ned Blackhawk (*History; American Studies*), Richard Burger (*Anthropology*), Hazel Carby (*African American Studies; American Studies*), Carlos Eire (*History; Religious Studies*), Eduardo Fernandez-Duque (*Anthropology*), Paul Freedman (*History*), Roberto González Echevarría (*Spanish & Portuguese; Comparative Literature*), Aníbal González-Pérez (*Spanish & Portuguese*), K. David Jackson (*Spanish & Portuguese*), Gilbert Joseph (*History*), Daniel Markovits (*Law*), Mary Miller (*History of Art*), Stephen Pitti (*History*), Alicia Schmidt Camacho (*American Studies*), Stuart Schwartz (*History*), Robert Thompson (*Emeritus, History of Art*), Claudia Vaggia (*Anthropology*), Noël Valis (*Spanish & Portuguese*), Elisabeth Wood (*Political Science*)

Associate Professors Rodrigo Canales (*Management*), Oswaldo Chinchilla (*Anthropology*), Ana De La O Torres (*Political Science*), Anne Eller (*History*), Moira Fradinger (*Comparative Literature*)

Assistant Professors Marcela Echeverri (*History*), Leslie Harkema (*Spanish & Portuguese*), Seth Jacobowitz (*East Asian Languages & Literatures*), Albert Laguna (*American Studies*), Didac Queralt (*Political Science*)

Senior Lectors and Lectors (Spanish & Portuguese) Sybil Alexandrov, Marta Almeida, Maria Pilar Asensio-Manrique, Mercedes Carreras, Ame Cividanes, Sebastián Díaz, María Jordán, Rosamaría León, Juliana Ramos-Ruano, Lissette Reymundi, Maria-Lourdes Sabé Colom, Terry Seymour, Margherita Tortora, Sonia Valle

Others Jane Edwards (*Sr. Associate Dean, Yale College; Dean, International & Professional Experience*), Reinaldo Funes Monzote (*Visiting Professor, MacMillan Center*), María José Hierro Hernández (*Lecturer, Political Science*), Jana Krentz (*Librarian, Latin American & Iberian Collections, Latinx Studies*), Florencia Montagnini (*Sr. Research Scientist, Forestry & Environmental Studies*)

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), Brazil (Jackson, Jacobowitz, Schwartz), the Caribbean (Carby, Echeverri, Eller, Thompson), Central America (Chinchilla, Joseph, Wood), Colombia (Echeverri), Cuba (Laguna), Mexico (Canales, De La O Torres, Joseph, Pitti, Schmidt Camacho), and the Southern Cone (Fradinger). F&ES 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

Kishwar Rizvi (*History of Art*)

Professors Abbas Amanat (*History*), Harold Attridge (*Divinity*), Gerhard Böwering (*Religious Studies*), John J. Collins (*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 (*History of Art*), Kishwar Rizvi (*History of Art*), Maurice Samuels (*French*), Lamin Sanneh (*Divinity*), Shawkat Toorawa (*Near Eastern Languages & Civilizations*), Kevin van Bladel (*Near Eastern Languages & Civilizations*), Harvey Weiss (*Near Eastern Languages & Civilizations*), Robert Wilson (*Divinity*)

Associate Professors Zareena Grewal (*American Studies*), Kaveh Khoshnood (*Public Health*), Mark Lazenby (*Nursing*), Jonathan Wyrzten (*Sociology*), Travis Zadeh (*Religious Studies*)

Assistant Professors Rosie Bsheer (*History*), Thomas Connolly (*French*), Robyn Creswell (*Comparative Literature*), Jill Jarvis (*French*), Eda Pepi (*Women's, Gender, & Sexuality Studies*)

Senior Lecturers and Lecturers Karla Britton (*Architecture*), Karen Foster (*Near Eastern Languages & Civilizations; History of Art*), Tolga Köker (*Economics*), 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*), Orit Yeret (*Hebrew*)

Librarians and Curators Roberta Dougherty (*Near East Collection*), Agnete Wisti Lassen (*Babylonian Collection*), Susan Matheson (*Ancient Art, Yale University 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, including summer- and academic-year language fellowships 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

A. Mushfiq Mobarak (*School of Management*)

Associate Chair

Harry Blair (*Political Science*)

Professors Tim Barringer (*History of Art*), Michael Dove (*Forestry & Environmental Studies*), Phyllis Granoff (*Religious Studies*), Inderpal Grewal (*Women's, Gender & Sexuality Studies*), Alan Mikhail (*History*), A. Mushfiq Mobarak (*School of Management*), Kishwar Rizvi (*History of Art*), Kalyanakrishnan Sivaramakrishnan (*Anthropology*), Shyam Sunder (*School of Management*), Steven Wilkinson (*Political Science*)

Associate Professors Nihal DeLanerolle (*School of Medicine*), Mayur Desai (*Public Health*), Zareena Grewal (*American Studies; Religious Studies*), Karuna Mantena (*Political Science*), Andrew Quintman (*Religious Studies*)

Assistant Professors Rohit De (*History*), Subhashini Kaligotla (*History of Art*), Priyasha Mukhopadhyay (*English*)

Senior Lecturer Geetanjali Singh Chanda (*Women's, Gender & Sexuality Studies*)

Lecturer Carol Carpenter (*Forestry & Environmental Studies*)

Senior Lectors Seema Khurana (*Hindi*), Swapna Sharma (*Hindi*)

Students with an interest in South Asian Studies should apply to one of the University's degree-granting departments, such as Anthropology, History, Political Science, Economics, or Religious Studies. The South Asian Studies Council is part of the MacMillan Center for International and Area Studies. It has been organized to provide guidance to graduate students who desire to use the resources of the departments of the University that offer South Asia-related courses.

The South Asian Studies Council aims to bring together faculty and students sharing an interest in South Asia, and it supplements the curriculum with seminars, conferences, and special lectures by scholars from Yale as well as visiting scholars. It provides information concerning grants, fellowships, research programs, and foreign study opportunities.

Language instruction is offered in Hindi and Sanskrit. Students planning to undertake field research or language study in South Asia may apply to the council for summer fellowship support.

For information and program materials, contact the South Asian Studies Council, Yale University, PO Box 208206, New Haven CT 06520-8206; or visit our website, <http://southasia.macmillan.yale.edu>.

COURSES

HNDI 510a, Elementary Hindi 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 and Seema Khurana

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 Seema Khurana and 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 Seema Khurana

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 598b, 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 562a / RLST 567a, Readings in Pali Texts Phyllis Granoff

In this course we read a selection of ritual texts from India's three classical religions, Buddhism, Jainism, and Hinduism. Prerequisite: a knowledge of Sanskrit.

SKRT 510a / LING 515a, Introductory Sanskrit I Staff

An introduction to Sanskrit language and grammar. Focus on learning to read and translate basic Sanskrit sentences in the Indian Devanagari script. No prior background in Sanskrit assumed. Credit only on completion of SKRT 520/LING 525.

SKRT 520b / LING 525b, Introductory Sanskrit II Staff

Continuation of SKRT 510/LING 515. Focus on the basics of Sanskrit grammar; readings from classical Sanskrit texts written in the Indian Devanagari script. Prerequisite: SKRT 510/LING 515.

SKRT 530a / LING 538a, Intermediate Sanskrit I Staff

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 540b / LING 548b, Intermediate Sanskrit II Staff

Continuation of LING 538, focusing on Sanskrit literature from the *kavya* genre. Readings include selections from the *Jatakamala* of Aryasura and the opening verses of Kalidasa's *Kumarasambhava*. Prerequisite: LING 538/SKRT 530 or equivalent.

Council on Southeast Asia Studies

The MacMillan Center

311 Luce Hall, 203.432.3431, seas@yale.edu

<http://cseas.yale.edu>

Chair

Michael Dove (*Forestry & Environmental Studies*)

Professors Michael Dove (*Forestry & Environmental Studies*), J. Joseph Errington (*Anthropology*), Benedict Kiernan (*History*), James Scott (*Political Science*), Mimi Hall Yiengpruksawan (*History of Art*)

Associate Professor Erik Harms (*Anthropology*)

Lecturers and Lectors (I, II) Dinny Risri Aletheiani (*Southeast Asian Languages*), Carol Carpenter (*Forestry & Environmental Studies*), Amity Doolittle (*Forestry & Environmental Studies*), Quang Phu Van (*Southeast Asian Languages*), Indriyo Sukmono (*Southeast Asian Languages*)

Curators Ruth Barnes (*Indo-Pacific Art, Yale University Art Gallery*), Richard Richie (*Southeast Asia Collection, 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 Richard Richie, Curator, Southeast Asia Collection, Sterling Memorial Library (203.432.1858, rich.richie@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.

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*.

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 570a or b, Readings in Vietnamese Quang Phu Van

For students with advanced Vietnamese language skills who wish to engage in concentrated reading and research. Prerequisite: permission of the instructor.

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 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*), Corey O'Hern (*Mechanical Engineering & Materials Science; Physics; Applied Physics; Computational Biology & Bioinformatics*), Thomas Pollard (*Molecular, Cellular, & Developmental Biology; Molecular Biophysics & Biochemistry*), Anna Pyle (*Molecular, Cellular, & Developmental Biology; Chemistry; Computational Biology & Bioinformatics*)

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, and degree-granting programs include Applied Physics; Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BBS track); Biomedical Engineering; Cell Biology; Chemical & Environmental Engineering; Computational Biology and Bioinformatics (BBS track and also degree-granting program); Mechanical Engineering & Materials Science; Molecular, Cellular, and Developmental Biology; Molecular Cell Biology, Genetics, and Development (BBS track); Neuroscience (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, either Dynamical Systems in Biology (MCDB 562/AMTH 765/CB&B 562/ENAS 561/INP 562/MB&B 562/PHYS 562) or Introduction to Dynamical Systems in Biology (MCDB 561/CB&B 561/MB&B 561/PHYS 561), should be completed by the end of the second year. With permission of the PEB leadership, one of the following three courses may be substituted to satisfy the fourth course requirement: (1) Systems Biology of Cell Signaling (ENAS 567), (2) Biomedical Data Science: Mining and Modeling (MB&B 752/CB&B 752/CPSC 752/MCDB 752), and (3) 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>.

Women's, Gender, and Sexuality Studies

315 William L. Harkness Hall, 203.432.0845

<http://wgss.yale.edu>

Chair

Margaret Homans

Director of Graduate Studies

Greta LaFleur

Professors Julia Adams (*Sociology*), Carol Armstrong (*History of Art*), Seyla Benhabib (*Political Science*), Jill Campbell (*English*), Hazel Carby (*African American Studies; American Studies*), Kang-i Sun Chang (*East Asian Languages & Literatures*), Jacqueline Goldsby (*English; African American Studies*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies; American Studies; Anthropology*), Margaret Homans (*English; Women's, Gender, & Sexuality Studies*), Jennifer Klein (*History*), Marianne LaFrance (*Psychology; Women's, Gender, & Sexuality Studies*), Kathryn Lofton (*American Studies; Religious Studies*), Mary Lui (*American Studies; History*), Joanne Meyerowitz (*History*), Sally Promey (*American Studies; Institute of Sacred Music; Religious Studies*), Ana Ramos-Zayas (*Ethnicity, Race, & Migration; Women's, Gender, & Sexuality Studies; American Studies*), Naomi Rogers (*History of Science & Medicine*), Alicia Schmidt Camacho (*American Studies*), Michael Warner (*English*), Laura Wexler (*American Studies; Women's, Gender, & Sexuality Studies*)

Associate Professors Rene Almeling (*Sociology*), Crystal Feimster (*African American Studies; American Studies*), Joseph Fischel (*Women's, Gender, & Sexuality Studies*), Moira Fradinger (*Comparative Literature*), Zareena Grewal (*American Studies; Religious Studies*), Angel David Nieves (*Women's, Gender, & Sexuality Studies*)

Assistant Professors Marta Figlerowicz (*Comparative Literature*), Greta LaFleur (*American Studies*), Edi Pepi (*Women's, Gender, & Sexuality Studies*), Dixa Ramirez (*American Studies*), Evren Savci (*Women's, Gender, & Sexuality Studies*)

Senior Lecturers Becky Conekin (*MacMillan Center; History*), Andrew Dowe (*Women's, Gender, & Sexuality Studies*), Maria Trumpler (*Women's, Gender, & Sexuality Studies*)

Lecturers Melanie Boyd (*Women's, Gender, & Sexuality Studies*), Igor De Souza (*Women's, Gender, & Sexuality Studies; English*), Karen Foster (*Near Eastern Languages & Civilizations*), Graeme Reid (*Women's, Gender, & Sexuality Studies*), George Syrimis (*Hellenic Studies*)

FIELDS OF STUDY

The Program in Women's, Gender, and Sexuality Studies considers gender and sexuality as fundamental categories of social and cultural analysis and offers critical perspectives upon them as a basis from which to study the diversity of human experience. Gender (the social and historical meanings of the distinction between the sexes) and sexuality (the domain of sexual practices, identities, discourses, and institutions) are studied as they intersect with class, race, ethnicity, nationality, and other axes of human difference. The introduction of these perspectives into all fields of

knowledge necessitates new research, criticism of existing research, and the formulation of new paradigms and organizing concepts.

The Certificate (previously known as the Qualification) in Women's, Gender, and Sexuality Studies is open to students already enrolled in a Ph.D. program at Yale. Interested students are strongly encouraged to register for the certificate by meeting with the director of graduate studies (DGS) during their first year. Students who wish to receive the certificate must (1) complete a graduate course on the theory of gender and sexuality; (2) complete two electives, including one course that must be drawn from the WGSS curriculum; (3) complete one term of WGSS 900, WGSS Certificate Workshop; (4) demonstrate the capacity to pursue independent, interdisciplinary research in Women's, Gender, and Sexuality Studies by presenting a qualifying paper at a meeting of the WGSS Colloquium; and (5) fulfill a teaching requirement. Each of these requirements must be met in consultation with the DGS and the individual WGSS graduate adviser. Students who fulfill these expectations will receive a letter from the DGS, indicating that they have completed the work for the certificate.

Program information and the requirements for the certificate are available on the Women's, Gender, and Sexuality Studies website, or by contacting 203.432.0845 or wgss@yale.edu.

COURSES

WGSS 529a / GLBL 529a, Sexuality, Gender, Health, and Human Rights Alice 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 625b, Sexual Orientation, Gender Identity, and Human Rights Graeme Reid
Examination of historical, cultural, and political aspects of sexual orientation, gender identity, and human rights in the context of globalization.

WGSS 629b / SOCY 629b, Politics of Reproduction Rene Almeling

Reproduction as a process that is simultaneously biological and social, involving male and female bodies, family formation, and powerful social institutions such as medicine, law, and the marketplace. Sociological research on reproductive topics such as pregnancy, birth, abortion, contraception, infertility, reproductive technology, and aging. Core sociological concepts used to examine how the politics of reproduction are shaped by the intersecting inequalities of gender, race, class, and sexuality.

WGSS 645b / AFAM 723b / AMST 645b / CPLT 949b, Caribbean Diasporic Intellectuals Hazel Carby

This course examines work by artists and writers of Caribbean descent from different regions of the transatlantic world. In response to contemporary interest in issues of globalization, the premise of the course is that in the world maps of these black intellectuals we can see the intertwined and interdependent histories and relations of the Americas, Europe, and Africa. Thinking globally is not a new experience for

black peoples, and we need to understand that what is represented as “Caribbeanness” is a condition of movement. Literature and art are most frequently taught within the boundaries of a particular nation, but this course focuses on the work of writers and artists who shape the Caribbean identities of their characters as traveling black subjects and refuse to restrain their work within the limits of any one national identity. We practice a new and global type of cognitive mapping as we read and explore the meanings of terms like black transnationalism, migrancy, globalization, and empire. Diasporic practice embraces and represents the geopolitical realities of the modern, modernizing, and postmodern worlds in which multiple racialized histories are inscribed on modern bodies.

WGSS 660b / ANTH 684b, Men, Manhood, and Masculinity Andrew Dowe
Cultural and historic constructions of masculinity through an investigation of male bodies, sexualities, and social interactions. Examination of multiple masculinities and exploration of the relationships among hegemonic, non-hegemonic, and subordinate masculinities.

WGSS 661b, Queer Theology Linn Tonstad
This course provides an introduction to queer theology, its theoretical grounding in queer theory, and some of the controversies and possibilities that make up its current shape. Questions considered include whether Christianity can or should be queer; the implications of contemporary debates in queer theory over temporality, futurity, sociality, and spatiality for the shape and possibility of queer theology itself; how to use art and performance as theological sources; and the way queer theory’s anti-essentialist stance shifts the stakes of debates over the theological and political status of LGBTQ+ persons. The course also considers the impact of HIV/AIDS on notions of community formation, risk, and finitude. Prerequisites: at least one term of theology at the graduate level (introduction to theology or systematic theology) or permission of the instructor; and preferably at least one course in gender studies.

WGSS 667b / FREN 900b / HIST 667b, History of Sexuality in Modern Europe
Carolyn Dean

An introduction to the various lines of inquiry informing the history of sexuality. The course asks how historians and others constitute sexuality as an object of inquiry and addresses different arguments about the evolution of sexuality in Europe, including the relationship between sexuality and the state and sexuality and gender.

WGSS 677a / PHIL 677a, Feminist Philosophy: Theories of Sex, Gender, and Sexual Orientation Robin Dembroff

This course surveys several feminist frameworks for thinking about sex, gender, and sexual orientation. We consider questions such as: Is there a tenable distinction between sex and gender? Between gender and sexual orientation? What does it mean to say that gender is a social construction, or that sexual orientation is innate? What is the place of politics in gender and sexual identities? How do these identities—and especially resistant or transgressive identities—impact the creation and revision of social categories?

WGSS 716a / AFAM 738a / AMST 706a / HIST 711a, Readings in African American Women’s History Crystal Feimster

The diversity of African American women’s lives from the colonial era through the late twentieth century. Using primary and secondary sources we explore the social,

political, cultural, and economic factors that produced change and transformation in the lives of African American women. Through history, fiction, autobiography, art, religion, film, music, and cultural criticism we discuss and explore the construction of African American women's activism and feminism; the racial politics of the body, beauty, and complexion; hetero- and same-sex sexualities; intraracial class relations; and the politics of identity, family, and work.

WGSS 737b / ANTH 735b, Gendering the Modern Subject Eda Pepi

This seminar familiarizes students with how the analytical categories of sex and gender interrogate "classic" philosophical texts and restructure key debates on the nature of the human subject as a locus of unmarked, universal reason and purposeful action as well as embodied perception and passion. From Spinoza and Descartes to Hegel and Merleau-Ponty, we engage an overview of the conceptual and historical development of modern, Western ideas of personhood and the emergence of liberalism as the basis of new technologies of the self. We read these texts alongside feminist, critical race, and postcolonial commentaries that highlight the sexual and racial constitution of a seemingly universal subject of modernity. These commentaries trace how practical theories of "lower" or minor selves—the subject people of the colonies, slaves, and others—were integral to the very development of ideas of the modern, autonomous, and acting self in the Western world.

WGSS 746b / AMST 729b / FILM 810b, Visual Kinship, Families, and Photography

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 782b / HIST 940b / HSHM 770b, Disability Histories: Research Seminar

Naomi Rogers

This course introduces students to the major issues in current disability history as well as theoretical debates in disability studies. We discuss cultural, social, and political meanings of citizenship; efforts to define and classify disabled bodies; contested notions of bodily difference; and the ways disability has and continues to be used as a metaphor for socially defined inferiority like gender, race, or sexuality. By the fourth week students have identified the topic for their research papers and discussed them in class. The next month is devoted to research and writing. We start meeting again after spring break to read and discuss a draft of each paper.

WGSS 852b / AMST 852b / ANTH 852b, Reading the Americas, Reading

Ethnography Ana Ramos-Zayas

The course uses ethnographic approaches to understand "America" as a hemispheric formation, while simultaneously examining "ethnography" as methodological, epistemological, and representational craft. Complemented by critical readings and seminar discussions about some of the trademarks of ethnographic research—e.g., participant observation, life history, field notes, and field sites—the course is designed to encourage students to interrogate the theoretical and methodological models that have been used in the production of knowledge about the Americas. Emphasizing ethnography's concern with everyday life, practices, routines, and relationships, it analyzes how micro-processes and manifestations of race, sexuality, class, and gender

entwine with macro-processes of empire and nation-state building, globalization, neoliberalism, transnationalism, urbanism, and social inequality in the United States, Latin America, and parts of the Caribbean. While this is not a “how to” course on ethnographic research, we use classic and contemporary ethnography to understand the region and gain greater knowledge about the process, epistemology, and politics of fieldwork. We analyze a number of aspects and approaches to doing and writing ethnography, including the challenges of entering, being in, and leaving the field; and as we build familiarity with the components of ethnography, we consider its applicability to an array of topics, settings, objects, cultural dynamics, and relationships.

WGSS 853a / FILM 806a, Archives: Histories, Practices, Theories, and Formations

Laura Wexler

This seminar studies the co-constitution of objects-with-documents and undocumented people. We explore theoretical, historical, material, practical, methodological, and curatorial questions related to the operation and status of the archive in this migration of objects and people. Students are asked to work collaboratively in and with archives as sources and tools, and to experiment with creating archives of their own. The seminar involves some travel to Brown and some irregular hours that are mentioned in the syllabus.

WGSS 960a / CPLT 881a / ENGL 960a, Literary Theory Marta Figlerowicz and

Jonathan Kramnick

What is literary theory today, and what is its history? The aim of the course is to introduce students to central concepts in theory and explore their relation to method. We examine the variety of approaches available within the field of literary studies, including older ones such as Russian formalism, New Criticism, deconstruction, Marxism, and psychoanalysis, as well as newer ones like actor-network theory and digital humanities research. We explore the basic tenets and histories of these theories in a way that is both critical and open-minded, and discuss their comparative advantages and pitfalls. The focus is on recurrent paradigms, arguments, and topics, and on transhistorical relations among our various schools of literary-theoretical thought. Readings might include work by René Wellek, Paul de Man, Jacques Derrida, Gayatri Spivak, Bruno Latour, Judith Butler, Northrop Frye, Fred Moten, and many others.

Yale Center for the Study of Globalization

Betts House, 203.432.1900, globalization@yale.edu
<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 studies 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.

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-graduate-school>

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 below 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/academics/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, transcripts from each academic institution previously attended, and the results of 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 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). This requirement is 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. The applicant must have studied in residence at the baccalaureate institution for at least three years to receive a waiver. 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 convictions and disciplinary actions. When an applicant answers affirmatively to either of these questions, 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 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 may be 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 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, preparation for qualifying examinations, gaining teaching experience, and the research and writing leading to the completion of 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 Degree Requirements, below.

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 for 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 <http://gsas.yale.edu/admissions/application-process/non-degree->

programs-division-special-registration. 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, and Renaissance 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 deans 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 the University.

The Graduate School also participates in formal joint-degree programs with the 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 European and Russian Studies, Global Affairs, and International and Development Economics, and for doctoral students in Nursing. 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 School of Medicine (see Requirements for Joint-Degree Programs, below).

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 for an academic year as exchange scholars at the University of California at Berkeley, Brown, University of Chicago, Columbia, Cornell, Harvard, MIT, University of Pennsylvania, Princeton, and Stanford. The Exchange Scholars Program enables students to take advantage of special educational opportunities not available at their home institutions. Applications are available at the website listed above. Please direct questions to Assistant 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 such a program, and that the program will conform to the established guidelines for all such exchange agreements. Students and faculty interested in pursuing these exchanges should contact Assistant Dean Jasmina Besirevic Regan (jasmina.besirevic@yale.edu).

INTERNATIONAL EXCHANGE PROGRAMS

Anthropology

Masarykova Univerzita, Brno, Czech Republic; Peking University, Beijing, China

Comparative Literature

Peking University, Beijing, China

Council on East Asian Studies

Peking University, Beijing, China; Sophia University, Tokyo, Japan; University of Tokyo, Japan

Economic Growth Center

Research Institute for Economics and Business Administration, Kobe University, Japan

Economics

Aalto University, Helsinki, Finland; Institut d'Études Politiques de Paris, France; Università Bocconi, Milan, Italy; Universität Bonn, Germany; Universität Mannheim, Germany

French

École Normale Supérieure, Paris, France; Institut d'Études Politiques de Paris, France

German

Humboldt-Universität zu Berlin, Germany

Graduate School

Connecticut Department of Education and the State of Baden-Württemberg Exchange, Germany; Graduate Institute of International and Development Studies, Geneva, Switzerland; German Academic Exchange Service (DAAD), Germany; Hebrew University, Jerusalem, Israel; Peking University, Beijing, China; Royal Holloway College, University of London, England; Secretariat of Higher Education, Science, Technology and Innovation, Ecuador; Universität Konstanz, Germany; University College London, England

History

Institut d'Études Politiques de Paris, France; Peking University, Beijing, China; Universität Heidelberg, Germany

History of Art

Peking University, Beijing, China

Political Science

Institut d'Études Politiques de Paris, France; Nuffield College, University of Oxford, England; Peking University, Beijing, China

Religious Studies

Hebrew University, Jerusalem, Israel; Peking University, Beijing, China

Sociology

Institut d'Études Politiques de Paris, France; Peking University, Beijing, China; 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, below). 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, intensive language 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 a relevant 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 should normally be 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 (normally a maximum of 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 will be 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 may 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 or two full-term 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 the major subject offered 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 the 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. 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. PTAs are responsible for small undergraduate courses, subject to guidance and advice by department faculty. For a more detailed description of these types of appointments, see Teaching Fellow Levels 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 such activities should not be done by students.

Graduate students may occasionally serve as graders for graduate-level courses, but only in highly quantitative courses with grading demands for frequent 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 SPEAK test, (2) passing the Center for Language Study oral exam, (3) passing the speaking section of the iBT TOEFL, (4) passing the speaking portion of the IELTS exam, or (5) 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.

DEFERRAL OF TEACHING YEAR

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.

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 on microfilm by University Microfilms International and then deposited in the Manuscripts and Archives section 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 one unbound copy of the dissertation, softbound copies that will be distributed to each reader, a completed set of required forms (http://gsas.yale.edu/sites/default/files/dissertation_checklist_and_phd_petition_02.16.16_secured_for_web.pdf), and any requisite fees to the Graduate School. The department must submit to the Graduate School a fully completed Notification of Readers form that has been approved by the director of graduate studies.

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. The Graduate School will send each student a copy of the readers' reports and place a copy in 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. Corrected pages or a new unbound copy of the dissertation must be submitted to the Graduate School, as well as 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 Master of Arts or Master of Science 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 director 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 director 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 eighteen departments and programs: African Studies, American Studies, Applied Physics, Archaeological Studies, Computational Biology and Bioinformatics, Computer Science, East Asian Studies, Engineering and Applied Science, English, European and Russian Studies, Global Affairs, History, History of Science and Medicine, International and Development Economics (IDE), Music, Near Eastern Languages and Civilizations, Public Health, and Statistics.

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 full-term graduate course (for students enrolled in one-year programs), or in at least two full-term 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 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 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 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 middle 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 full-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 by the end of the second year of study and must complete all remaining 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 combines the two-year M.B.A. degree from the School of Management (SOM) with the six-year Ph.D. It would allow its 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 will 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, five years of stipend, and health insurance for each term registered. Funding for students in the sciences will mirror 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 will use independent admissions processes and make independent admissions decisions. Applicants must take both the GRE tests and the GMAT. Prospective students who are currently enrolled neither in the Graduate School nor in SOM may apply to both schools simultaneously. Students already enrolled in the Graduate School normally apply to SOM after taking one course at SOM for matriculation 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 registered in 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 in SOM before applying there. 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 a small-group discussion of 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. If the petition is successful, the student will be notified in writing by the dean of the Graduate School.

Students enrolled in Ph.D. programs should not petition for M.A./M.S. and M.Phil. degrees until the end of 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

<http://gsas.yale.edu/academics/commencement>

GScommencement@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 e-mail 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 the 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. In compliance with Connecticut state law, no student will be allowed to register unless satisfactory evidence of immunity to measles and rubella has been presented to Yale Health (see Health Services under Yale University Resources and Services for more information).

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, 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 e-mail 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 submitting the petition for extended registration, which includes 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 a report that specifies the progress the student has already made in writing the dissertation and that also includes a detailed plan for completing the dissertation in the seventh year. 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. Students who

receive extended registration must register online each term and are normally expected to be in residence.

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 e-mail 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 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 (http://gsas.yale.edu/sites/default/files/files-forms/credit_request_form.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 through the School of Management and the Law School must also obtain written permission from the respective schools' registrars 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 at the Graduate School Student Information Office (Warner House, 1 Hillhouse Ave.), through the student's department, or 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 submission of course work to meet these 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 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) on the student's record.

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) on the student's record.

“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).

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 deputy 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 may be obtained 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. The Graduate School funds travel insurance for students who have been approved to pursue degree-related activities outside the United States. Such students should register their locations at

<http://world.yale.edu/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 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, 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 will remain registered full-time and 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. 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 this 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 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 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 nonenrollment.
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 or 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 require a student to take a leave for medical reasons when, on recommendation of the director of Yale Health or the chief of the Mental Health and Counseling department, an associate dean of the Graduate School determines that the student is a danger to self or others because of a serious medical problem, or that the student has refused to cooperate with efforts deemed necessary by Yale Health to determine if the student is such a danger. An appeal of such a leave must be made in writing to the dean of the Graduate School no later than seven days from the effective date of the leave.

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.

Leave of absence for parental responsibilities A student who wishes or needs to interrupt study temporarily for reasons of pregnancy, maternity care, or paternity care may be granted a leave of absence for parental responsibilities. 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 is started, if they apply for this 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 to the end 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 the 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. Most students take an entire term of parental relief, but the relief may be split in two, with a student taking only eight weeks of relief during the term in which, or just after, a birth or adoption occurs and then receiving an additional eight weeks of stipend funded by the Graduate School postponed to a later term. Parental relief may not be combined with other funding. To arrange for parental relief, a student should contact the associate dean for student progress four months prior to a birth or adoption. This benefit is limited to two birth or adoption events. If both parents are graduate students at Yale, only one student may receive this benefit per birth or adoption event, though the second student may consult with the associate dean for graduate student advising and academic support regarding a modification of academic responsibilities.

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 the 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

Yale University 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. 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.

The Graduate School specifically prohibits the following forms of behavior by graduate students:

1. Cheating on examinations, problem sets, and any other form of test; also, falsification and/or fabrication of data.

2. Plagiarism, that is, the failure in a dissertation, essay, or other written exercise to acknowledge ideas, research, or language taken from others.
3. Multiple submission of the same work without obtaining explicit written permission from both instructors before the material is submitted.
4. Misuse of the materials or facilities of the University library.
5. Unauthorized use of University services, equipment, or facilities, such as telephones and photocopying equipment.
6. Violation of University rules for using information technology services and facilities, including computers, the University network, software systems, and electronic mail. (See Information Technology Appropriate Use Policy, online at <https://your.yale.edu/policies-procedures/policies/1607-information-technology-appropriate-use-policy>.)
7. Assault on, or coercion, harassment, or intimidation of, any member of the University community, including harassment on the basis of race, religion, gender, ethnicity, or sexual orientation; sexual harassment; or the use of a teaching position to harass or intimidate another student.
8. 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 Relationships").
9. 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. (See Freedom of Expression, below.)
10. 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.
11. Misuse, alteration, or fabrication of University credentials or documents, such as an identification card or transcript, including grade lists submitted by teaching fellows.
12. Misrepresentation or lying during a formal inquiry by University officials.
13. Misrepresentation in applying for admission or financial aid.
14. Theft, misuse of funds, or willful damage of University property. Off-campus misconduct may result in disciplinary action if such conduct imperils the integrity and values of the University community. Off-campus violations committed in the course of a Yale-sponsored program anywhere in the world could also be subject to disciplinary charges.
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 illicit 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.

Violations of any of the above regulations 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. Violations of regulations pertaining to sexual misconduct or the University's Consensual Relations Policy will be referred to the University-Wide Committee on Sexual Misconduct. Students found guilty of such violations will be subject to one or more of the following disciplinary penalties:

- 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.

Copies of the 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 via the Graduate School website (<http://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.

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 (<http://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 most student complaints, including, but not limited to, complaints of discrimination on the basis of race, sex, color, religion, national or ethnic origin, disability, or sexual orientation, against a member of the faculty or administration of the Graduate School. 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, 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.

PROVOST'S PROCEDURE

The Provost's Procedure governs most student complaints, including, but not limited to, complaints of discrimination on the basis of race, sex, color, religion, national or ethnic origin, disability, or sexual orientation, against a faculty member who is not a member of the Faculty of Arts and Sciences, or against an employee who is not an administrator in the Graduate School or who is not subject to discipline by the student's dean. This procedure is available at www.yale.edu/equalopportunity/grievance. 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, 2018–2019

Tuition^{*}

Full-time study, per term: \$21,050

Full-time study in IDE, per term: \$21,550

Half-time study, per term: \$10,525

Master's programs, less than half-time per term

One-quarter time study, per term: \$5,262.50

Division of Special Registration (DSR, nondegree study)

Course work, per course, per term (including audited courses): \$5,262.50

Visiting Students, per term: \$21,050

Visiting Assistants in Research, per month: \$425

Fees[†]

Continuous Registration Fee (CRF), per term[‡]: \$650

Special in absentia registration, per term[‡]: \$650

Yale Health Hospitalization/Specialty Coverage, twelve months[§]: \$2,402

^{*} 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 appointment is 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. The 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 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 BILLS

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>.

Bills

Yale University's official means of communicating monthly financial account statements is through the University's Internet-based system for electronic billing and payment, Yale University eBill-ePay. Yale does not mail paper bills.

Student account statements are prepared and made available twelve times a year at the beginning of each month. Payment is due in full by 4 p.m. Eastern Time on the first business day of the following month. E-mail notifications that the account statement is available on the University eBill-ePay website (<http://student-accounts.yale.edu/ebep>) are sent to all students at their official Yale e-mail addresses and to all student-designated proxies. Students can grant others proxy access to the eBill-ePay system to view the monthly student account statements and make online payments. For more information, see <http://sfas.yale.edu/proxy-access-and-authorization>.

Bills for tuition, room, and board are available during the first week of July, due and payable by August 1 for the fall term; and during the first week of November, due and payable by December 1 for the spring term. 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. Nonpayment of bills and failure to complete and submit financial aid application packages on a timely basis may result in the student's involuntary withdrawal from the University.

No degrees will be conferred and no transcripts will be furnished until all bills due the University are paid in full. In addition, transcripts will not be furnished to any student or former student who is in default on the payment of a student loan.

The University may withhold registration and certain University privileges from students who have not paid their term bills or made satisfactory payment arrangements by the day of registration. To avoid delay at registration, students must ensure that payments reach Student Financial Services by the due dates.

Payments

There are a variety of options offered for making payments. Yale University eBill-ePay (<http://student-accounts.yale.edu/ebep>) is the *preferred* means for payment of your monthly student account bill. The ePayments are immediately posted to the student account. There is no charge to use this service. Bank information is password-

protected and secure, and a printable confirmation receipt is available. On bill due dates, payments using the eBill-ePay system can be made up to 4 p.m. Eastern Time in order to avoid late fees.

For those who choose to pay the student account bill by check, a remittance advice and mailing instructions are included with the online bill available on the eBill-ePay website. All bills must be paid in U.S. currency. Checks must be payable in U.S. dollars drawn on a U.S. bank. Payments can also be made via wire transfer. Instructions for wire transfer are available on the eBill-ePay website.

Yale does *not* accept credit card payments.

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

The Yale Payment Plan (YPP) is a payment service that allows students and their families to pay tuition, room, and board in ten equal monthly installments throughout the year based on individual family budget requirements. It is administered by the University's Office of Student Financial Services. The cost to enroll in the YPP is \$100 per contract. The deadline for enrollment is June 25. Additional details concerning the Yale Payment Plan are available at <http://student-accounts.yale.edu/ypp>.

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 mailed during the month of March. Applicants for admission to nondegree and terminal master's programs are required to complete the financial statement contained in the application brochure. Students are strongly encouraged to seek financial support from external sources (see External Fellowships and Combined Award Policy, below).

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/Children Yale Health Hospitalization/Specialty Coverage (including coverage for prescriptions), half the cost of the Student + Spouse coverage, and the Student + Child/Children 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 \$4,500, issued in installments of \$2,250 per term. The annual subsidy will increase by \$1,000 (\$500 per term) for each additional child under the age of six. The student can decide whether to use this money for spousal health insurance, childcare, or other expenses. The subsidy is one per family, not one per Ph.D. student, and midterm changes will be prorated on a case-by-case basis. 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 when such teaching is not part 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.

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, below).

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 and fourth 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 as outlined in the student's offer of admission.

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.

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 indicated in their letter of admission 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. Students who are permitted to register beyond the sixth year of study may be appointed as TFs or PTAs, but only if there is no other qualified candidate available in the first six years of study in any department or program of the Graduate School. 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. In any year of study, the maximum amount of teaching a student in years one through six may do is one Level 20 assignment (up to twenty hours per week) or one PTAI per term. Students in the natural sciences teaching above the requirement are limited to one Level 10 assignment per term. Seventh-year students may teach up to three Level 20 assignments (up to

twenty hours per week) per year. Students may not serve as faculty members 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. Level 10 TFs are expected to teach for 6–10 hours per week. Level 20 TFs are expected to teach for 15–20 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. 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 Level 10 assignment and \$8,000 for a Level 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).

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 following federal student loan programs: Federal Direct Loans and Federal Perkins Loans.

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

<http://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 23 and can be submitted directly from the website.

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 (203.436.2881), which is the exclusive Yale service for providing off-campus rental and sales listings. 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

<http://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 <http://hospitality.yale.edu>. Inquiries concerning food services should be addressed to Yale Hospitality, 246 Church Street, PO Box 208261, New Haven CT 06520-8261; e-mail, 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, laboratory, 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. 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, or students enrolled in the Eli Whitney Program prior to September 2007 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 during 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, 2018. Please access the Incoming Student Vaccination Record form for graduate and professional students at <https://yalehealth.yale.edu/resources/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 Medica online system (available mid-June), and all supporting documents must be uploaded to <http://yale.medicatconnect.com>. The final deadline is August 1.

Measles, mumps, rubella, and varicella All students who were born after January 1, 1957, 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 on or after January 1, 1980, and after the student's first birthday; the second dose must have been given at least thirty (30) 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, 2018.

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 received after January 1, 2014. 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, 2018. 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 off campus.

TB screening The University strongly recommends tuberculosis screening for all incoming students who have lived or traveled outside of the United States within the past six months.

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.

OFFICE OF INTERNATIONAL STUDENTS AND SCHOLARS

<http://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; see <http://oiss.yale.edu/coming>.

OISS programs, like the Community Friends hosting program, 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 e-mail, 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 <http://oiss.yale.edu/about/the-international-center/international-center-room-reservations>. For information about the center, visit <http://oiss.yale.edu/about/international-center>.

RESOURCE OFFICE ON DISABILITIES

<http://rod.yale.edu>

The Resource Office on Disabilities facilitates accommodations for undergraduate and graduate and professional school students with disabilities who register with and have appropriate documentation on file in the Resource Office. Early planning is critical. Documentation may be submitted to the Resource Office even though a specific accommodation request is not anticipated at the time of registration. It is recommended that matriculating students in need of disability-related course accommodations at Yale University contact the Resource Office by June 15. Special requests for University housing need to be made in the housing application. Returning students must contact the Resource Office at the beginning of each term to arrange for course and exam accommodations.

The Resource Office also provides assistance to students with temporary disabilities. General informational inquiries are welcome from students and members of the Yale community and from the public. The mailing address is Resource Office on Disabilities, Yale University, PO Box 208305, New Haven CT 06520-8305. The Resource Office is located at 35 Broadway (rear entrance), Room 222. Office hours are Monday through Friday, 8:30 a.m. to 4:30 p.m. Voice callers may reach staff at 203.432.2324; fax at 203.432.8250. The Resource Office may also be reached by e-mail (ROD@yale.edu) or through its website (<http://rod.yale.edu>).

RESOURCES ON SEXUAL MISCONDUCT

Yale University is committed to maintaining and strengthening an educational, working, and living environment founded on civility and 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 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, resources, and mechanisms for victims of sexual misconduct. The options for undergraduate, graduate, and professional school students are described at <https://smr.yale.edu>.

SHARE: Information, Advocacy, and Support

55 Lock Street, Lower Level
Office 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, including holidays. SHARE is available to members of the Yale community who wish to discuss any 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 students 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 Carole Goldberg, the director of SHARE (203.432.0310, carole.goldberg@yale.edu), Jennifer Czincz, assistant director (203.432.2610, jennifer.czincz@yale.edu), Sherine Powerful (203.436.8217, sherine.powerful@yale.edu), or John Criscuolo (203.494.6247, john.criscuolo@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.

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, Deputy 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 definition of sexual misconduct. The UWC is comprised of faculty, administrative, and student representatives from across the University. In UWC cases, investigations are conducted by professional, independent fact finders.

Yale Police Department

101 Ashmun Street

24/7 hotline: 203.432.4400

<https://your.yale.edu/community/public-safety/police/sensitive-crimes-support>

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 Marnie Robbins Hoffman, the Sensitive Crimes & Support coordinator, she can be reached at 203.432.9547 during business hours or via e-mail at marnie.robbs@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 <http://admissions.yale.edu>, e-mail 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 <http://gsas.yale.edu>, e-mail 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 <http://medicine.yale.edu/education/admissions>, e-mail 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 <http://divinity.yale.edu>, e-mail 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 <http://law.yale.edu>, e-mail 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 <http://law.yale.edu>, e-mail 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 <http://seas.yale.edu>, e-mail 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 208267, New Haven CT 06520-8267.

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>, e-mail 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, composition, and conducting. Certificate in Performance, 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 <http://music.yale.edu>, e-mail 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 Forestry & Environmental Studies 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 <http://environment.yale.edu>, e-mail fesinfo@yale.edu, or call the Office of Admissions at 800.825.0330. Postal correspondence should be directed to Office of Admissions, Yale School of Forestry & Environmental Studies, 195 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 <http://publichealth.yale.edu>, e-mail ysph.admissions@yale.edu, or call the Admissions Office at 203.785.2844.

School of Architecture Est. 1916. Courses for college graduates. 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 <http://architecture.yale.edu>, e-mail 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, 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 <http://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.

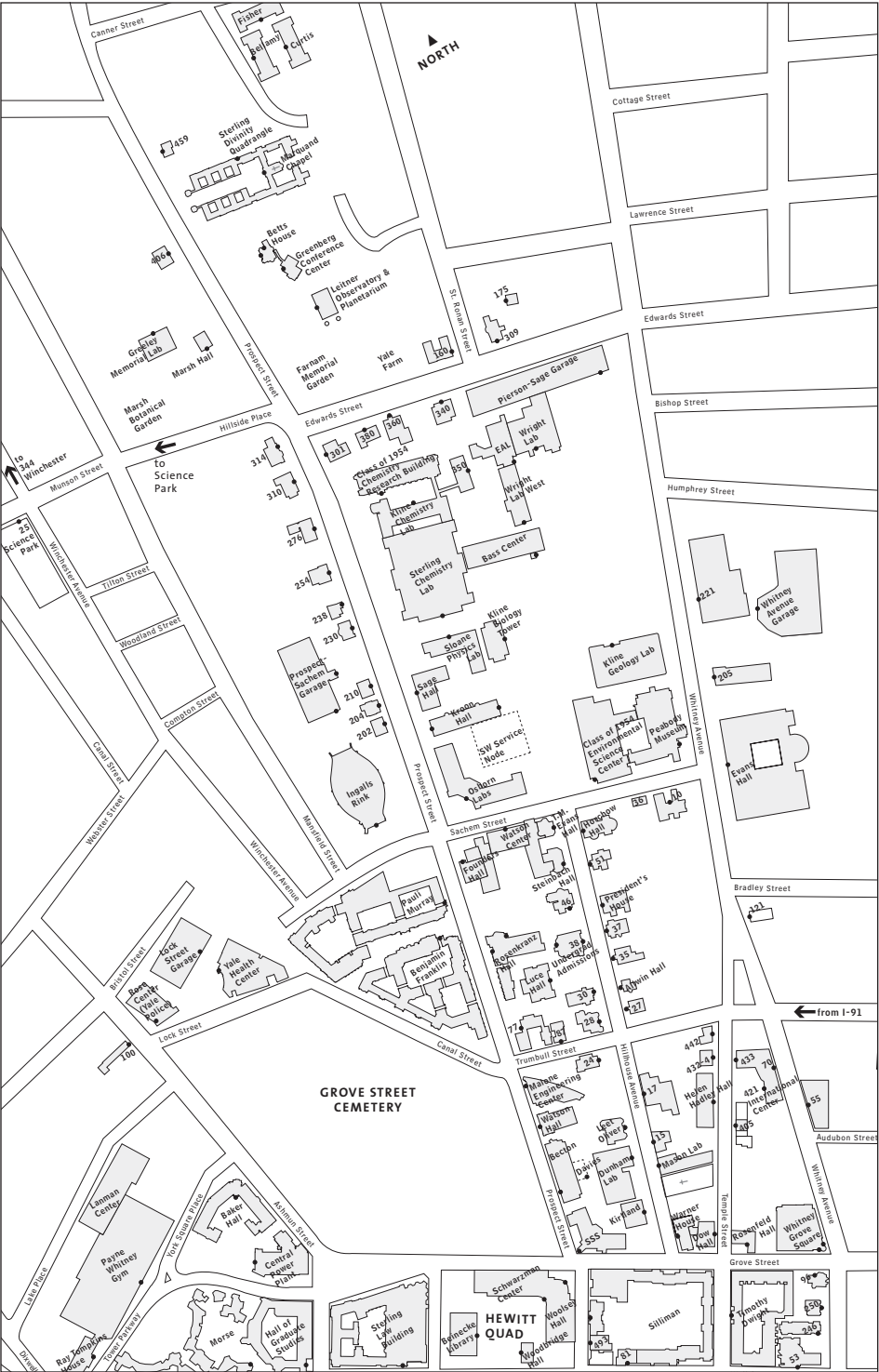
School of Drama Est. 1925. Courses for college graduates and certificate students. Master of Fine Arts (M.F.A.), Certificate in Drama, Doctor of Fine Arts (D.F.A.).

For additional information, please visit <http://drama.yale.edu>, e-mail ysd.admissions@yale.edu, or call the Registrar/Admissions Office at 203.432.1507. Postal correspondence should be directed to Yale School of Drama, 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 <http://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



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, Director of the Office for Equal Opportunity Programs, 221 Whitney Avenue, 4th Floor, 203.432.0849. For additional information, see www.yale.edu/equalopportunity.

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 Office of the Vice President for Human Resources and Administration, PO Box 208322, 2 Whitney Avenue, Suite 810, New Haven CT 06520-8322, 203.432.8049, the University will provide this information to any applicant for admission, or prospective students and employees may 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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