School of Medicine
2019–2020

BULLETIN OF YALE UNIVERSITY
Series 115 Number 8 July 30, 2019

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The University reserves the right to withdraw or modify the courses of instruction or to change the instructors at any time.

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Contents

Calendar

TWO HUNDRED AND EIGHTH SESSION

FALL 2019

June 10	M	Matriculation for first-year students in the START@Yale Program
June 17	M	First term begins for fourth- and fifth-year students
July 8	M	First term begins for third-year students
Aug. 12	M	Matriculation for first-year students First term begins for first-year students
Aug. 18	SU	Fall online SIS check-in begins
Sept. 2	M	Labor Day. No classes for first-year students
Sept. 4	W	First term begins for second-year students
Oct. 31	TH	Fall online SIS check-in ends
Nov. 25–29	M–F	Fall recess for first- and second-year students
Nov. 28–29	TH–F	Thanksgiving break for third-year students
Dec. 19	TH	Winter recess begins for second-year students
Dec. 21	SA	Winter recess begins for third-year students
Dec. 23	M	Winter recess begins for first-year students

SPRING 2020

Jan. 2	TH	Second term begins for third- through fifth-year students
Jan. 3	F	Spring online SIS check-in begins
Jan. 6	M	Second term begins for first- and second-year students
Jan. 20	M	Martin Luther King, Jr. Day. No classes for first-year students
Mar. 9	M	Spring recess begins for first-year students
Mar. 13	F	Spring recess ends for first-year students
Mar. 15	SU	Spring online SIS check-in ends
Mar. 20	F	Match Day
May 14	TH	Student Research Day. No afternoon classes for first-year students
May 15	F	Spring term ends for fourth-year students
May 18	M	University Commencement
June 10	W	Spring term ends for first-year students
June 12	F	Spring term ends for third- and fifth-year students
June 19	F	Spring term ends for second-year students

The President and Fellows of Yale University

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

Fellows
His Excellency the Governor of Connecticut, *ex officio*
Her Honor the Lieutenant Governor of Connecticut, *ex officio*
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Charles Waterhouse Goodyear IV, B.S., M.B.A., New Orleans, Louisiana
Catharine Bond Hill, B.A., B.A., M.A., Ph.D., New York, New York
Paul Lewis Joskow, B.A., Ph.D., Brookline, Massachusetts
William Earl Kennard, B.A., J.D., Charleston, South Carolina
Reiko Ann Miura-Ko, B.S., Ph.D., Menlo Park, California (*June 2025*)
Gina Marie Raimondo, A.B., D.Phil., J.D., Providence, Rhode Island (*June 2020*)
Emmett John Rice, Jr., B.A., M.B.A., Bethesda, Maryland
Eve Hart Rice, B.A., M.D., Bedford, New York (*June 2021*)
Joshua Linder Steiner, B.A., M.St., New York, New York
David Li Ming Sze, B.A., M.B.A., Hillsborough, California
Annette Thomas, S.B., Ph.D., Cambridge, England (*June 2022*)
Kathleen Elizabeth Walsh, B.A., M.P.H., Wellesley, Massachusetts (*June 2023*)
Douglas Alexander Warner III, B.A., Hobe Sound, Florida
Michael James Warren, B.A., P.P.E., Washington, D.C. (*June 2024*)
Lei Zhang, B.A., M.A., M.B.A., Hong Kong, China

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Senior Vice President for Operations
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Senior Vice President for Institutional Affairs and General Counsel
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Vice President for Facilities and Campus Development
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Vice President for Communications
Nathaniel Westgate Nickerson, B.A.

Administration and Faculty

General Administration

As one of the coordinate schools of the University, the general administration of the School of Medicine is conducted in accordance with the bylaws of the Yale Corporation. The affairs of the School are under the direction of the dean and the faculty, subject to the approval of the Corporation.

Administration

Peter Salovey, Ph.D., President of the University
Benjamin Polak, Ph.D., Provost of the University
Robert J. Alpern, M.D., Dean of the School of Medicine
Sten H. Vermund, M.D., Ph.D., Dean of the School of Public Health
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Linda K. Bockenstedt, M.D., Deputy Dean for Faculty Affairs
Michael C. Crair, Ph.D., Deputy Dean for Scientific Affairs (basic science departments)
Darin Latimore, M.D., Deputy Dean for Diversity and Inclusion
Brian R. Smith, M.D., Deputy Dean for Scientific Affairs (clinical departments)
Paul Taheri, M.D., M.B.A., Deputy Dean for Clinical Affairs and Chief Executive Officer of Yale Medicine
Cynthia L. Walker, M.B.A., CPA, Deputy Dean for Finance and Administration
Linda C. Mayes, M.D., Special Adviser to the Dean

Nancy R. Angoff, M.D., M.P.H., M.Ed., Associate Dean for Student Affairs
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Carrie P. Capezzone, M.B.A., Associate Dean for Finance
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John N. Forrest, M.D., Director, Office of Student Research
John Gallagher, M.L.S., Director, Medical Library
Alexandria Garino, M.S., PA-C, Director, Physician Associate Program
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N'Kenge Haines, B.A., Director of Financial Aid
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Michael L. Schwartz, Ph.D., Associate Dean for Curriculum
Lisa Stump, M.S., Chief Information Officer for the School of Medicine and Yale New Haven Health System
Geraldine A. Sullivan, Assistant Vice President, Employee Relations and Staffing
Terri L. Tolson, Registrar for Student Affairs
James Van Rhee, M.S., PA-C, Director, Physician Assistant Online Program
Ronald J. Vender, M.D., Associate Dean for Clinical Affairs, Yale Medicine
Merle Waxman, M.A., Associate Dean, Ombudsperson, and YSM Title IX Coordinator

Faculty

Faculty listings for the School of Medicine can be found within each department's write-up in this bulletin. See individual departments, under Departments and Sections. The closing date for departmental faculty lists was April 30, 2019.

A Message from the Dean

Yale School of Medicine was founded in 1810 as the Medical Institution of Yale College and has conferred more than 9,000 medical degrees in its proud history. We are dedicated to continuing to educate tomorrow's leaders of the medical profession, with a firm focus on the innovative research that we undertake in every area of the biomedical sciences and the advanced care that our Yale Medicine physicians provide.

Basic translational research is helping us identify drivers of the growth and spread of cancer, and of resistance to drugs, that new therapies can target. We are at the forefront of learning how to harness the immune system to kill cancer cells. In the neurosciences, we are making progress in understanding the intricacies of the brain and the biological basis of behavior and abnormal brain function, and gaining insight about the underpinnings of such neurodegenerative brain diseases as Alzheimer's, Parkinson's, and ALS. We are devoting extensive resources to developing and obtaining new technologies to study cells, genes, and other essential structures of life in atomic detail.

Our researchers and clinicians also combine their considerable talents to attain advances in personalized medicine. Their ability to link whole-genome sequencing to a patient's health record is creating possibilities for predicting diseases for which patients are at particular risk, and which treatments will work best in specific patients. We are applying this precision medicine approach in areas that include newborn diseases, prenatal diagnosis, and personalized cancer treatments where we identify a tumor's genetic abnormalities to determine the most effective treatment.

Our methods of educating students are also at the leading edge. The courses described in this Bulletin represent a new curriculum launched in 2015 and continually refined both through self-evaluation and by observing best educational practices at other institutions and in other disciplines. Our program combines personal interaction with preeminent faculty with effective technology tools that promote more interactive learning and innovative teaching.

Welcome to all, at an exciting time for Yale School of Medicine.

Robert J. Alpern, M.D.
Dean and Ensign Professor of Medicine
Yale School of Medicine

History, Mission, and Facilities

HISTORY

The School of Medicine was established following passage of a bill in the Connecticut General Assembly in 1810 granting a charter for "The Medical Institution of Yale College," to be conducted under the joint supervision of the college and the Connecticut State Medical Society. The institution was formally opened in 1813, and the first degrees were conferred the following year. In 1884, with the approval of the Medical Society, the original charter was amended to place the School definitely in the control of the College as the Medical School of Yale College. The name Yale College was changed to Yale University in 1887, and the name of the Medical School was automatically changed. The present name was adopted in 1918.

Shortly after the establishment of the School, members of its faculty and physicians in the state joined with other citizens in raising funds for a hospital in New Haven to provide, among other services, clinical facilities for the instruction of medical students. The outcome of these efforts was the incorporation of the General Hospital Society of Connecticut in 1826, and the opening of the New Haven Hospital in 1832. The New Haven Dispensary was founded in 1872 and later became a division of the New Haven Hospital. Instruction in clinical medicine has been conducted in the hospital continuously since its establishment.

A merger was effected in 1945 between the New Haven Hospital and Grace Hospital to form the Grace-New Haven Community Hospital. The affiliation agreement between the hospital and University was revised in 1965 and the name of the institution changed to Yale-New Haven Hospital (YNHH). In 1999, a separate affiliation agreement was adopted by the University and the Yale New Haven Health System.

Members of the professional staffs of the VA Connecticut Healthcare System, West Haven, and the Connecticut Mental Health Center, 34 Park Street, hold appointments in Yale University.

MISSION

As a preeminent academic medical center that supports the highest-quality education, research, and patient care, the Yale School of Medicine will (1) educate and inspire scholars and future leaders who will advance the practice of medicine and the biomedical sciences; (2) advance medical knowledge to sustain and improve health and to alleviate suffering caused by illness and disease; and (3) provide outstanding care and service for patients in a compassionate and respectful manner.

FACILITIES

Located southwest of the New Haven Green and Yale's Old Campus, Yale-New Haven Medical Center includes the School of Medicine, School of Public Health, Yale New Haven Hospital (YNHH), Smilow Cancer Hospital, Connecticut Mental Health Center, and the John B. Pierce Laboratory. In 2013 the School of Nursing moved to Yale West Campus in Orange, Connecticut.

The School of Medicine's Sterling Hall of Medicine, 333 Cedar Street, is the central building. This handsome limestone structure with domed roof includes administrative offices, the 450-seat Mary S. Harkness Auditorium, the Center for Cellular and Molecular Imaging, the Child Study Center, the departments of Cellular and Molecular Physiology, Pharmacology, Molecular Biophysics and Biochemistry, Genetics, Cell Biology, Neuroscience, Yale Cancer Center, and History of Medicine.

The Harvey Cushing/John Hay Whitney Medical Library, located in Sterling Hall of Medicine, houses approximately 366,500 print volumes and subscribes to more than 23,000 electronic journals, 39,500 electronic books, and 96 databases. It offers comfortable seating, small-group study spaces, computers, and services to help with research.

Connected to the south end of Sterling Hall is the Jane Ellen Hope Building, a teaching facility of conference rooms and lecture halls. At Sterling's north end is the Nathan Smith Building, which spans Cedar Street, joining the School of Medicine and YNHH patient-care facilities, including the Hunter Building, which houses research laboratories for Therapeutic Radiology and Dermatology. The Nathan Smith Building contains offices and laboratories of Yale Cancer Center and the department of Genetics. Entrances to the Hope and Nathan Smith buildings are at 315 Cedar Street and 333 Cedar Street, respectively.

Yale New Haven Hospital (YNHH) is a nationally recognized, 1,541-bed, not-for-profit hospital serving as the primary teaching hospital for the Yale School of Medicine. Founded as the fourth voluntary hospital in the United States in 1826, YNHH today has two New Haven-based campuses and also includes Yale New Haven Children's Hospital, Yale New Haven Psychiatric Hospital, and Smilow Cancer Hospital. YNHH has received Magnet designation from the American Nurses Credentialing Center, the nation's highest honor for nursing excellence. YNHH has a combined medical staff of about 4,500 university, hospital, and community physicians and advanced care providers practicing in more than one hundred specialties. Last year, YNHH had 74,307 inpatient discharges and more than 1.4 million outpatient encounters. YNHH (www.ynhh.org) is the flagship hospital of Yale New Haven Health, an integrated delivery system that includes Bridgeport, Greenwich, Lawrence + Memorial, and Westerly hospitals and their affiliated organizations, as well as Northeast Medical Group.

The Laboratory of Epidemiology and Public Health is the School's other major teaching facility and is home to the nationally accredited Yale School of Public Health. The nine-story building at 60 College Street contains classrooms, laboratories, an auditorium, and the office of the dean of Public Health. (Additional administrative offices are housed at 135 College Street and 350 George Street.) It also is the site of a World Health Organization Collaborating Center, focusing on health promotion policy and research.

Laboratories and offices for the School's clinical departments are located in contiguous buildings across Cedar Street from Sterling Hall. The Anthony N. Brady Memorial Laboratory and Lauder Hall provide offices and laboratories for the departments of Surgery, Neurosurgery, Pathology, Urology, Comparative Medicine, and Anesthesiology. The Boardman Building houses offices for the departments of Surgery and Internal Medicine. Farnam Memorial Building (FMB) and the Laboratory of Surgery, Obstetrics and Gynecology (LSOG) provide facilities for the departments of Surgery; Orthopaedics

and Rehabilitation; Obstetrics, Gynecology, and Reproductive Sciences; Neurosurgery; Neuroscience; Internal Medicine; Pediatrics; and Comparative Medicine.

The YNHH Clinic Building connects Farnam with the Laboratory for Medicine and Pediatrics (LMP). Adjacent to the Clinic Building are Tompkins Memorial Pavilion (TMP) and Fitkin Memorial Pavilion (FMP), facilities shared by the hospital and the School. They contain the departments of Anesthesiology, Laboratory Medicine, Neurology, Neurosurgery, Orthopaedics and Rehabilitation, Pathology, Radiology and Biomedical Imaging, and Urology; the Cardiology section; offices for the Cancer Center; and laboratories and offices for the Department of Pediatrics. On the other side of the Clinic Building are Fitkin Amphitheater, the LMP, and the Lippard Laboratory for Clinical Investigation (LLCI), which houses Neurology department offices and research labs for the departments of Dermatology, Pediatrics, and Therapeutic Radiology.

Laboratories of the departments of Ophthalmology and Visual Science and Neurology; the Cardiology section; the Cancer Center; the Keck Foundation Biotechnology Resource Laboratories, and the Human and Translational Immunology Program; offices for the Geriatric section, the Department of Pathology, and the School of Public Health; and laboratories and offices of the Department of Psychiatry are located at 300 George Street. Many of the Psychiatry department's teaching, research, and patient-care activities are conducted at the Connecticut Mental Health Center and the Yale New Haven Psychiatric Hospital.

The Yale Physicians Building (YPB), a four-story structure on the southwest corner of Howard and Davenport avenues, contains outpatient specialty and consultative services, X-ray, laboratories, and a pharmacy. Ophthalmology clinical services and offices moved in 2007 to 40 Temple Street.

The Magnetic Resonance (MR) Center, on the corner of Davenport and Howard avenues, operated by the Department of Radiology and Biomedical Imaging, maintains three MR imaging systems for clinical examination. A new Positron Emission Tomography (PET) Center, also operated by the Department of Radiology and Biomedical Imaging, maintains a cyclotron radioisotope system for imaging research.

The Boyer Center for Molecular Medicine, at the intersection of Congress Avenue and College Street, houses multidisciplinary programs in Molecular Genetics, Cell Biology, Microbial Pathogenesis, and the interdepartmental Program in Cellular Neuroscience, Neurodegeneration, and Repair.

College Place, a series of buildings at 37–55 College Street, houses classrooms and a number of administrative offices for the School of Public Health as well as academic and administrative offices for the departments of Surgery and Orthopaedics and Rehabilitation; the Cancer Center; and the Office of Research Administration.

The medical school's newest research building, at 10 Amistad Street, is home to three interdisciplinary groups: the Interdepartmental Program in Vascular Biology and Therapeutics, the Human and Translational Immunology Program, and the Yale Stem Cell Center.

350 George Street, a three-story structure at the corner of George and York streets, houses clinical services for the Child Study Center, offices for Yale School of Public Health, and a laboratory facility for the Department of Neuroscience.

The Anlyan Center for Medical Research and Education is the medical school's largest state-of-the-art research and educational facility. Completed in November 2002, this outstanding facility is located on the corner of Cedar Street and Congress Avenue and encompasses a full city block. The building includes six floors of laboratories for disease-based research, core facilities for genomics and magnetic resonance imaging, and state-of-the-art teaching space for anatomy and histology. This facility provides laboratories and offices for the departments of Internal Medicine, Genetics, Immunobiology, Laboratory Medicine, Neurosurgery, and Radiology and Biomedical Imaging.

Edward S. Harkness Memorial Hall, 367 Cedar Street, is a student dormitory with the Nicholas P. R. Spinelli student lounge, the Class of 1958 Fitness Center, dining facilities, and the Phyllis Bodel Childcare Center. The School of Medicine offices of admissions, student affairs, financial aid, and international health and student programs are located on the second floor. The offices of education, student research, M.D./Ph.D. Program, and multicultural affairs are located on the third floor.

A number of other spaces in the vicinity of the School are leased rather than owned by Yale University.

The VA Connecticut Healthcare System, West Haven, a major teaching affiliate of the School of Medicine, is the site of the Paralyzed Veterans of America/EPVA Center for Neuroscience and Regeneration Research of Yale University.

Harvey Cushing/John Hay Whitney Medical Library

http://library.medicine.yale.edu

John Gallagher, M.L.S., Director
Holly Grossetta Nardini, M.L.S., Associate Director
Lindsay Barnett, M.L.S., Collection Development and Scholarly Communication Librarian
Janene Batten, M.L.S., Nursing Librarian
Alexandria Brackett, M.L.S., Clinical Librarian
Thomas Falco, Research Specialist
Katherine Stemmer Frumento, M.L.S., M.B.A., Assistant Director of Clinical Information Services
Melissa Funaro, M.L.S., M.S., Clinical Librarian
Rolando Garcia-Milian, M.L.S., Biomedical Sciences Research Support Librarian
Melissa Grafe, M.L.S., Ph.D., Head of the Medical Historical Library and John R. Bumstead Librarian for Medical History
Alyssa Grimshaw, M.L.S., Evening/Weekend Supervisor and Clinical Librarian
Dana Haugh, M.L.S., Web Services Librarian
Robert Hughes, Business and Operations Manager
Katherine Isham, M.S.I.S., Archivist
Caitlin Meyer, M.L.I.S., Research and Education Librarian
Sawyer Newman, M.L.I.S., Data Librarian for the Health Sciences
Melanie Norton, M.L.S., Head of Access and Delivery Services
Kate Nyhan, M.L.S., Research and Education Librarian
Judy Spak, M.L.S., Assistant Director of Research and Education Services
Lei Wang, M.S.I., Assistant Director of Technology and Innovation Services
Susan Wheeler, Curator, Prints and Drawings

MISSION

The Harvey Cushing/John Hay Whitney Medical Library provides access to an extensive array of information resources and tools, offers research assistance and expertise, and delivers meaningful services to our users, to support innovation and excellence in biomedical research, patient care, and the development of scholars and future leaders in health care.

HISTORY

Elihu Yale himself donated Yale College's first two medical volumes. A century later, in 1813, the Medical Institution of Yale College opened, but it was not until 1917 that the professors of the medical school began a separate medical library on the medical campus.

The Historical Library was the vision of Dr. Harvey Cushing, a neurosurgeon and pioneer of brain surgery, who graduated from Yale College in 1891 and returned to Yale

in 1933. Cushing joined with his two friends and fellow bibliophiles, Arnold C. Klebs and John F. Fulton, in what they called their "Trinitarian Plan," to donate their superb book collections to Yale. As the plan matured it became wedded to the idea of creating a new medical library for the Yale School of Medicine. Cushing was the driving force persuading Yale officials to realize his vision. He wanted the medical library to be the heart of the medical school and therefore specified that it be located on the main floor and that the old and new collections be equally accessible. This vision was realized in 1941 with the dedication of the Yale Medical Library, designed in the shape of a Y with two wings, one for the Historical Library reading room and one for what was then the periodical room, with stacks below for books and journals. The central rotunda honors Dr. Harvey Cushing.

A generous gift from Betsey Cushing Roosevelt Whitney, daughter of Dr. Harvey Cushing, enabled a major renovation and expansion of the Medical Library that included the addition of increased study and stack space. Upon completion of the renovations in June 1990, the library was officially renamed the Harvey Cushing/John Hay Whitney Medical Library, honoring both Cushing and John Hay Whitney (1904–1982), Yale graduate, editor of the *Herald Tribune,* and patron of the arts.

New this year are a large team-based learning classroom, eight rooms for small-group learning and independent study, an expanded studio for video production of learning materials, and an enhanced information commons with plentiful workstations, comfortable seating, and an information desk for help. The new spaces are designed for flexible use and incorporate technologies to support the YSM curriculum and accommodate individual study preferences.

SERVICES

During orientation week, first-year students are introduced to the library and their "personal librarian." Every Yale medical student has a personal librarian to answer questions and help with research, especially when approaching the thesis.

Students have access to library resources beyond the Medical Library's vast collections. The library can scan, loan, and deliver articles and books not owned by Yale from other libraries around the world.

Library guides and video tutorials provide 24/7 help on a wide range of library topics, from getting started with a research project to using specific library resources like EndNote. Most questions about the library can be answered by the Medical Library website, but students should not hesitate to contact their personal librarian for assistance.

SPACES TO COLLABORATE AND STUDY

Students will find group and individual study space throughout the Medical Library. Individual study carrels and tables are located on all levels of the library. The Morse Reading Room is designated as quiet study space. Details can be found at http://library.medicine.yale.edu.

COMPUTING IN THE LIBRARY

The Cushing/Whitney Medical Library provides Windows and Mac computers in multiple locations, including the 24/7 Computer & Study Space. The computers have productivity software such as Microsoft Office, EndNote, and other tools including Adobe Acrobat Pro, Adobe Creative Suite, statistics and GIS software (SAS, SPSS, ArcGIS, etc.), and medical education software. Black-and-white and color printers/copiers/scanners are available. In addition, the library offers two scanning stations (Windows and Mac) in the 24/7 space, which have a variety of applications for graphics and video editing and production. A high-performance workstation with a suite of licensed and open source tools, such as BRB-Array Tools, Cytoscape, and Qlucore, is also available to process, manage, analyze, and visualize data in a variety of formats. Access to this workstation can be reserved by any Yale researcher.

A mix of Windows and Mac laptops are available for loan to Medical Center students needing a computer for short-term use. Digital cameras, camcorders, and related video accessories are also available at the Circulation Desk, as are chargers for common models of mobile phones, tablets, and many computers. This equipment may be borrowed by anyone with a valid Yale ID.

LIBRARY COLLECTIONS

The Cushing/Whitney Medical Library provides a comprehensive collection of clinical reference tools, databases, evidence-based practice resources, image collections, educational software, and books and journals in support of programs in medicine, nursing, public health, physician associates, bioinformatics, and the basic sciences. The library provides access to more than 39,500 electronic books, 23,000 electronic journals, and 96 databases, in addition to more than 366,500 print volumes. Its holdings also include all Yale medical student theses, many of which are available online. Yale affiliates have access to the library's electronic collections from any device wherever they are.

The Medical Historical Library contains one of the world's finest collections of rare medical books, journals, prints, posters, drawings, and photographs, as well as current works in the history of medicine. There are 325 medical incunabula, more than 75 manuscript volumes from the twelfth through sixteenth century, and one of the best study collections of weights and measures in the world. Its holdings also include Yale catalogs, yearbooks, photographs, and other publications and ephemera related to the Yale School of Medicine. Special strengths in the collection are the works of Hippocrates, Galen, Vesalius, Boyle, Harvey, Culpeper, Haller, Priestley, and S. Weir Mitchell, and works on anatomy, anesthesia, and smallpox inoculation and vaccination. The library also owns an extensive smoking and tobacco advertising collection and the Robert Bogdan collection of disability photographs and postcards. In addition, an outstanding selection of photographs, posters, and other images is available in the Cushing/Whitney Medical Library Digitized Collections online.

The Cushing Center, located in the Cushing/Whitney Medical Library, houses a unique collection of materials once owned by Dr. Harvey Cushing. The center is the home of the Harvey Cushing Brain Tumor Registry, which consists of approximately 600 brain specimens, glass-plate negatives, and accompanying patient files from the early twentieth century. The space also displays a portion of Cushing's rich collection of rare books.

MEDICAL LIBRARY ASSOCIATES

The Associates of the Cushing/Whitney Medical Library are friends of the library who, through membership and other contributions, are committed to assist the Medical Library in its mission of serving the information needs of Yale students, faculty, and staff. Funds raised by associates represent unallocated money that can be used at the librarian's discretion to support various projects.

The associates host an annual lecture in the spring. Past lecturers include Nobel Laureates, writers, professors, and Surgeons General who have spoken on a wide variety of topics relating to medicine. A gratis membership for Yale medical students continues through their years of residency. More information is available online at http://library.medicine.yale.edu/associates.

Degree Programs

Students at the School of Medicine are candidates for the degree of Doctor of Medicine (M.D.). Students receiving competitive fifth-year research fellowships are eligible for the combined degree M.D./M.H.S. (Master of Health Science). Students completing a curriculum of didactic, research, and clinical experiences in global health are eligible for the Certificate in Global Medicine. Jointly with the School of Public Health, the School of Medicine administers a program leading to the degrees of Doctor of Medicine (M.D.) and Master of Public Health (M.P.H.). Jointly with the Graduate School, the School of Medicine also administers the combined degrees of Doctor of Medicine (M.D.) and Doctor of Philosophy (Ph.D.). In addition, special arrangements may be made with the appropriate associate deans to receive the combined Doctor of Medicine (M.D.) and Doctor of Jurisprudence (J.D.) degrees, the combined Doctor of Medicine (M.D.) and Master of Divinity (M.Div.) degrees, and the combined Doctor of Medicine (M.D.) and Master of Business Administration (M.B.A.) degrees. The School of Medicine also offers a Physician Associate program and a Physician Assistant Online program leading to a Master of Medical Science (M.M.Sc.) degree. Jointly with the School of Public Health, the School of Medicine also administers the PA/M.P.H. program leading to the combined Master of Medical Science (M.M.Sc.) and Master of Public Health (M.P.H.) degrees.

DOCTOR OF MEDICINE

The degree of Doctor of Medicine is conferred upon students who have satisfactorily completed the requirements stated below.

1. Pass all of the required pre-clerkship integrated courses and clinical experience courses.
2. Pass all of the required clinical clerkships.
3. Complete and pass a subinternship.
4. Pass the examinations of the United States Medical Licensing Examination (USMLE), Steps I and II.
5. Submit an approved dissertation by mid-March of the year of graduation.
6. Pass the clinical skills assessment, performed at the University of Connecticut (C-OSCE) in Year 3.
7. Meet all of the requirements of the Progress Committee and Board of Permanent Officers concerning academic standing, moral and ethical character, emotional stability, and professional conduct.

Because of the heavy demands in terms of time and energy required for the study of medicine, the Yale School of Medicine discourages students from assuming extracurricular activities that may prove burdensome. Such extracurricular work and/or professional activity will not justify inadequate academic performance. Any student wishing to work or pursue a professional activity other than medicine that would consume a significant amount of time must have the permission of the associate dean for student affairs.

Admissions

The Yale School of Medicine seeks to provide an education in the scholarly and humane aspects of medicine and to foster the development of leaders who will advance medical practice and knowledge. The Committee on Admissions, in general, seeks to admit students who seem best suited for the educational programs and aims of the School. In particular, the committee looks for intelligent, mature, and intrinsically motivated students who show the greatest promise for becoming leaders and contributors in medicine. The Committee on Admissions also considers very carefully personal qualities necessary for the successful study and practice of medicine. These include maturity, integrity, common sense, personal stability, compassion, dedication to the ideal of service, and the ability to inspire and maintain confidence.

School of Medicine graduates must have the knowledge and skills to function in a broad variety of clinical situations and to render a wide spectrum of patient care. In addition to scholastic accomplishments and potential, applicants must have the physical capacities and personal characteristics to meet the full requirements of the School's curriculum and to graduate as skilled and effective practitioners of medicine.

The School also attempts to ensure adequate representation of women and all minority groups and a diversity of interests and backgrounds. All applications to the Yale School of Medicine are given careful consideration without regard to sex, race, age, religion, national origin, sexual orientation, or financial status. For a complete statement of the Yale University policy on nondiscrimination, refer to https://equalopportunity.yale.edu/policies-and-programs.

The School of Medicine admissions process is holistic and contextual. In evaluating candidates, the committee takes into consideration many factors including academic record; MCAT scores; medical experience; research experience; extracurricular and community activities and accomplishments; leadership potential; recommendations from premedical committees, individual science teachers, or research mentors; and personal interviews.

It is recommended that students enter medical school after four years of study in a college of arts and sciences. Students holding advanced degrees in science or other fields are also considered. International students (other than Canadians) must have completed at least one year of study in an American college prior to application. Students who have been refused admission on three prior occasions are ineligible to apply for admission to the first-year class.

The minimum requirements for admission to the first-year class are:

1. Attendance for three academic years, or the equivalent, at an accredited college of arts and sciences or institute of technology.
2. Satisfactory completion of the following courses including laboratory work:
   General Biology or Zoology (one year)
   General Chemistry (one year)
   Organic Chemistry (one semester)
   Biochemistry (one semester)
   General Physics (one year)

(Acceptable courses in these subjects are usually given six to eight hours credit per year, or three to four term hours credit per semester.) These courses should be completed in a U.S., Canadian, or U.K. college or university. Advanced courses may be substituted for introductory-level courses in each of these subjects.

The Committee on Admissions has no preference as to a major field for undergraduate study and leaves this decision to students, with the advice that they advance beyond the elementary level in the field of their choice rather than pursue an undirected program. A liberal education is the supporting structure for graduate study and must encompass understanding of the humanities, arts, and society as well as the scientific foundations of technology and civilization. The student of medicine enters a profession closely allied to the natural sciences and must be prepared to cope with chemistry and biology at the graduate level. Students entering college with a strong background in the sciences, as demonstrated by Advanced Placement courses, are encouraged to substitute advanced science courses for the basic requirements listed above.

Application Process

The Yale School of Medicine participates in the "common" application process of the American Medical College Application Service (AMCAS). Applicants must first submit their AMCAS application, on which they indicate that they wish to apply to the Yale School of Medicine. After submitting the AMCAS application, applicants must complete the Yale Supplemental Application, which must be submitted online (see below for details).

Inquiries regarding AMCAS should be addressed to the American Medical College Application Service, 2501 M Street NW, Lobby 26, Washington DC 20037-1300. AMCAS can also be reached by telephone at 202.828.0600 or by e-mail at amcas@aamc.org. Extensive information can also be obtained at the AMCAS website: www.aamc.org.

Inquiries to the Yale School of Medicine regarding the degree of Doctor of Medicine should be addressed to the Office of Admissions, Yale School of Medicine, Edward S. Harkness Memorial Hall D, 367 Cedar Street, New Haven CT 06510. The e-mail address of the admissions office is medical.admissions@yale.edu. Information about the Yale Supplemental Application can also be obtained online at http://medicine.yale.edu/admissions. Inquiries are welcome at any time.

AMCAS applications must be submitted no later than October 15 of the year prior to the fall in which enrollment is sought. Yale Supplemental Applications must be submitted online no later than November 15. Applicants seeking admission under the Early Decision Plan must submit the AMCAS application by August 1 and the Yale Supplemental Application by August 31. The number of students admitted each year for studies leading to the M.D. degree is 104.

A complete application consists of the following components:

1. AMCAS application and all required components of the application (see 2 and 5 below).
2. Complete official transcripts from all colleges attended. Transcripts should be sent from the colleges directly to AMCAS.
3. Yale Supplemental Application submitted online no later than November 15.

4. An evaluation from the applicant's Premedical Advisory Committee or individual letters from three of the applicant's instructors, two of whom should be in science fields. These evaluations must be sent to the Office of Admissions via AMCAS Letter Service. Detailed instructions regarding electronic transmission of evaluation letters will be found in the General Information section of the Supplemental Application.
5. Scores from the Medical College Admission Test (MCAT) must be submitted in conjunction with the AMCAS application. For information on the MCAT, applicants should communicate directly with the MCAT Program Office, PO Box 4056, Iowa City IA 52243. Information on the MCAT can also be obtained online at www.aamc.org. Scores of tests taken earlier than three years prior to submitting an application will not be accepted.
6. A fee of $95 or an AMCAS fee waiver must accompany the Yale Supplemental Application. The fee is not refundable.

During the course of the admissions process, selected applicants will be invited for personal interviews with members of the Committee on Admissions at Yale. Regional interviews can be arranged when necessary.

Early Decision Program

The Yale School of Medicine participates in the AMCAS Early Decision Program (EDP). Under EDP, a student may make a single early application to the school of the student's choice and is guaranteed a prompt decision by the school. AMCAS applications for the EDP program must be submitted by August 1. Yale Supplemental Applications must be submitted by August 31. EDP applicants will be notified of the decision of the Committee on Admissions no later than October 1.

Admission to Advanced Standing (Transfer Admissions)

Because of a limited number of available positions, the Yale School of Medicine does not routinely consider requests for transfer with advanced standing. The only exception to this policy is that the School will consider applications into the second-year or third-year class from students who are enrolled in LCME-accredited medical schools in the United States or Canada and who have a compelling personal need to be at Yale.

The following three circumstances constitute "compelling personal need" under this policy:

1. The applicant's spouse holds, or has been accepted for, a position in the Yale New Haven Medical Center community as a student, a member of the house staff at Yale New Haven Hospital, a postdoctoral fellow, or a faculty member. *Transfer applicants whose eligibility is established in this manner must by married at the time of matriculation, and the applicant's spouse must be in residence in New Haven and holding a position in the Yale New Haven Medical Center*.
2. A serious illness in the immediate family of the applicant requires the ill person to be in New Haven for treatment and the applicant to be in New Haven as the primary supportive member of the family during the time of the illness. *Transfer applicants whose eligibility is established in this manner must provide specific information regarding the family member's illness to the Admissions Committee.*

3. In collaboration with a faculty member of the Yale School of Medicine, the applicant has completed exceptional biomedical research, which both the applicant and the faculty member wish to continue. Completing medical studies at Yale would enable the applicant to pursue this collaborative research and achieve important and unique educational and scientific objectives that would not be possible at the original medical school. *Decisions regarding the exceptional nature of the research and uniqueness of opportunities at Yale will be made by the Admissions Committee, based on information provided by the applicant and by the Yale faculty member with whom the applicant has collaborated.*

If an applicant does not fall into one of the above "compelling need" eligibility categories, as determined by the Admissions Committee, the applicant's transfer application will not be considered, regardless of other qualifications. The distance of the applicant from New Haven will also be taken into consideration. Students attending medical school in New York City, Connecticut, or Rhode Island will not normally be eligible to apply for advanced standing.

Transfer into the second-year class is possible only from medical schools with a basic science curriculum compatible with the curriculum at Yale. Transfer into the third-year class is contingent upon passing Step I of the United States Medical Licensing Examination (USMLE). *An applicant who fails USMLE Step I will not be considered for admission under any circumstances*. In all cases, in accordance with AAMC guidelines, the applicant's transfer request must be supported by the dean of students (or comparable official) at the original medical school, and courses being taken at the original medical school must be completed successfully.

Eligible transfer applicants will be evaluated by the Admissions Committee, with decisions based on academic credentials, supporting material, interviews, and the urgency of the need to transfer. Overall qualifications are expected to be comparable to those of Yale students admitted through the regular admissions process. Regardless of eligibility factors and qualifications, transfer into either the second- or third-year class is contingent upon the availability of positions in the class at Yale, and transfer into the third-year class is also contingent on the capacity of clinical clerkships to accommodate additional students.

All accepted applicants must matriculate in the year accepted. Transfer students must complete all required clinical clerkships (including the fourth-year Primary Care Clerkship and the Integrative Clinical Medicine Clerkship) and the thesis requirement at Yale School of Medicine. If a transfer student wishes to spend an extra (fifth) year at Yale, one-half of the tuition for that year will be waived.

Completed transfer applications consist of Yale School of Medicine application forms, letters of recommendation, MCAT scores, college transcripts, a transcript from the current medical school, and a letter from the dean of students (or comparable official) at the current medical school. Inquiries regarding transfer applications should be addressed to the Office of Admissions, Yale School of Medicine, 367 Cedar Street, New Haven CT 06510 or medical.admissions@yale.edu. Transfer applications, including all supporting credentials, must be submitted by April 1 of the year the student wishes to enter Yale.

Educational Objective

The mission of Yale School of Medicine is to educate and inspire scholars and future leaders who will advance the practice of medicine and the biomedical sciences. The educational program is designed to develop physicians who are highly competent and compassionate practitioners of the medical arts, schooled in the current state of knowledge of both medical biology and patient care. It is expected that Yale-trained physicians will establish a lifelong process of learning the medical, behavioral, and social sciences by independent study. The aim is also to produce physicians who will be among the leaders in their chosen field, whether it be in the basic medical sciences, academic clinical medicine, or medical practice in the community. Belief in the maturity and responsibility of students is emphasized by creating a flexible program through anonymous examinations and the elimination of grades in pre-clerkship courses, and by encouraging independent study and research.

Educational Philosophy: The Yale System

The Yale System of Medical Education remains unique among medical schools. It has been an important part of life at the Yale School of Medicine since 1931. Although it has undergone modifications in the intervening years, its essential spirit has remained intact, and it is a major reason why many students choose to come to Yale for their medical education.

The fundamental element of the system is the concept that Yale medical students are mature individuals, strongly motivated to learn, requiring guidance and stimulation rather than compulsion or competition for relative standing in a group. The corollary of this concept is that students must assume more than usual responsibility for their education. Students should be considered adults in a graduate school and be permitted to enjoy as much freedom as is consistent with the fulfillment of requirements for the degree of Doctor of Medicine. Memorization of facts should be far less important than a well-rounded education in fundamental principles, training in methods of investigation, and the acquisition of the scientific habit of mind.

During the pre-clerkship years, the students acquire knowledge and develop clinical skills. In the integrated basic and clinical science courses, lectures are held to a minimum, and there is a focus on interactive learning in small-group workshops and conferences. Students are evaluated through examinations that they take anonymously. Performance is assessed by the faculty based upon participation in small-group sessions, by anonymous qualifying examinations at the end of each course, and by passing of the United States Medical Licensing Examinations. Competency in performing a complete history and physical examination is assessed at the end of the pre-clerkship period using standardized patients in an observed structured clinical examination (P-OSCE). Student attendance is expected in all skill-building sessions and sessions in which interactive learning, clinical reasoning, or collaboration are necessary for optimal learning.

In the pre-clerkship period (first eighteen months) there are no grades, and there is no class ranking throughout medical school. While grades are not given and rank order not established, evaluation of students is an important part of the educational process. The faculty considers small-group teaching with formative feedback interchanges between

faculty and students to be the most effective means of teaching and evaluation. Students should expect direct questioning in workshops and labs as an important adjunct to the evaluation process. The final decision of acceptable performance for a given course or clerkship is determined by the course/clerkship director based upon the successful completion of the assessments described above. Freed from the usual anxieties provoked by high-stakes summative examinations, students tend to learn for their future rather than for tests. Competition for grades is eliminated and students are eager to help one another. Class spirit is remarkably high year after year. Upon completing a course, all students are expected to submit a programmatic evaluation so that course/clerkship directors can make changes based on student feedback.

Finally, the Yale System requires each student to design, carry out, and successfully complete a research thesis, intended to foster the development of a lifelong commitment to learning (see Required Thesis, in the chapter Degree Programs).

Pre-Clerkship Curriculum

The first eighteen months of the curriculum focus on providing students with a foundation in the basic and clinical sciences and the art of medical practice. During this period, students engage in eleven Integrated Courses, the Clinical Skills course, the Interprofessional Longitudinal Clinical Experience, and the Medical Coaching Experience. The integrated course curriculum includes eight master courses (Introduction to the Profession, Scientific Foundations, Genes and Development, Attacks and Defenses, Homeostasis, Energy and Metabolism, Connection to the World, and Across the Lifespan); and three longitudinal courses (Professional and Ethical Responsibility, Human Anatomy, and Scientific Inquiry).

The Clinical Skills course (CS) introduces students to the principles and skills of medical interviewing and physical examination. CS course sessions meet weekly and provide an opportunity for students to observe and develop clinical skills.

In addition to didactic sessions, students will also participate in the Interprofessional Longitudinal Clinical Experience (ILCE) in the first year, where students will work in interprofessional teams with students from Yale School of Nursing and the Physician Associate Program in a consistent clinical setting. Students meet at their clinical settings one afternoon per week. At the end of the first year, students are assessed on their acquired clinical skills utilizing a two-case Observed Structured Clinical Exam (P-OSCE).

At the conclusion of the ILCE and into the fall of the second year, students participate in the Medical Coaching Experience (MCE) to learn advanced clinical skills and prepare them for the clerkship year.

Pre-Clerkship Requirements

In order to proceed to the clerkship year, a student must satisfy the following requisites:

1. Pass the mandatory qualifying examinations for all first- and second-year courses.
2. Pass the Clinical Skills course by attending all didactic and skill-building sessions.
3. Meet all requirements of the Interprofessional Longitudinal Clinical Experience (ILCE) and MCE courses.
4. Achieve clinical competence as ascertained by the P-OSCE assessment.
5. Comply with all immunization requirements.

6. Provide feedback on all pre-clerkship courses by completing surveys and participating in advisory groups.

The Clerkship Year

CLINICAL CLERKSHIPS

The clerkship curriculum consists of four twelve-week integrated clerkship blocks:

- The Medical Approach to the Patient (Internal Medicine and Neurology)
- The Surgical Approach to the Patient (Surgery and Emergency Medicine)
- Women's and Children's Health (Obstetrics & Gynecology and Pediatrics)
- Biopsychosocial Approach to Health (Ambulatory Internal Medicine, Psychiatry, Family Medicine, and Pediatric Primary Care)

Clerkship scheduling will be arranged through the registrar in the Office of Student Affairs. There is no required order for taking clerkships, and there is no advantage to any particular order. Students are required to complete and pass all clerkships before proceeding to the Advanced Clinical Training and Research period.

Advanced Clinical Training and Research

The final phase of the curriculum includes a time of maximum flexibility and choice for students to engage in a variety of clinical electives and subinternships, research, thesis preparation, and residency preparation.

The Office of Student Affairs holds an informational meeting in the fall of the third year (last six months of the clerkship period), and students meet with their advisers to discuss scheduling and requirements during the advanced clinical training and research period.

Graduating students are required to submit a thesis plan to the Office of Student Research in the fall of their final year. Students must provide a tentative thesis title and the name of the thesis adviser as part of the thesis plan.

Clinical Skills Assessment (C-OSCE) Requirements

It is important to have a formal assessment of clinical skills to determine whether students have achieved the required level of competence in history taking, physical examination, communication, and clinical reasoning.

For Yale medical students, this formal assessment occurs at the completion of the clerkships at the clinical skills facility at the University of Connecticut. Students evaluate simulated patients, who portray patients with common clinical presentations, and are evaluated using checklists and rating scales. All encounters are videotaped. Passing standards are determined with accepted procedures.

If a student fails the assessment, the student meets with a member of the Yale Skills Assessment Team to review the performance based on established criteria and create an action plan for improvement. The student then returns to UConn for reassessment in six to eight weeks.

POLICY

1. Students must demonstrate competence in clinical skills, determined by passing the C-OSCE assessment, as a requirement for graduation.
2. C-OSCE is offered during, or immediately after, the last clerkship rotation in the clerkship year. Students will be scheduled to take it as close to the completion of their clerkships as possible, recognizing that some students such as those who have postponed a clerkship will have to take the assessment before they have completed all of their clerkships.
3. If a student fails the first attempt, the student and the student's academic adviser are notified and a plan is made for remediation. Two additional attempts to pass within the next twelve months are permitted.
4. Failure on three attempts results in dismissal. Based on extraordinary circumstances, the Progress Committee may direct the Clinical Skills Assessment Committee (CSAC) to independently evaluate the student's clinical skills, drawing upon observations in the two recent remediation periods and, if needed, new assessments. If the CSAC confirms insufficient clinical skills, the student will be dismissed. However, if the CSAC determines that the student demonstrates a minimum competence in clinical skills, the student will be credited for this graduation requirement.

United States Medical Licensing Examinations (USMLE) Requirements

Passing USMLE Step I and both parts of Step II is required for graduation from Yale School of Medicine.

USMLE STEP I

The Office of Student Affairs holds a USMLE Step I Fair and informational session. Students apply for the USMLE online at the NBME (National Board of Medical Examiners) website at www.nbme.org. Information on how to register for the USMLE examination is available online at http://medicine.yale.edu/education/osa/registrar/Copy_of_index.aspx. The United States Medical Licensing Examinations (USMLE) Step I, and the Step II Clinical Knowledge (CK), are computer-administered at Prometric Testing Centers. This system has given students considerable flexibility over the choice of test time and place. Students should consult the USMLE website for more information (www.usmle.org).

Matriculation on or before 2014 Students are required to sit for Step I of the United States Medical Licensing Examination by December 31 of the third chronological year of medical school; however, students are strongly encouraged to take Step I before starting clinical clerkships in June of the third year.

Matriculation on or after 2015 All M.D. students are required to sit for Step I of the United States Medical Licensing Examination by December 31 of their fourth year of medical school, but students are strongly encouraged to take it within six months of completing their clinical clerkships.

Joint degree For students completing a joint degree (other than an M.D./Ph.D.), Step I and both parts of Step II must be taken and passed before starting the second degree program.

For additional information, see https://medicine.yale.edu/education/ppgg/USMLE%20Requirements%20and%20Guidelines_320507_5_v4.pdf.

USMLE STEP II

The written Step II exam is called Step II Clinical Knowledge (Step II CK). Step II CK must be taken by December 31 of the final (fourth) year. It is strongly recommended that students take Step II CK early in the advanced clinical training and research period immediately after completing the clinical clerkships. Like Step I, this computer-based exam is administered at Prometric Test Centers throughout the world.

Step II Clinical Skills (Step II CS) is a separate, required component of Step II and must be taken by December 31 of the final year. However, it is to the student's advantage to take Step II CS as soon as possible after completing the clinical clerkships. Utilizing standardized patients, this exam is administered at regionally located centers operating year-round. Information on how to register for the USMLE examination is available online at http://medicine.yale.edu/education/academicprogress/registrar/scheduling.

It is the student's responsibility to ensure that both parts of USMLE Step II are scheduled and taken by December 31 of their final year. Disregarding this requirement is considered unprofessional behavior and may be considered by the Progress Committee in deciding whether a student has satisfactorily completed the requirements to graduate. If a student schedules the exams but then fails to take them as scheduled, the Progress Committee and the dean of the medical school will be notified. In addition, the student may be prevented from putting in a match list, or the residency programs to which the student has applied may be notified that the student behaved in an unprofessional manner and may be in jeopardy of not graduating on time to start residency.

FAILURE OF USMLE STEP I, II CK, AND STEP II CS POLICY

Any failure of Step I, Step II CK, or Step II CS will be brought to the attention of the Progress Committee and the student's academic adviser. In general, a student in good standing will be allowed three attempts to take and pass each of these examinations. The timing of the repeat exams should be determined in consultation with the academic adviser. If a student fails an exam three times, the Progress Committee will review the student's overall academic progress. Under extraordinary circumstances, the Progress Committee may permit a fourth attempt, but barring that permission, the student will be dismissed from the medical school.

If a student who fails one of these exams is also experiencing other academic difficulties, including issues related to unprofessional behavior or failure to progress through the clinical clerkships, or is already on academic probation, the Progress Committee will review the student's overall academic progress. The Progress Committee will then determine how many times and under what circumstances that individual may be permitted to repeat these exams, which may be fewer than three times.

Course Schedules, 2019–2020

Integrated Course Curriculum (eighteen months)
Introduction to the Profession
Scientific Foundations
Genes and Development
Attacks and Defenses
Homeostasis
Energy and Metabolism
Connection to the World
Across the Lifespan
Professional and Ethical Responsibility
Human Anatomy
Scientific Inquiry: Biostatistics and Research Methods and Responsible Conduct of Research
Clinical Skills
Integrated Longitudinal Clinical Experience (ILCE)
Medical Coaching Experience (MCE)

CLERKSHIP YEAR

Four required clerkship blocks:

- The Medical Approach to the Patient (Internal Medicine and Neurology)
- The Surgical Approach to the Patient (Surgery and Emergency Medicine)
- Women's and Children's Health (Obstetrics & Gynecology and Pediatrics)
- Biopsychosocial Approach to Health (Ambulatory Internal Medicine, Psychiatry, Family Medicine, and Pediatric Primary Care)

ADVANCED CLINICAL TRAINING AND RESEARCH

Students are required to schedule one four-week subinternship, thirty-three weeks of scheduled clinical electives or research time, and the capstone course in the spring of the fourth year. Students will also schedule time for the USMLE Step I, Step II CK, and Step II CS board examinations and for interviewing and residency preparation.

Required Thesis

Yale is the only medical school with a long tradition requiring a dissertation based on original research. The M.D. thesis, a requirement since 1839, is an essential part of the curriculum, designed to develop critical judgment, habits of self-education, and application of the scientific method to medicine. The thesis requirement gives students the opportunity to work closely with full-time faculty who are distinguished scientists, clinicians, and scholars. The investigation may have its origins in basic science or in clinical, laboratory, epidemiology and public health, or medicine and the humanities (medical ethics, history of medicine, etc.). A hypothesis must be defined, experimental methods developed, and data gathered to prove or disprove the hypothesis. Students are expected to use state-of-the-art methods appropriate for research and scholarship in each discipline. Stipends are provided for summer and all other short-term research periods (four deadlines throughout the year). In addition there are many national (National Institutes

of Health, Sarnoff Foundation, American Heart Association) and Yale-sponsored one-year research fellowships available. Conduct of the research is begun in the summer following the first year and is continued during free periods in the third and fourth years, often over vacations. A significant percentage of students (currently 55 percent of Yale medical students) elect to take an additional year of medical school to pursue their research projects in greater depth, but this is not a requirement. These students are eligible for a joint M.D./Master of Health Science (M.H.S.) if all requirements for the joint degree are fulfilled.

A doctoral dissertation in the biological sciences previously accepted as a part of the requirements for the Ph.D. degree may be submitted in lieu of a School of Medicine dissertation at the discretion of the director of the Office of Student Research and the Thesis Committee. Information about the thesis and research opportunities and funding may be obtained from the Office of Student Research, at 203.785.6633 or on its website, http://medicine.yale.edu/education/osr.

JOINT ACADEMIC PROGRAMS

Students from the Yale School of Medicine accepted into another Yale degree program will be considered to be participating in a "Joint-Degree Program" and will receive the benefit of sharing tuition between the medical school and the other program's school so that each program gives up a half-year of tuition. For example, a student accepted to the M.D./J.D. Program will pay three and one-half years' tuition to the School of Medicine and two and one-half years' tuition to the Law School, completing seven years of school in six. This arrangement holds for Yale schools only. A student wishing to create such an arrangement at a school outside of Yale must receive permission from the associate dean for student affairs at the School of Medicine and, of course, must have the consent of the other school.

School of Medicine students enrolled in a joint-degree program or in a program to obtain a degree at another school must complete three years in the School of Medicine and pass Steps I and II of the USMLE before beginning in the other program.

M.D./Ph.D. Program

A limited number of highly qualified students will be admitted into the M.D./Ph.D. Program each year. Students accepted into this program have an excellent academic record and a strong motivation toward a career in academic medicine and the biomedical sciences, and will have had previous research experiences of a high caliber.

The goal of the M.D./Ph.D. Program at Yale School of Medicine is to train physician-scientists and provide them with a broad exposure to human biology and medicine and to an in-depth and rigorous training in one of the scholarly disciplines relevant to medicine. It is expected that these individuals will develop into academic physicians capable of assuming faculty positions in either basic science or clinical departments of schools of medicine, and in these positions will provide leadership in academic medicine and in research related to medicine and human welfare.

The M.D./Ph.D. Program, sponsored jointly by the School of Medicine and the Graduate School of Arts and Sciences, is intended for students who wish to obtain a research

degree in an established Ph.D. program. Participating in the M.D./Ph.D. Program are the Graduate School departments/programs of Anthropology; Applied Mathematics; Biomedical Engineering; Cell Biology; Cellular and Molecular Physiology; Chemistry; Experimental Pathology; Genetics; History of Science and Medicine; Immunobiology; Interdepartmental Neuroscience Program; Microbiology; Molecular Biophysics and Biochemistry; Molecular, Cellular, and Developmental Biology; Pharmacology; and Public Health (Biostatistics, Chronic Disease Epidemiology, Environmental Health Sciences, Epidemiology of Microbial Diseases, Health Policy and Management, and Social and Behavioral Sciences). Students interested in taking the joint degree in another department may be able to do so, provided they can work out, in advance of acceptance, a program that is approved by the department concerned and the director of the M.D./Ph.D. Program. Students who anticipate programs in the humanities and social sciences for their Ph.D. studies must be admitted to the programs concurrently with their admission to the M.D./Ph.D. Program.

Applications to the M.D./Ph.D. Program are accepted from U.S. citizens or permanent residents and foreign nationals. All applicants selected for admission currently receive support from the program for stipend, tuition, and health fees. Substantial funding is provided by the Medical Scientist Training Program (MSTP), a grant provided from the National Institute of General Medical Sciences. Continuing in the program is contingent on satisfactory progress in both the School of Medicine and the Graduate School. The average length of time students spend completing the requirements for the M.D./Ph.D. Program is seven to eight years.

Students who have matriculated at Yale School of Medicine and are interested in applying to the M.D./Ph.D. Program should meet with the director or deputy director to discuss the internal application process. An important consideration for admission to the M.D./Ph.D. Program is adequate research experience and identification of a supportive thesis adviser and intended program of graduate study. This will be assessed on a case-by-case basis. It may be necessary to complete a summer (or the equivalent in time) of research in a lab at Yale for an application to be considered. Applications for admission are reviewed by the same committee that evaluates outside applicants to the M.D./PhD. Program.

Requirements of the M.D./Ph.D. Program

Beginning with students who matriculated in fall 2015, candidates for M.D./Ph.D. degrees will normally begin their thesis research after completing the first four terms of the School of Medicine curriculum. Students will complete two twelve-week clinical rotations at the end of the second year of medical school that will enable them to participate in longitudinal clinical experiences during their Ph.D. years. Students following this schedule are expected to take their Step I board exams in the summer following the second year of medical school and to affiliate with a graduate program by the beginning of the third year of the program. Only under unusual circumstances will students be allowed to complete more or less than six months of clerkships prior to beginning Ph.D. work; this requires prior approval of the director.

During the first and second years of medical school, the majority of M.D./Ph.D. students take, for credit, graduate-level courses primarily designed for them. These courses

supplement the core medical school curriculum and can be applied toward the course requirements of the student's chosen Ph.D. program. The summer between the first and second years is spent in lab rotation(s), the purpose of which is to orient students in the selection of a thesis mentor and research area. However, students must request affiliation with a particular department in the Graduate School by the beginning of their third year of study in the joint-degree program. Any exceptions must be approved by the director of the M.D./Ph.D. Program and the director of graduate studies (DGS) of their proposed Ph.D. department.

A student admitted to the joint-degree program must satisfy the Graduate School Honors requirement and complete all predissertation requirements within four terms of affiliation with the Ph.D. department. These include course requirements, teaching requirements if applicable, a departmental qualifying examination, and the submission of an approved prospectus. At that point, the student is admitted to candidacy. Students in the M.D./Ph.D. Program must be admitted to candidacy one full year before they expect to be awarded the Ph.D. degree. An average of three to four years is spent completing the Ph.D. requirements.

As described above, the integrated curriculum of clinical clerkships begins in January of the second year of medical school, and M.D./Ph.D. students participate in six months of clerkships prior to beginning Ph.D. work. Students are encouraged to take the twelve-week Medical Approach to the Patient integrated clerkship and one other twelve-week integrated clerkship prior to beginning research. This will enable the student to participate in outpatient clinical activities during dissertation work. After the student's thesis defense, the student returns to the medical wards to complete six months of integrated clinical clerkships and remaining clinical course work, including mandatory and/or elective subinternships, clinical electives, and the M.D. Capstone Course. Students must also pass Step II CK/CS and C-OSCE exams by December 31 of the year they plan to graduate from the joint-degree program.

The Ph.D. dissertation will be accepted as the thesis requirement for the School of Medicine, providing the Ph.D. degree is received before or at the same time as the M.D. degree. If the M.D. degree is to be awarded before the Ph.D., an approved thesis must be submitted to the Office of Student Research at the School of Medicine by May 1 in order to meet the School of Medicine thesis requirement for graduation. Students will be eligible for the M.D. and Ph.D. degrees, provided the degree requirements for both the School of Medicine and the Graduate School have been fulfilled, usually at the end of seven years. If requirements have not been completed, additional time will be required.

Joint M.D./Master of Health Science (M.D./M.H.S.)

Yale School of Medicine has established a joint degree, the M.D./Master of Health Science (M.D./M.H.S.), for students completing a competitively funded full fifth year of research and other requirements. This program was approved by the Yale Corporation in January 2006.

There are two pathways to the M.D./M.H.S. degree for medical students: a clinical research pathway and a laboratory/translational research pathway. The M.D./M.H.S. degree is centered around a fifth-year pull-out supported by a fully funded one-year

medical student research fellowship at Yale (currently funded by the YCCI Multidisciplinary Pre-Doctoral Training Program, NIH-NIDDK fellowships, and Yale Endowment Fellowships).

The independent research project in the fifth year is the centerpiece of the M.D./M.H.S. degree program. In addition the following requirements apply:

1. The project mentor and a three-person thesis committee must be approved by the Office of Student Research and the M.D.-Master of Health Science Advisory Committee.
2. Additional course work is required:
   a. Clinical research pathway—Courses: Principles of Clinical Research; Introduction to Biostatistics in Clinical Investigation; Organization and Leadership; Responsible Conduct of Research (during master's year)
   b. Laboratory/translational research pathway—Courses: Intensive Pedagogical Experience in Techniques and Strategies for Laboratory Research or Selected Seminars in Clinical and Translational Informatics; Introduction to Biostatistics in Clinical Investigation; Organization and Leadership; Responsible Conduct of Research (during master's year)

      These courses can be taken prior to or during the research year.
      Additional electives are also required.
3. Participation in monthly research-in-progress seminars, journal clubs, Leadership in Biomedicine Lecture Series and dinners, and other announced activities throughout the master's research year is required. Further information is available in the Office of Student Research or online at http://medicine.yale.edu/education/research/mhs/instructions.aspx.

M.D./M.P.H. Program

Students enrolled for the M.D. degree at the School of Medicine may apply to the Yale School of Public Health for admission to a combined program leading to the degrees of Doctor of Medicine and Master of Public Health. This program (Advanced Professional Program) is designed for students with special interest in aspects of medicine dealing with biostatistics, epidemiology of acute or chronic disease, organization and management of health services, or aspects of preventive medicine and public health.

Normally the combined program requires five years of study. One thesis satisfies both degree requirements provided it is approved and carried out under the supervision of a faculty member of the School of Public Health and is in an appropriate subject area.

Applications for the M.P.H. portion of this combined degree program must be submitted through www.sophas.org. The SOPHAS application opens in the fall of each year, and medical students are encouraged to apply during their third year of study. The M.P.H. program is on rolling admissions, and the final application deadline is December 15. Medical students may contact the YSPH director of admissions at ysph.admissions@yale.edu or the director of the AP M.P.H. Program, Dr. Mayur Desai, for more detailed information regarding the curriculum and areas of study.

M.D./M.Div. Program

Students who have been admitted to the Yale School of Medicine and are enrolled for the M.D. degree may apply to the Divinity School for admission to a combined program leading to the award of the degrees of Doctor of Medicine and Master of Divinity. Students who apply to the joint M.D./M.Div. Program are expected to do so at the same time that they apply to the School of Medicine or by the end of their second year at the School of Medicine in order to qualify for the special tuition arrangement. Students enrolled in the program pay three and one-half years' tuition to the School of Medicine and two and one-half years' tuition to the Divinity School.

The joint program is tailored to the individual interests and needs of those students seeking professional education and training in a theological understanding of the self, society, and work; in bioethics; in international health and missions; in relating a ministry of healing to hospice or similar patient-care facilities; in a biblical understanding of person; or in academic work in teaching, counseling, and chaplaincy.

Six years are required for the combined M.D./M.Div. Program.

M.D./J.D. Program

The Yale School of Medicine has a formal relationship with the Law School to allow students to seek degrees from both schools. This can be done in six years instead of seven, as would be the case if these disciplines were studied separately. Students pay three and one-half years' tuition to the School of Medicine and two and one-half years' tuition to the Law School. Students interested in this program must confer early with the appropriate deans at each school to plan curriculum and find out if they qualify for the special tuition arrangement. Students at the Law School must petition for approval of a joint-degree program, and they may only petition after they have matriculated in Law School and completed their first term.

Students who apply to the joint M.D./J.D. Program are expected to do so at the same time that they apply to the School of Medicine or by the end of their second year at the School of Medicine in order to qualify for the special tuition arrangement. Students must be found acceptable by both admissions committees. It is suggested that the student state on each application that the student is applying to both schools in order to pursue the combined degree program.

M.D./M.B.A. Program

The purpose of the joint-degree program in medicine and management is to develop clinician-managers capable of pursuing careers that balance delivery of patient care with sound management in a changing health care environment. The joint-degree program normally requires five years of study and simultaneous award of the degrees of Doctor of Medicine and Master of Business Administration at the conclusion of the five-year period. A joint-degree student pays three and one-half years' tuition to the School of Medicine and one and one-half years' tuition to the School of Management, in a pattern determined in advance by the two schools. Students interested in this program must discuss their intentions with the associate deans of student affairs at both schools and with Howard P. Forman, M.D., M.B.A., director of this joint-degree program.

YALE SCHOOL OF PUBLIC HEALTH

The School of Public Health (YSPH) is an accredited school of public health where students may earn the Master of Public Health (M.P.H.) degree. The Doctor of Philosophy (Ph.D.) and Master of Science (M.S.) degrees in public health are awarded through the Graduate School of Arts and Sciences.

The M.P.H. degree program is available as a two-year program; as an eleven-month program for individuals with a doctoral-level (or international equivalent) degree in a field related to public health (e.g., physicians, dentists, veterinarians, attorneys, and those with a doctorate in the biological, behavioral, or social sciences), individuals with a master's degree and at least two years of relevant work experience, individuals with a bachelor's degree and at least five years of relevant work experience, and students who have completed their third year in an accredited medical, dental, or podiatric school in the United States; or as a five-year joint B.A.-B.S./M.P.H. program with Yale College. See the YSPH Bulletin for details on each degree program.

YALE PHYSICIAN ASSOCIATE PROGRAM

The concept of a physician assistant (or Physician Associate) was first developed in 1965. Today the Physician Associate is a highly valued member of the health care team. Physician Associates are distinguished from other advanced health care practitioners by the extent to which they are given decision-making authority regarding patient care, diagnosis, and treatment. The twenty-eight-month Yale program, established in 1970, is committed to educating students for generalist medical practice. As of December 2018, the Yale Physician Associate Program has graduated 1,271 Physician Associates who are employed in a variety of settings throughout the nation. Graduates practice in rural as well as urban areas, in emergency rooms, health maintenance organizations, clinics, and solo and private practices. They possess a variety of skills, which enable them to take a medical history; perform a physical examination; diagnose illness and formulate patient treatment plans; counsel patients; perform medical procedures; and assist in surgery.

Mission of the Yale Physician Associate Program

The mission of the Yale School of Medicine Physician Associate Program is to educate individuals to become outstanding clinicians and to foster leaders who will serve their communities and advance the PA profession.

Curriculum Structure and Goals of the Yale Physician Associate Academic Program

The program is divided into a didactic phase of twelve months and a clinical phase of fourteen months. In addition, a research component is included in the clinical phase of the curriculum, with two one-month periods for research-related activities. The program provides a rich combination of medical courses and clinical experiences to ensure that Physician Associate students are prepared for their careers as professionals in interprofessional medical teams. Through problem-based learning, case studies, hands-on patient

care, and research, the Yale Physician Associate students are well prepared to join hospitalist teams and private practices in both primary care and specialties.

A Master of Medical Science (M.M.Sc.) degree is awarded upon completion of the program.

THE DIDACTIC PHASE

The first calendar year is devoted to course work in basic and clinical sciences. Courses include:
Anatomy I, II, III
Basic Science I, II, III
Behavioral Medicine I, II, III
Clinical Medicine I, II, III
Diagnostic Studies I, II, III
Patient Assessment I, II, III
Pharmacology I, II, III
Practice, Policy, and Ethics I, II, III
Research I, II, III

THE CLINICAL PHASE

Each student completes fourteen four-week rotations, in a variety of medical specialties, in order to acquire broad experiences in primary, emergency, and surgical care. Two additional four-week blocks during the clinical phase are reserved as research/thesis months. Ten rotations are mandatory: Internal Medicine I, Internal Medicine II, General Surgery, Primary Care I, Primary Care II, Psychiatry, Pediatrics, Obstetrics and Gynecology, Geriatrics, and Emergency Medicine. The remaining four rotations are reserved for subspecialty electives.

Although many rotations are in the New Haven area, the experience of the student is expanded by exposure to rotations in other geographic settings. Consequently, students entering the program should expect to spend at least one rotation outside of New Haven or Connecticut. Students should expect to provide their own transportation and housing for all rotations away from New Haven. Students may also choose to broaden their experience by applying for international rotations. Students have chosen clerkships in China, Spain, Uganda, Rwanda, and Peru.

In order to graduate from the program, a student must successfully complete all rotations, summative evaluation using standardized patients, a written examination, and a thesis proposal. The thesis proposal must present a rationale for the topic of study, a comprehensive literature review, and a detailed description of the methodology to be used. A Yale School of Medicine faculty adviser serves as a thesis mentor to each student.

MANDATORY ROTATIONS

Emergency Medicine
General Surgery
Geriatrics
Internal Medicine I
Internal Medicine II
Obstetrics and Gynecology
Primary Care I
Primary Care II
Pediatrics
Psychiatry

ELECTIVE ROTATIONS

Ambulatory Medicine
Anesthesiology
Cardiology
Cardiothoracic Surgery
Dermatology
Diagnostic Imaging/Radiology
Endocrinology
Gastroenterology
Gynecologic Oncology
Hematology
Hospitalist Medicine
Infectious Disease
International Medicine
Interventional Pulmonology
Interventional Radiology
Maternal-Fetal Medicine
Medical Intensive Care
Neonatology
Nephrology
Neurology
Neurosurgery
Occupational Health
Oncology
Orthopedics
Otolaryngology
Pediatric Cardiology
Plastic Surgery
Rheumatology
Surgical Intensive Care
Thoracic Surgery
Transplant Surgery
Trauma Surgery
Urology

Tuition and Fees

Tuition for the Physician Associate program for the 2019–2020 academic year is $43,815 for first- and second-year students, and $14,605 for third-year students. Fees and other expenses—including books, supplies, and equipment; room and board; personal expenses and transportation; Yale Health Hospitalization coverage; and travel to rotations—are estimated at an additional $32,776 for first-year students, $34,127 for second-year students, and $11,733 for third-year students. For more information, visit https://medicine.yale.edu/education/financialaid/paprogram/index.aspx#page2.

Admission to the Yale Physician Associate Program

The admissions process is highly selective and competitive. Selection is based on a multitude of factors including academic history, community or leadership involvement, patient care experience, and interpersonal effectiveness. For additional information regarding admissions, please visit the PA Program website at http://paprogram.yale.edu/admissions.

ACADEMIC

Students must have a baccalaureate degree prior to matriculation. The Admissions Committee closely examines applicant records for evidence that individuals are capable of successfully completing graduate-level science work. An undergraduate science major is not required, but applicants must complete the following prerequisites: one semester of statistics or calculus, one semester of organic or biochemistry, one semester of anatomy with or without lab, one semester of animal or human physiology, one semester of microbiology, and one semester of genetics. Please visit http://paprogram.yale.edu/admissions/prerequisites/academic.aspx for further details. A cumulative science grade

point average of 3.0 is required. The program considers Graduate Record Exam (GRE) scores (required) and performance in science courses as indicators of academic ability in light of applicants' past records.

EXPERIENCE

Applicants must have some awareness of the intricacies of medical care delivery as it exists today and demonstrate their commitment to a profession that helps the sick and injured. The majority of the PA Program's students have had one year of direct patient contact experience in a variety of health care roles such as orderly, nurses' aide, military corpsman, nurse, medical scribe, phlebotomist, or emergency medical technician. Experience need not be in a hospital setting. One thousand hours of direct, hands-on patient care experience is highly recommended to be considered for admission.

INTERPERSONAL

The program values ability to work skillfully, thoughtfully, responsibly, and constructively with people. The Admissions Committee screens applicants to determine their career commitment, interpersonal skills, and willingness to work with the supervision of a physician.

In addition to scholastic potential and interpersonal skills, applicants must have the physical capacities and personal characteristics necessary to meet the full requirements of the program's curriculum and to graduate as skilled and effective physician assistants. Policy on nonacademic considerations is outlined in our Technical Standards, which are available at http://paprogram.yale.edu/admissions/prerequisites/technical.aspx.

APPLICATION FOR ADMISSION

The application deadline for the class entering in August 2020 is September 1, 2019. Program information is available on the PA Program website, http://paprogram.yale.edu/admissions/apply.aspx. Online applications for admission are processed through the Centralized Application Service for Physician Assistants (CASPA) at www.caspaonline.org. The program also requires a supplemental application.

M.M.Sc./M.P.H. Joint-Degree Program

The M.M.Sc./M.P.H. joint-degree program at Yale School of Medicine affords individuals interested in pursuing clinical and public health training a unique opportunity to complete both degree programs in thirty-nine months. The goal of this program is to expose students to the core competencies needed for shaping both local and global health systems as physician assistants and policy makers. Students must choose the area of academic concentration for the public health portion of their training from among the following: Epidemiology of Microbial Diseases, Chronic Disease Epidemiology, Social and Behavioral Sciences, or Health Policy.

Applicants must apply for admission and be accepted to both the Physician Associate Program and the Yale School of Public Health during concurrent admissions cycles. Although the deadline for application to the School of Public Health is January 15, individuals interested in the joint-degree program should apply to the PA Program and the School of Public Health as early as possible. For individuals granted an interview with the PA Program, the School of Public Health will expedite the review of the application.

Tuition and fees are billed to the student by the corresponding school during matriculation. Satisfactory academic progress is required for continued matriculation in both schools. Only students who have begun their studies at Yale are eligible for the joint degree.

YALE PHYSICIAN ASSISTANT ONLINE PROGRAM

Yale University's strategy for digital education is to prioritize initiatives that (1) use technology to improve teaching and learning at Yale University; and (2) amplify the impact of the great teaching at Yale beyond the campus. In pursuing these objectives, Yale seeks ideas that introduce pedagogical innovation and experimentation. In doing so, digital education initiatives benefit teaching and learning across the campus, while also advancing a school's, center's, or department's educational objectives.

The Physician Assistant (PA) Online Program assists the University in meeting all of these goals. This program extends the great teaching at Yale beyond the local area, revolutionizes PA education, and advances the PA program's goals.

The concept of a physician assistant was first developed in 1965. Today the Physician Assistant is a highly valued member of the health care team. They are distinguished from other advanced health care practitioners by the extent to which they are given decision-making authority regarding patient care, diagnosis, and treatment. The twenty-eight-month PA Online Program is committed to educating students for primary care medical practice.

In September 2017 the Yale School of Medicine Physician Assistant Online Program was granted Accreditation–Provisional status from the Accreditation Review Commission on Education for the Physician Assistant (ARC-PA). In January 2019 the inaugural class of forty-one students proceeded to their clinical year, and the second class of fifty-eight students began their didactic year (see roster in the chapter Enrollment for 2018–2019).

Accreditation–Provisional is an accreditation status granted when the plans and resource allocation, if fully implemented as planned, of a proposed program that has not yet enrolled students appear to demonstrate the program's ability to meet the ARC-PA Standards, or when a program holding Accreditation–Provisional status appears to demonstrate continued progress in complying with the Standards as it prepares for the graduation of the first class (cohort) of students.

Mission of the Yale Physician Assistant Online Program

The mission of the Yale Physician Assistant (PA) Online Program is to prepare PAs to provide compassionate, high-quality, patient-centered care as members of interdisciplinary teams in a primary care setting. Graduates will be culturally competent clinicians who are committed to continuous learning and professional development. Our graduates will make significant contributions to their communities and to the advancement of the PA profession.

Vision of the Yale Physician Assistant Online Program

The vision of the Yale Physician Assistant Online Program is to strive to be the national leader in innovative PA education and to prepare physician assistants of the highest quality to practice medicine as part of the health care team.

Curriculum Structure of the Yale Physician Assistant Online Academic Program

The program is divided into a didactic phase of twelve months (including two mandatory on-campus immersions, both one week in length) and a clinical phase of sixteen months (including a capstone month and one mandatory on-campus immersion, one week in length). A research component, in the form of a capstone, is incorporated into the clinical phase of the curriculum over a single four-week rotation period. The program provides a rich combination of medical courses and clinical experiences to ensure that PA students are prepared for their careers as professionals in interprofessional medical teams. Students begin their Clinical Experience in Early Didactic (CEED) immediately following their first on-campus immersion. Through problem-based learning, case studies, hands-on patient care in CEED, and the capstone, the Yale PA Online students are well prepared to join health care teams across the country to meet the ever-increasing demand for primary care providers.

A Master of Medical Science (M.M.Sc.) degree is awarded upon completion of the program.

THE DIDACTIC PHASE

The didactic year will consist of two mandatory on-campus immersions and a series of courses that are spread out over the course of the twelve months. The organ system approach will be used, with pediatrics, emergency medicine, and geriatrics being included across each system. The following is a summary of the courses and credit hours:

Course number	*Course name*	*Credits*
5010	Human Anatomy I	3
5110	Human Anatomy II	3
5210	Human Anatomy III	3
5020	Basic Science I	2
5120	Basic Science II	2
5220	Basic Science III	2
5030	Patient Assessment I	3
5130	Patient Assessment II	3
5230	Patient Assessment III	3
5040	Diagnostic Studies I	1
5140	Diagnostic Studies II	1
5240	Diagnostic Studies III	1
5050	Clinical Medicine I	5
5150	Clinical Medicine II	5
5250	Clinical Medicine III	5
5060	Pharmacology I	3

Course number	*Course name*	*Credits*
5160	Pharmacology II	3
5260	Pharmacology III	3
5070	Behavioral and Preventive Medicine I	1
5170	Behavioral and Preventive Medicine II	1
5270	Behavioral and Preventive Medicine III	1
5080	Preparing Future PAs I: PA Practice	1
5180	Preparing Future PAs II: EBM	1
5280	Preparing Future PAs III: Bioethics	1

Total credits, 57

THE CLINICAL PHASE

Each student completes fifteen four-week rotations, with an emphasis on internal medicine and primary care. One additional four-week block during the clinical phase is reserved as the capstone month. There are three four-week elective rotations and one final mandatory on-campus immersion.

The majority of the rotations will be in the student's local geographic area, although there may be some opportunities for elective rotations in other geographic areas. Students are expected to provide their own transportation to and from CEED sites, all clinical rotations, and for all campus immersions. These expenses are calculated into the student budget.

CLINICAL ROTATIONS AND CAPSTONE

Internal Medicine I, II, and III (12 weeks; 12 credits)
Primary Care I, II, and III (12 weeks; 12 credits)
Behavioral Medicine (4 weeks; 4 credits)
Pediatrics I and II (8 weeks; 8 credits)
General Surgery (4 weeks; 4 credits)
Women's Health (4 weeks; 4 credits)
Emergency Medicine (4 weeks; 4 credits)
Electives (12 weeks; 12 credits)
Master's Capstone (4 weeks; 1 credit)

Total credits, 61

Graduation Requirements

In order to graduate from the PA Online Program, a student must successfully complete their didactic year (57 credits), all clinical rotations and the Master's Capstone (61 credits), summative evaluation using standardized patients, and a written final cumulative examination.

Tuition and Fees

Tuition for the PA Online Program for the 2019–2020 academic year is $14,605 per term. For first-year students who begin their studies in January 2020, the tuition is approximately $43,815 for three terms of tuition. Second-year students can expect to

remit approximately $43,815 for three terms of tuition, and third-year students remit $14,605 for one term of tuition. First-year and second-year students should expect a slight increase in tuition for their fall terms. Activity fees, technology fees, and other expenses—including books and supplies; equipment; room and board; personal and transportation expenses; hospitalization coverage and miscellaneous medical expenses; and travel to rotations—are estimated at an additional $27,511 for first-year students, $29,061 for second-year students, and $9,415 for third-year students. For more information see https://paonline.yale.edu/admissions/tuition-and-financial-aid.

Veterans Affairs (VA) recipients: The PA Online Program allows VA recipients with pending VA remittance to attend or participate in the PA course of study, provided that the individual submits a Chapter 33 Certificate of Eligibility (or equivalent form from e-Benefits) or a Chapter 31 contract with the institution for this student on VA Form 28-1905.

Admission to the Yale Physician Assistant Online Program

Admission selection to the January cohort is based on a multitude of factors including academic history, community or leadership involvement, patient care experience, and interpersonal effectiveness. For additional information regarding admissions, please visit the PA Online Program website at https://paonline.yale.edu/admissions.

ACADEMIC

Students must have a baccalaureate degree prior to matriculation. The Admissions Committee closely examines applicant records for evidence that individuals are capable of successfully completing graduate-level science work. An undergraduate science major is not required, but applicants must complete the following prerequisites either in a quarter or semester system: 3–5 credits in statistics or calculus, 3–5 credits in organic or biochemistry, 3–5 credits in human anatomy with or without lab, 3–5 credits in animal or human physiology, 3–5 credits in microbiology, and 3–5 credits in genetics. Please visit https://paonline.yale.edu/admissions/prerequisites for detailed descriptions of the courses required. A cumulative science grade point average of 3.0 is required. A cumulative undergraduate GPA of 2.8 is also required. Official Graduate Record Exam (GRE) scores (required) and performance in science courses are some of the indicators of academic success examined by the Admissions Committee.

EXPERIENCE

Applicants must have some awareness of the intricacies of health care delivery and demonstrate their commitment to the PA profession. While experience is not required, any hands-on health care experience does make an applicant more competitive and will reconfirm the applicant's commitment to the field. Some examples of experience include working as an emergency medical technician, nurses' aide, or medical scribe. Experience can be in a variety of health care settings.

INTERPERSONAL

The program values the ability to work competently, maturely, conscientiously, and with empathy within a team setting. Beginning with the next cohort, the program will request all applicants to complete the online CASPer test. This examination will provide the

Admissions Committee with a way to review applicants' interpersonal skills fairly and reliably.

The Admissions Committee reviews letters of recommendation and screens applicants to determine their career commitment, interpersonal skills, and willingness to work with the supervision of a physician. All admissions interviews are conducted online.

In addition to scholastic potential and interpersonal skills, applicants must have the physical capacities and personal characteristics necessary to meet the full requirements of the program's curriculum and to graduate as skilled and effective physician assistants. Policy on nonacademic considerations is outlined in our Technical Standards, which are available at https://paonline.yale.edu/admissions/technical-standards.

APPLICATION FOR ADMISSION

The priority application deadline is July 1, 2020. The final application deadline is September 1, 2020. The program participates in CASPA, the Central Application Service for Physician Assistants (https://caspa.liaisoncas.com). The application usually opens the last week of April.

CERTIFICATE IN GLOBAL MEDICINE

The Certificate in Global Medicine is awarded upon graduation to Yale School of Medicine students who demonstrate competence in global health and provides recognition that a student has completed required didactic course work, scholarly work, global health clinical experience, and language, culture, and leadership activities relevant to global health. This certificate allows students to develop expertise and prepares students for leadership in global health by providing the knowledge, skills, and attitude essential for success in this field. In addition to directly benefiting students at Yale, this program will establish the Yale School of Medicine as a model for excellence in global health education. Requirements for earning the certificate can be completed over four (or five) years, while maintaining flexibility in terms of both the timing and content of these opportunities. It is expected that students pursuing the certificate will engage with the community of practitioners and scholars working on global health at Yale and around the world. International field experience in global health is an integral part of the program.

Additional information is available at http://medicine.yale.edu/globalhealth/yale/global-certificate.aspx.

Expenses and Financial Aid

TUITION AND SPECIAL FEES

Tuition for candidates for the M.D. degree (per academic year)	$62,974
Yale Health Hospitalization coverage and miscellaneous medical expenses	$2,635

Examination fees for candidates for the M.D. degree:

United States Medical Licensing	*2019–2020*
Step I and Step II – Clinical Knowledge	$1,260
Step II, Part II – Clinical Skills	$1,290
Travel to USMLE Step II–Clinical Skills	$1,075

Student accounts, billing, and related services are administered through the Office of Student Financial Services; see Student Accounts and Bills, below.

Students must pay four full years of tuition. Students who spend five years in medical school at Yale either take a fifth year to do extended study or may request to take a leave of absence. Both require the approval of the associate dean for student affairs.

Tuition payment options for fifth-year students (Extended Study) (1) pay full tuition for four consecutive years and a registration fee for the chronological fifth year; (2) pay split tuition and the registration fee over a two-year period. Students will pay one-half of the current rate of tuition and one-half of the registration fee each year. The total amount will be charged in two installments, for each term; (3) students enrolled in a joint-degree program at another Yale professional school will pay the required tuition of the other degree program to that school and no tuition or registration fee to the School of Medicine. Students will pay the required amount of tuition to the School of Medicine in the next academic year. Students will apply for financial aid at the other school; (4) students enrolled in a dual-degree program at an away institution will pay the required tuition of the other degree program to the away school and pay the registration fee to the School of Medicine. Students will pay full tuition to the School of Medicine in the next academic year. Students will apply for financial aid at the away institution.

Tuition payment options for students who take a leave of absence Students who take a leave of absence pay a registration fee for the year(s) on leave. They pay full tuition for the four years they are in residence. If a student decides to take a leave of absence in the middle of any year, full tuition will be charged for that year and a registration fee for the following year.

The following tuition arrangements for joint-degree programs apply only if the student is enrolled at Yale University for both degrees. It is strongly suggested that students interested in any joint program make an appointment to speak with the registrar at each school to discuss the tuition payment schedule.

Students who spend five years in the School of Medicine in order to receive an M.D./M.P.H. joint degree pay four years of full tuition to the School of Medicine. In addition, they pay half of the School of Medicine tuition to the School of Public Health during the year in which they are enrolled in YSPH.

M.D./Ph.D. students pay three and one-half years' tuition to the School of Medicine and two and one-half years' tuition to the Graduate School of Arts and Sciences. Any students who are in the program after six years will pay a minimal registration fee to the school they are attending. (Students are responsible for their own health insurance.)

Students who apply to one of the joint M.D./J.D., M.D./M.B.A., or M.D./M.Div. programs at Yale are expected to do so at the same time that they apply to the School of Medicine or by the end of their second year at the School of Medicine in order to qualify for the special tuition arrangements. Students in the M.D./J.D. Program pay three and one-half years' tuition to the School of Medicine and two and one-half years' tuition to the Law School. Students enrolled in the M.D./M.Div. Program pay three and one-half years' tuition to the School of Medicine and two and one-half years' tuition to the Divinity School. Students in the M.D./M.B.A. Program pay three and one-half years' tuition to the School of Medicine and one and one-half years' tuition to the School of Management.

Students who are asked to repeat one or more years of course work because of academic failure in curriculum requirements will pay full tuition for each additional year of study.

Enrollment in courses in other schools at the University may subject the student to additional fees.

First-year students should anticipate a cost of $92,329, including tuition, for necessary expenses in an academic year. Married students and/or students with dependents have a federally established standard maintenance allowance deducted from their income.

First-year students may wish to purchase some of their equipment, such as an ophthalmoscope. Each medical student must have special equipment for individual courses.

All students are required to pay a $565 Activity Fee. All students are required to pay an annual $450 Technology Fee.

Upperclassmen are reminded that they should anticipate the expenses of travel for interviews related to internship applications and also the cost of binding their theses.

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.

For enrollment deadlines and additional details concerning the Yale Payment Plan, see http://student-accounts.yale.edu/ypp.

FINANCIAL AID

Yale University recognizes the increasing cost of acquiring a medical education and wants students to pursue their medical studies at Yale as free of financial concerns as possible. Therefore, since the amount of funds available to the School is limited, and in order to meet the financial needs of students in a fair and equitable manner, the method for determining the financial aid for individual students is as follows.

In the spring of each year the budgets for students are established. These budgets include all projected expenses, including tuition, books and supplies, health insurance, personal and transportation, technology fee, student activity fee, and living expenses. They do not include the cost of purchasing, maintaining, or insuring an automobile.

The Federal Selective Service law was amended in 1982 to provide that students may not receive Title IV funds (Federal Direct Unsubsidized Loan) unless they have executed a Statement of Registration Compliance (SRC) that either confirms that the individual has registered for Selective Service or states the reason why the student is not required to do so. Because most of the School's financial aid awards include funds from at least one Title IV program, failure to execute a Statement of Registration Compliance will render students ineligible for that portion of the financial aid award that would normally be provided through these programs. Students for whom this law presents special problems, and who are subject to Selective Service, should consult the financial aid officer.

All student financial assistance is need based. The amount of the budget considered the student's responsibility is determined using the Free Application for Federal Student Aid (FAFSA) and the CSS Profile, and includes money from the student's own resources (assets, salaries, etc.), from the spouse and/or fiancé's income, when applicable, and from a parent contribution. The difference between the amount for which the family is responsible and the basic budget constitutes the financial support for which each student is eligible.

The availability of financial aid is dependent on a student's status.

(a) Full-Time. An individual who has matriculated at this school and is pursuing a full course of studies as outlined in this bulletin is a full-time student. This includes the required basic science courses in the first and second years and the required clinical clerkship in the third year. In addition, during the fourth year the student works on and completes a required thesis, and completes an adviser-approved schedule of electives. This student is charged full tuition, and financial aid is available if the student completes all the necessary forms and a need for aid has been determined.

(b) Leave of Absence. No financial aid is available to students not attending classes or working toward the requirements of the M.D. degree at Yale or elsewhere. This student is charged a registration fee. If a student is studying at another Yale graduate or professional school, that student is charged tuition by the school the student is attending.

(c) Extended Study. A student who is not taking a full course load but is attending at least one class at Yale, or elsewhere, and/or is doing research toward the thesis requirement is charged a registration fee and is eligible for financial aid only in the form of a Federal Direct Student Loan. Students on leave of absence or extended study programs

may have this option for only one year unless there are exceptional circumstances. Students must be back in school full time at the end of one year.

(d) Satisfactory Academic Progress. In order to be considered eligible for any type of financial assistance, a student must be in good academic standing and making satisfactory progress. At appropriate evaluation intervals, the student must be approved for continued enrollment by the Progress Committee of the School of Medicine. It is this committee's responsibility to require a student to finish incomplete work and/or complete any required remedial study prior to advancement to the next academic year. If the student fails to finish incomplete work and/or remedial study within one year, the student is not considered in good standing and is ineligible for any type of financial aid. Students are expected to complete the requirements of the M.D. degree within four years. With the approval of the Progress Committee of the School of Medicine or the Office of Student Affairs, a student may remain up to six years.

When a student is no longer in residence and has failed to complete required course work needed to receive the M.D. degree, the student's enrollment status is in absentia to submit. Failure to complete requirements includes not completing the dissertation, not passing the USMLE Step I or Step II, or not satisfactorily completing a required clerkship. The student is not charged a tuition fee and is not eligible for any financial assistance, University services, and/or loan deferments. Once the student has completed all of the requirements for graduation, the student's name is presented to the Board of Permanent Officers and to the Yale Corporation for the awarding of the M.D. degree.

Consistent with student status, satisfactory academic progress, and available funds, the need for financial aid is met by: (1) loans, made up of monies from various loan sources, and (2) scholarship, when eligibility for financial aid is determined using a parent contribution. This includes scholarship money supplied directly to the student from non-Yale sources. The maximum scholarship awarded to a married student never exceeds the amount calculated for a single student with no resources. The total scholarship support for all students is, of course, limited by the availability of funds. Should scholarship need exceed the supply of funds, additional loans are made available.

It is the policy of the School of Medicine to abide by the FAFSA and CSS Profile calculation of the student's and parents' contribution.

Additional financial support in the form of loans, scholarships, or employment must be made known to the student financial aid officer and may result in a proportionate reduction of School support. If a student does not report changes, the student's financial aid file is subject to review by a Disciplinary Committee and all financial aid may be canceled and the incident reported.

Signed copies of parents' and student's (and spouse/fiancé's, if applicable) tax returns, including all schedules and W-2 forms or a statement of earnings for the previous fiscal year are required for all students applying for Yale Loans and Scholarships. Copies of Social Security benefits, unemployment compensation, and retirement benefits of both student and parents are also required. All information is verified in accordance with federal regulations. If the parents are divorced, the student must provide information on the custodial parent. The custodial parent will remain the same for all subsequent years; a student cannot change custodial parents unless the original custodial parent dies. If the custodial parent is remarried, the stepparent's information is also required.

All information in individual student financial aid applications is strictly confidential and is used only for the purpose of determining and administering the student's aid.

It is understood that allocations of financial aid are held as binding commitments only insofar as the original data on which these allocations were based are correct.

For 2019–2020 all students who have a calculated loan need and who are U.S. citizens or permanent residents of the United States may borrow through the Federal Direct Unsubsidized Loan program. They may also receive a Yale Medical School Loan. The combination of these loans will cover a part of their educational expenses. These loans are normally repaid over a ten-year period beginning six months after borrowers complete their education.

Additional information concerning educational loans available to students of the School of Medicine may be obtained from the Student Financial Aid Office, Room 202, Edward S. Harkness Memorial Hall, 367 Cedar Street, or from our website at http://medfinaid.yale.edu.

MEDICAL STUDENT FAMILY SUPPORT AND HEALTH CARE

Yale School of Medicine provides health insurance for the families of medical students who have children under twenty-six years of age. This includes full health care coverage at Yale Health for all medical students and their children (basic as well as hospitalization/specialty care). A full description of the coverage can be found on the Yale Health website at https://yalehealth.yale.edu and in this bulletin under Health Services in the chapter Yale University Resources and Services.

Medical students with a child of any age will receive an annual subsidy of $4,700. If a student has family coverage through Yale Health that includes spousal coverage, the $4,700 will automatically be applied toward spousal coverage. Otherwise, parents can best decide how to use this funding—for child care, spousal coverage elsewhere, or any other family expense.

Additionally, medical students will receive an annual subsidy of $1,000 for each additional child under the age of six.

The subsidy is one per family, not one per enrolled student. The School of Medicine will prorate the M.D. Student Family Support subsidy with a birth or adoption event.

For information on the possible effects of the subsidy on financial aid awards, contact the Office of Financial Aid at ysmfinaid@yale.edu.

TUITION REBATE AND REFUND POLICY

On the basis of the federal regulations governing the return of federal student aid (Title IV) funds for withdrawn students, the following rules apply to the rebate and refund of tuition.

1. For purposes of determining the refund of Title IV funds, any student who withdraws from the School of Medicine for any reason during the first 60 percent of the term will be subject to a pro rata schedule that will be used to determine the amount of Title IV funds a student has earned at the time of withdrawal. A student who withdraws after

the 60 percent point has earned 100 percent of the Title IV funds. In 2019–2020, the last days for refunding Title IV funds will be October 23, 2019 (Year 1), October 31, 2019 (Year 2), October 28, 2019 (Year 3), and November 1, 2019 (Years 4 and 5) in the fall term; and April 11, 2020 (Year 1), May 3, 2020 (Year 2), May 11, 2020 (Years 3 and 5), and March 22, 2020 (Year 4) in the spring term.

2. For purposes of determining the refund of institutional aid funds and for students who have not received financial aid:
   a. 100 percent of tuition will be rebated for withdrawals that occur on or before the end of the first 10 percent of the term: August 23, 2019 (Year 1), September 13, 2019 (Year 2), August 24, 2019 (Year 3), and August 25, 2019 (Years 4 and 5) in the fall term; and January 20, 2020 (Year 1), January 25, 2020 (Year 2), January 23, 2020 (Years 3 and 5), and January 15, 2020 (Year 4) in the spring term.
   b. A rebate of one-half (50 percent) of tuition will be granted for withdrawals that occur after the first 10 percent but on or before the last day of the first quarter of the term: September 11, 2019 (Year 1), September 27, 2019 (Year 2), September 13, 2019 (Year 3), and September 15, 2019 (Years 4 and 5) in the fall term; and February 11, 2020 (Year 1), February 24, 2020 (Year 2), February 25, 2020 (Years 3 and 5), and February 4, 2020 (Year 4) in the spring term.
   c. A rebate of one-quarter (25 percent) of tuition will be granted for withdrawals that occur after the first quarter of a term but on or before the day of midterm: October 11, 2019 (Year 1), October 22, 2019 (Year 2), October 16, 2019 (Year 3), and October 19, 2019 (Years 4 and 5) in the fall term; and March 28, 2020 (Year 1), April 14, 2020 (Year 2), April 20, 2020 (Years 3 and 5), and March 9, 2020 (Year 4) in the spring term.
   d. Students who withdraw for any reason after midterm will not receive a rebate of any portion of tuition.
3. The death of a student shall cancel charges for tuition as of the date of death, and the bursar will adjust the tuition on a pro rata basis.
4. If the student has received student loans or other forms of financial aid, funds will be returned in the order prescribed by federal regulations; namely, first to Federal Direct Unsubsidized Loans, if any; then to Federal Direct Graduate PLUS Loans; next to any other federal, state, private, or institutional scholarships and loans; and, finally, any remaining balance to the student.
5. Recipients of federal and/or institutional loans who withdraw are required to have an exit interview before leaving Yale. Students leaving Yale receive instructions on completing this process from Yale Student Financial Services.

This schedule applies only to the School of Medicine. Contact the School of Public Health, the Physician Associate Program, and the Physician Assistant Online Program for their schedules and policies.

SCHOLARSHIPS

All scholarships listed below are administered by the Financial Aid Office and are awarded to students based on need and interests. Students who apply for financial aid are automatically applying for these scholarships.

The Robert Campbell Adams (1899) and Claire Adams Scholarship Fund Established in 1981 by a bequest from the estate of Estelle B. Spinney in memory of her sister and brother-in-law, who graduated from Yale University with the Class of 1899. Preference for students who plan to practice medicine in a rural area.

The Dr. Ludwig Adler Scholarship Fund Established in 1981 by a bequest from Hedwig (Mrs. Ludwig) Adler in memory of her husband for scholarships to needy men and women medical students.

The Arthur N. Alling Scholarship Fund Established in 1986 by a bequest from Helen F. Alling in memory of her father for scholarships for female medical students.

The Edward Ames Scholarship Fund Established in 1940 by a bequest from Edward Ames, M.D. 1874.

The Arons Memorial Scholarship Fund Established in 2015 by a bequest from Daniel L. Arons, B.A. 1963, M.D. 1967.

The John Kenly Bacon Fund Established in 1994 by a bequest from the estate of Elsie L. Bacon in memory of her husband (Yale College Class of 1925) to provide scholarship assistance for worthy students attending the Yale School of Medicine.

The Muriel Frances Hanley Bagshaw, M.D. Scholarship Fund Established in 2000 by a gift from Malcolm A. Bagshaw, M.D. 1950, in memory of his wife to assist female students enrolled in the Yale School of Medicine.

The Donald S. Baim, M.D. 1975 Scholarship Fund Established in 2011 by a gift from Boston Scientific Corporation in memory of Donald S. Baim, M.D., to provide scholarship assistance for Yale School of Medicine students.

The Judson Bardwell, 1891 M.D. Memorial Scholarship Fund Established in 1935 by a gift from Harry J. Bardwell, B.A. 1890, in memory of his brother.

The Horace D. Bellis (M.D. 1907) Scholarship Fund Established in 1966 by a bequest from Horace D. Bellis, M.D., for scholarships to worthy students in the School of Medicine.

The Bigwood Memorial Fund Established in 2002 by a bequest from the estate of Gertrude L. Bigwood, M.A. 1932, for scholarships and/or loans to students planning a career in a health care profession.

The Francis Gilman Blake (M.A. Hon. 1921) Memorial Fund Established in 1952 by gifts from an anonymous donor and Dorothy D. (Mrs. Francis) Blake in memory of her husband for scholarships.

The M. Grant Blakeslee (Ph.B. 1912) Memorial Scholarship Fund Established in 1966 by a bequest from Catherine Woodruff Blakeslee in memory of her husband for scholarships for worthy students in the School of Medicine.

The Sanfurd G. Bluestein, M.D. 1946 Scholarship Fund Established in 1996 by a gift from Sanfurd Bluestein, M.D., on his fiftieth reunion to support medical students with a need for financial aid.

The Bohmfalk Scholarship Fund The John Frederick Bohmfalk Scholarship Fund and the Alice Bohmfalk Scholarship Fund support students planning careers in general medical practice.

The Dr. and Mrs. Harold D. Bornstein, Jr., M.D. '53 Scholarship Fund Established in 2011 by a gift from Harold D. Bornstein, Jr., M.D., to provide scholarships for Yale School of Medicine students in good academic standing with need for financial aid.

The John E. Borowy, M.D. (1950) and Ruth Borowy Scholarship Fund Established in 2006 by a bequest from John E. Borowy, M.D., to support students in the M.D. program with demonstrated need.

The Brace Ogilvie Financial Assistance Fund Established in 1997 by a gift from Donna Brace Ogilvie in honor of her husband, John B. Ogilvie, B.S. 1931, M.D. 1934, to provide scholarships for Yale School of Medicine students.

The David L. Brook (B.S. 1945S, M.D. 1947) Memorial Scholarship Fund Established in 1995 by a gift from David Brook, M.D.'s family upon his death to be used to assist worthy medical students in need of financial assistance.

The Victor Joseph Burner Scholarship Fund Established in 2003 by a bequest from Victor Joseph Burner, B.A. 1959, M.D. 1965, for students attending the Yale School of Medicine who meet the requirements for need-based financial aid.

The Edward Thomas Calhoun, M.D. Scholarship Fund Established in 1928 by a gift from Lida T. Calhoun in memory of her son for scholarships to students working in pathology.

The Robert E. Carroll, M.D. Yale School of Medicine Scholarship Fund Established in 2007 by a gift from Robert E. Carroll, B.A. 1938, M.D. 1942, to provide scholarship assistance to students. Preference for graduates of Yale University.

The Ettore Ciampolini, M.D. (Ph.D. 1923) Scholarship Fund Established in 1968 by a bequest from the estate of Helen A. Ciampolini in memory of her husband to be awarded to male students in need of funds to help pay tuition.

The Ruth G. Clammer Scholarship Fund Established in 2011 by a bequest from Ruth G. Clammer for scholarships in the School of Medicine.

The Class of 1944 Medical School Scholarship Fund Established in 1994 by gifts from the Class of 1944 in celebration of their fiftieth reunion to provide scholarship assistance for medical students.

The Class of 1948 Endowed Scholarship Fund Established in 2002 by gifts from the Class of 1948 in honor of their fiftieth reunion to provide financial aid to outstanding medical students who demonstrate need for support.

The Class of 1950 Endowed Scholarship Fund Established in 2001 by gifts from the Class of 1950 to provide scholarships to medical students.

The Class of 1954 Memorial Scholarship Fund Established in 2004 by gifts from the Class of 1954 in honor of their fiftieth reunion to provide support for medical students.

The Class of 1955 Scholarship Fund Established in 2011 by a gift from David R. Kessler, M.D. '55, in honor of his classmates to provide scholarships for Yale School of Medicine students pursuing an M.D. degree.

The Class of 1956 Scholarship Fund Established in 2006 by gifts from the Class of 1956 in honor of their fiftieth reunion for students with demonstrated need for financial aid in the M.D. program.

The Class of 1957 Scholarship Fund Established in 2007 by gifts from the Class of 1957 in honor of their fiftieth reunion to provide financial aid to outstanding medical students who demonstrate need for support.

The Class of 1958 Medical School Scholarship Fund Established in 2014 by gifts from the Class of 1958 to provide scholarship support for students in the M.D. program with need for financial aid.

The Class of 1959 Medical School Scholarship Fund Established in 1994 by gifts from the Class of 1959 to provide financial aid to medical students who demonstrate need for support.

The Class of 1961 Memorial Scholarship Fund Established in 2002 by gifts from the Class of 1961 to support medical students.

The Class of 1963 Scholarship Fund Established in 2008 by gifts from the Class of 1963 in celebration of their thirty-ninth reunion for students in the M.D. program with need for financial aid.

The Class of 1967 Memorial Scholarship Fund Established in 2002 by gifts from the Class of 1967 in memory of their classmates.

The Class of 1972 Scholarship Fund Established in 1998 by gifts from the Class of 1972 in honor of their twenty-fifth reunion to provide scholarship support for students in the M.D. program with need for financial aid.

The Sidney M. and Phyllis D. Cohen Scholarship Fund Established in 2012 by a gift from Sidney M. Cohen, M.D., for Yale School of Medicine students pursuing an M.D. degree.

The Jack W. Cole Scholarship Fund Established in 2011 by gifts from Mrs. Jack Cole and family in memory of Dr. Jack W. Cole, founder of the Physician Associate Program at Yale, to provide scholarships for School of Medicine students enrolled in the Physician Associate Program.

The Thomas J. Coleman III, M.D. and Bebette Gualano Coleman Scholarship Fund Established in 2000 by a gift from Dr. and Mrs. Thomas J. Coleman III for scholarships for Yale medical students who will not perform abortions or euthanasia in their medical practice.

The Fred C. Collier, M.D. Memorial Fund Established in 2008 by a bequest from Rosalie F. Collier, M.N. 1950, in memory of her husband (M.D. 1946) for scholarships for needy medical students.

The Berthold R. Comeau Medical '28 Scholarship Fund Established in 1999 by a bequest from Elizabeth G. Comeau in memory of her husband for scholarships.

The Julian Czamanski Scholarship Fund Established in 2002 by a bequest from Julian Czamanski for scholarships to students with financial need.

The Lycurgus M. Davey (B.A. 1939, M.D. 1943) Fellowship Fund Established in 1986 by a gift from Lycurgus M. Davey, M.D., for financial aid to needy medical students.

The Edwin P. and Eleanor H. Dawson Scholarship Fund Established in 1971 by a gift from Eleanor Dawson for medical students in need of financial assistance.

The Franklin M. Doolittle (Ph.B. 1915) and Frances C. Doolittle Scholarship Fund Established in 1959 by a gift from Franklin M. Doolittle to provide financial assistance to needy and deserving students in the School of Medicine.

The Thomas H. and Mary Jones Drews Scholarship Fund Established in 2003 by a gift from John A. Drews, M.D. 1967, in honor of his parents to provide financial assistance to medical students.

The John Sinclair Dye Memorial Scholarship Fund Established in 1971 by a gift from Lucy Wade Dye in memory of her husband for scholarships to worthy students in the School of Medicine.

The Richard N. and Catherine Foster M.D./Ph.D. Scholarship Fund Established in 2012 by a gift from anonymous donors to provide stipend support for medical students who are jointly pursuing M.D./Ph.D. degrees at Yale. Preference for students planning to pursue careers as physician-scientists, making use of both their clinical and scientific training.

The Alvin E. Friedman-Kien M.D. (1960) Scholarship Fund Established in 2006 by a gift from Alvin E. Friedman-Kien, M.D, to support students in the M.D. and/or M.D./Ph.D. program.

The Carl Gade (M.D. 1910) Scholarship Fund Established in 1955 by a bequest from Carl Gade, M.D., to provide assistance for needy and deserving students at the Yale School of Medicine.

The J. Roswell Gallagher Scholarship Fund Established in 1998 by a gift from J. Roswell Gallagher (Yale College Class of 1925 and School of Medicine Class of 1930) to provide scholarship assistance to medical students in need.

The John Currier Gallagher Memorial Scholarship Fund Established in 1998 by gifts from the parents and friends of John C. Gallagher (Yale College Class of 1954 and School of Medicine Class of 1958) in his memory to provide scholarship assistance to medical students in need.

The Anne G.K. Garland Memorial Fellowship Fund Established in 1930 by a gift from William J. Garland in memory of his wife to provide assistance to students in the graduate and professional schools.

The Robert H. Gifford, M.D. Medical Scholarship Fund Established in 2006 by gifts from students, colleagues, and friends of Dr. Robert H. Gifford in honor of his retirement to provide financial aid for medical students with the greatest need for support.

The Maurice H. Givens (Ph.B. 1909, Ph.D. 1917) Scholarship Fund Established in 1974 by a bequest from the estate of Maurice H. Givens to provide scholarships for financially needy second-year medical students who have excelled in biochemistry.

The Gladys Godfried Scholarship Fund Established in 2006 by a bequest from Milton S. Godfried, B.A. 1934, M.D. 1936, in memory of his wife to provide financial assistance to medical students in good standing entering their third or fourth year.

The Gold Family Yale Medical Scholarship Fund Established in 2011 by a gift from Janice R. Gold, '78 M.P.H., and Mark S. Gold, M.D., to provide scholarships for Yale School of Medicine students in good academic standing with need for financial aid.

The James Raymond Goodrich Memorial Fund Established in 1923 by a gift from Charles Stillman, B.A. 1882, in memory of his uncle (B.A. 1853) to provide scholarships in the School of Medicine.

The Dr. Jack Peter Green and Arlyne F. Green M.D./Ph.D. Scholarship Fund Established in 2007 by a bequest from the estate of Jack Peter Green, M.D. 1957, Ph.D. 1952, and his wife to support promising M.D./Ph.D. students at the Yale School of Medicine.

The Maurice R. Greenberg Scholarship Fund Established in 2014 by a gift from the C.V. Starr Foundation in honor of Maurice R. Greenberg to support students with demonstrated financial need at the Yale School of Medicine.

The Esther S. Gross, M.D. Scholarship Fund Established in 2004 by a gift from the Esther S. Gross Trust to support medical students interested in pursuing a career in pediatrics.

The George D. Gross, M.D. Scholarship Fund Established in 2004 by a gift from the Esther S. Gross Trust to support medical students interested in internal or family medicine.

The GTE Foundation Fund Established in 1988 by a gift from the GTE Corporation for scholarships for minority medical students.

The Dixon Hall (M.D. 1850) Scholarship Fund Established in 1965 by a bequest from John Dixon Hall, B.A. 1881, in memory of his father for assistance to students or in the investigation of diseases.

The Winfred Morgan Hartshorn, M.D. Scholarship Fund Established in 1992 by a bequest from the estate of Edith H. Woodruff in honor of her father (Yale College Class of 1898) to provide scholarship assistance to medical students in need.

The Abner Hendee Scholarship Fund Established in 1949 by a bequest from Nellie E. Hendee in memory of her husband.

The Susan and William H. Hindle, M.D. Scholarship Fund Established in 2010 by a gift from William H. Hindle, M.D. 1956, and his wife to provide scholarship assistance to Yale School of Medicine students pursuing an M.D. degree.

The Muriel Hirshfield Memorial Scholarship Fund Established in 1964 by a gift from Jack Hirshfield in memory of his wife to assist needy medical students who are residents of Connecticut. Preference for residents of the greater New Haven area.

The John A. Hoober (LL.B. 1891) Memorial Fellowship Fund Established in 1952 by a bequest from Sarah A.K. Hoober for scholarships for students from York County, Pennsylvania, or nearby counties.

The Howey Scholarship Fund Established in 1945 by a bequest from Ennes G. Howey to support needy and deserving students of good standing.

The Marion E. Hyde Scholarship Fund Established in 1974 by a bequest from Marion E. Hyde in memory of Charles E. Hyde, M.D. 1910, for scholarships for worthy students in the Yale School of Medicine.

The Oliver Kingsley Isham, M.D. Memorial Scholarship Fund Established in 1981 by bequests from Julia L. Isham and Charlotte T. Isham in memory of their brother for scholarships.

The James D. Jamieson and Family M.D./Ph.D. Scholarship Fund Established in 2009 by a gift from James D. Jamieson, M.D., 1975 M.A.H., to provide stipend support for medical students who are jointly pursuing M.D./Ph.D. degrees at Yale and conducting research in the life sciences.

The Harold W. and Helen M. Jockers Fund for Medical School Financial Aid Established in 1999 by a gift from Mrs. Harold Jockers in support of scholarships for Yale School of Medicine students.

The Thomas J. Keenan, M.D. Scholarship Fund Established in 1997 by a bequest from Thomas J. Keenan, M.D., to provide financial aid to medical students who demonstrate the need for support.

The Alfred E. (1937 M.D.) and Louise B. King Scholarship Fund Established in 2003 by a gift from Dr. Alfred and Louise King to provide financial aid for students at the School of Medicine.

The Hans A. and Elizabeth R. Klagsbrunn Scholarship and Loan Fund Established in 1993 by a bequest from Elizabeth Ramsey, M.D. 1932, and her husband, Hans A. Klagsbrunn, LL.B. 1932, for promising medical students who need financial assistance.

The Louise F. Klock Scholarship Fund Established in 2011 by a gift from the Salem Shuchman and Barbara Klock Family Foundation to provide scholarships for Yale School of Medicine students pursuing an M.D. degree. Preference for students who are parents.

The Benjamin (M.D. 1926) and Fortuna Iseman Klotz Memorial Scholarship Fund Established in 1990 by a bequest from Benjamin Klotz, M.D., for scholarships at the medical school.

The Dr. David and Colleen Leof Scholarship Fund Established in 2010 by a gift from David Leof, M.D. 1964, and his wife to provide financial support for Yale School of Medicine students. Preference for students with distinction in the humanities or the arts.

The Marguerite Rush Lerner Award Fund Established in 1981 by a gift from Dr. Aaron B. Lerner in memory of his wife to support financial aid for deserving students in the School of Medicine.

The Frank E. Lucente Scholarship Fund Established in 2016 by a gift from Frank E. Lucente, M.D. 1968, to provide scholarships for students within the Yale School of Medicine.

The John C. Marsh, M.D. '59 Scholarship Fund Established in 2015 by a gift from John Marsh, M.D., to provide financial assistance for first-year students.

The Professor Lafayette B. Mendel (B.A. 1891, Ph.D. 1893) Scholarship Fund Established in 1974 by a bequest from the estate of Maurice H. Givens, Ph.D. 1909, in memory of Professor Mendel to provide scholarships for financially needy first-year medical students who have demonstrated a proficiency and interest in biochemistry or physiological chemistry.

The Howard A. Minners, M.D. 1957 and Family Scholarship Fund Established in 2003 by a gift from Howard A. Minners, M.D., for students attending Yale School of Medicine.

The Anoush Miridjanian, M.D. Scholarship Fund Established in 2011 by a gift from Anoush Miridjanian, M.D. 1961, to provide scholarships for Yale School of Medicine students. Preference for students of Armenian descent.

The Bernadette M. Mosellie Scholarship Fund Established in 2009 by a gift from Bernadette M. Mosellie, M.P.H. 1986, to provide scholarships for Yale medical students of United States citizenship with outstanding academic achievement and demonstrated financial need who are also pursuing a Master of Public Health degree in health policy or health management.

The Professor Ernst Mylon and Hildegard D. Mylon Scholarship Fund Established in 1984 by a bequest from Peter Mylon in honor of his parents for scholarships for medical students.

The Leona R. M. Normandie Scholarship Fund Established in 1994 by a bequest from the estate of Leona R.M. Normandie to provide scholarship assistance to medical students.

The Julian J. Obermann Medicine Fellowship Fund Established in 1959 by a bequest from Julian J. Obermann, honorary M.A. 1935, to defray the costs of tuition and expenses of needy and deserving students in the School of Medicine.

The John and Jessie Ogilvie Memorial Scholarship Fund Established in 1968 by a gift from John B. Ogilvie, B.S. 1931, M.D. 1934, in memory of his parents to provide assistance to medical students in the third- or fourth-year class interested in surgery.

The Ogilvie Family Scholarship Fund Established in 1989 by a gift from John B. Ogilvie, B.S. 1931, M.D. 1934, to assist worthy students who are in need of financial help.

The Raymond E. Parks, M.D. 1945 Medical Scholarship Fund Established in 2014 by a bequest from Mrs. Raymond E. Parks in honor of her late husband to provide scholarships for Yale School of Medicine students pursuing an M.D. degree in good academic standing with the need for financial aid.

The David V. Pecora, M.D. 1941 and Dorothy E. Pecora, R.N. Scholarship Fund Established in 2007 by a gift from Dr. David and Dorothy Pecora to support students at the Yale School of Medicine.

The Frank Elmer Phillips (M.D. 1901) Scholarship Fund Established in 1992 by a bequest from Anne P. Whistler in honor of her father to benefit medical students in need of financial assistance.

The Carrie T.B. Purinton Fund Established in 1965 by a bequest from Carrie T.B. Purinton for scholarships in the School of Medicine.

The Puzak-Kurtz Scholarship Fund Established in 1962 by a gift from Michael Puzak, M.D. 1942, and his wife, Elizabeth Kurtz, M.N. 1941.

The Mila Rainof, M.D. Memorial Fund Established in 2010 by gifts from family and friends in memory of Mila Rainof, M.D. (Class of 2008), to provide financial aid for medical students with demonstrated financial need.

The Otto G. Ramsay Memorial Scholarship Fund Established in 1915 by gifts from women in New Haven in memory of Dr. Otto G. Ramsay (M.A.H. 1901) for scholarships to third-year medical students.

The Henry and Dorothea Riedel Scholarship Fund Established in 2003 by a gift from the trust of Henry A. Riedel, M.D. 1943, and his wife to benefit promising medical students.

The Dr. Irwin K. and Dr. Barbara F. Rosenberg Medical Student Scholarship Fund Established in 2017 by a bequest from Dr. Irwin K. Rosenberg to support students in the M.D. program with demonstrated need for financial aid.

The Nathan E. ('28) and Hilda M. Ross Scholarship Fund Established in 2002 by a gift from the trust of Nathan E. Ross, B.S. 1925, M.D. 1928, and his wife to benefit needy medical students.

The Salvatore and Lee (M.D. 1940) Sannella Scholarship Fund Established in 1991 by gifts from members of the Sannella family in memory of Dr. Salvatore Sannella and in honor of his son, Dr. Lee Sannella, to benefit needy medical students. Preference for students with an interest in the physiological, psychological, and spiritual qualities of the human being as described by Dr. Lee Sannella in his book *The Kundalini Experience*.

The Schley Family Scholarship Fund Established in 2011 by a gift from Mary Wheatland Schley, M.D. 1952, to provide scholarships for Yale School of Medicine students pursuing an M.D. degree.

Scholarships for Disadvantaged Students Established by the University to provide financial assistance to needy medical students.

The Donald H. Sheridan Scholarship Fund Established in 1986 by a bequest from Kathryn Whitelam Wynn in memory of her husband for scholarships for needy medical students.

The Anson Frederick Smolowe (B.A. 1964) Memorial Fund Established in 1969 by a gift from Mr. and Mrs. Philip Smolowe in memory of their son for medical students in need of financial aid while attending the Yale School of Medicine.

The Nicholas P.R. Spinelli Scholarship Fund Established in 2011 by a bequest from Nicholas P.R. Spinelli, 1941 B.S., 1944 M.D., for scholarship aid to deserving medical students.

The Starr Foundation Scholarship Fund Established in 1991 by a gift from the C.V. Starr Foundation to provide financial assistance to medical students.

The Ruth and Milton (Ph.B. 1924) Steinbach Fund Established in 1991 by a gift from the trust of Milton Steinbach to be used to benefit needy men and women in the Epidemiology and Public Health, Medicine, and Physician Associate programs.

The Nathan B. and Masha K. Tager Scholarship Fund Established in 1987 by a gift from Morris Tager, Ph.D. 1931, M.D. 1936, for financial aid for students.

The John Seymour Thacher (B.A. 1877) Memorial Fund Established in 1964 by a bequest from Frances Lake (Mrs. John) Thacher in honor of her son for scholarships.

The Reuben E. Thalberg Scholarship Fund Established by the University in 1977 in memory of Dr. Reuben E. Thalberg for medical students in need of financial aid while attending the Yale School of Medicine.

The Charles Henry Thomas Fund Established in 1940 by a bequest from Mrs. Georgine H. Thomas in memory of her husband (M.D. 1873).

The Lois E. and Franklin H. Top, Jr., M.D. 1961 Scholarship Fund Established in 2001 by a gift from Dr. and Mrs. Franklin Top for medical students.

The Dr. Joseph Hendley Townsend Scholarship Fund Established in 1928 by a bequest from Emily Allison Townsend in memory of her brother (B.A. 1885, M.D. 1887) for scholarship aid for New Haven residents.

The Tremonti Family Scholarship Fund Established in 2010 by a gift from Lawrence Tremonti, M.D. 1963, to provide scholarships for Yale School of Medicine students pursuing an M.D. degree. Preference for students from small liberal arts schools.

The Myra Tyler Student Financial Aid Fund Established in 1998 by a bequest from Myra D. Tyler (Class of 1950) for scholarships for Yale School of Medicine students.

The Flora Adler Ullman Memorial Fund Established in 1927 by gifts from Joseph C. Johnson and other friends of Flora Adler Ullman for scholarship aid.

The Rosa Verdi Scholarship Fund Established in 1927 by a gift from William F. Verdi, M.D. 1894, in memory of his mother.

The Robert R. and Mary B. Wagner Scholarship Fund Established in 2014 by a gift from Robert R. Wagner for scholarships to School of Medicine students.

The Alfred Eastman Walker (B.A. 1864, M.D. 1867) Fund Established in 1951 by a bequest from Frances E. Walker in memory of her brother for a student in the second year who has made the most satisfactory progress during the first year.

The Bernice L. Walker Memorial Scholarship Fund Established in 2005 by a bequest from the estate of Bernice L. Walker to provide support for medical students.

The Arthur K. Watson (B.A. 1942) Scholarship Fund Established in 1984 by a bequest from Arthur Watson for scholarships for medical students.

The Andrew Judson White Scholarship Fund Established in 1951 by a gift from Margaret White (Mrs. Chauncey S.) Truax in memory of her grandfather (M.D. 1846, honorary M.A. 1894) to provide aid for students who otherwise would be unable to acquire a medical education.

The William M. Wiepert (B.A. 1933, M.D. 1937) and Lucille Reed Wiepert (Ph.D. 1930, M.D. 1937) Scholarship Fund Established in 1974 by a gift from an anonymous donor in honor of Drs. William and Lucille Wiepert to provide scholarship aid for financially needy students who have demonstrated scholastic achievement.

The Amy Hunter-Wilson (M.D. 1930, D.P.H. 1934) Fund Established in 1990 by a gift from Dr. Amy Hunter-Wilson and Frederick C. Wilson to provide financial assistance to needy medical and public health students.

The Louise Farnam Wilson (Ph.D. 1916, M.D. 1920) Memorial Scholarship Fund Established in 1955 by a gift from Mrs. Samuel Clark Harvey in memory of her sister to provide scholarship aid for financially needy female students.

The Donald D. Wright, 1930 B.A., 1933 Ph.D. (Chemistry) Scholarship Fund Established in 1998 by a gift from M. Felix Freshwater, M.D. 1972, in honor of Donald D. Wright, the chemistry major adviser at Brooklyn College who encouraged students to apply to Yale School of Medicine, to provide financial aid to medical students. Preference for graduates of Brooklyn College or any college in the City University of New York system.

Armed Forces scholarships are available upon application.

LOAN FUNDS

All loans listed below are administered by the Financial Aid Office and are awarded to students based on need and interests. Students who apply for financial aid are automatically applying for these loans.

The Alumni Revolving Loan Fund Established in 1981 by gifts from alumni.

The Katharine C. Angell Revolving Loan Fund Established by the University in 1982 in honor of Katharine C. Angell to recognize her contributions to the School of Medicine.

The Jack R. Aron Loan Fund Established in 1980 by a gift from Jack R. Aron, B.A. 1928, to provide financial aid to minority students in the School of Medicine.

The Harry J. Bardwell Loan Fund Established in 1928 by a gift from Harry J. Bardwell, B.S. 1890.

The Leona Baumgartner Student Revolving Loan Fund Established in 1981 by a gift from Leona Baumgartner Langmuir, Ph.D. 1931, M.D. 1934.

The David Challinor Student Loan Fund Established in 1973 by a gift from Mr. and Mrs. David Challinor to be used for student loans at the discretion of the director of student aid.

The Class of 1922 Medical Student Loan Fund Established in 1922 by gifts from the Class of 1922.

The Class of 1923 Medical Student Loan Fund Established in 1923 by gifts from the Class of 1923.

The John Duberg Loan Fund Established in 1980 by a gift from H.P.J. Duberg, B.A. 1930.

The Harry Gray Memorial Loan Fund Established in 1982 by a gift from Jesse G. Rubin, M.D. 1957, and Mrs. Rubin.

The C.S.M.S. Memorial Student Loan Fund Established in 1972 to provide supplementary loans up to $500.

The Health Professions Student Loan Fund Established in 1964 by the Department of Health, Education, and Welfare under the Health Professions Educational Assistance Act of 1963.

The Howard Heinz Students' Educational Fund Established in 1927 to aid deserving students at the Yale School of Medicine.

The Kaiser Loan Fund Established in 1980 to be used for student loans at the discretion of the director of student aid.

The Wood Kalb Foundation Loan Fund Established in 1970 by a gift from the Wood Kalb Foundation to provide loans to students of the School of Medicine.

The Bernard L. Kartin Memorial Loan Fund Established in 1968 by gifts from the friends and associates of Bernard L. Kartin, M.D., for loans to students in medicine.

The W. K. Kellogg Foundation Loan Fund Established in 1942 by grants from the W.K. Kellogg Foundation for loans to students in medicine and public health.

The Kinney Memorial Loan Fund Established in 1955 by gifts from the friends of Gilbert Kinney, B.A. 1905, in his memory.

The Eli Lilly Loan Fund Established in 1980 as a revolving loan fund for the benefit of senior medical students.

Loans for Disadvantaged Students Established by the University to provide financial assistance to needy medical students.

The George W. Merck Memorial Loan Fund Established in 1959 by the Merck Company Foundation in memory of George W. Merck for loans to medical students.

The Harry G. Moss Memorial Loan Fund Established in 1972 by gifts from the friends and colleagues of Dr. Harry G. Moss in his memory to provide financial assistance for students in the School of Medicine, thus enabling the needy among them to complete their medical education.

The William Herbert Ordway Memorial Fund Established in 1956 by a gift from Mrs. Ordway in memory of her husband (M.D. 1912).

The Primary Care Loan Program Fund Established in 1993 by the Department of Health and Human Services under the Health Professions Educational Assistance Act of 1993 to be used as a revolving loan fund to assist needy medical students interested in primary care medicine.

The Marion Leonard Robbins Loan Fund Established in 1962 by a bequest from Marion Leonard Robbins, M.S. 1929, M.D. 1931, for loans to students in the School of Medicine.

The Frederick W. Roberts Loan Fund Established in 1961 in memory of Dr. Frederick W. Roberts, Ph.D. 1920, to provide loans to needy and deserving members of the residency staff of affiliated hospitals.

The School of Medicine Loan Fund A limited amount of money is available for aiding deserving students during their medical education.

The Anson Frederick Smolowe Memorial Student Loan Fund Established in 1976 by a gift from Mr. and Mrs. Philip Smolowe in memory of their son (B.A. 1964) for medical students in need of financial aid while attending the Yale School of Medicine.

The Wayne O. Southwick Loan Fund Established in 1965 by gifts from an anonymous donor to provide loans to medical students in need of financial aid.

The Phebe Vail Tate Memorial Student Loan Fund Established in 1956 by a gift from Dale S. Tate, B.A. 1897, in memory of his wife.

The Reuben E. Thalberg Foundation Loan Fund Established in 1972 by a gift from the Reuben E. Thalberg Foundation for medical students in need of financial aid while attending the Yale School of Medicine.

The Lewis Thorne Memorial Fund Established in 1956 by gifts from anonymous donors in memory of Lewis Thorne, B.A. 1931, M.D. 1936.

The Woods Student Loan Fund Established in 1955 by a grant from the Woods Charitable Fund, Inc.

The Yale Men in Medicine Fund Contributions have been made since 1931 for loans to meritorious students.

FELLOWSHIPS

The Arons-Millard Student Research Fund for Surgery Established in 2014 by a gift from M. Felix Freshwater, M.D., for medical student summer thesis research fellowships with a priority first in the history of surgery, then in clinical aspects of plastic surgery.

The James Hudson Brown Memorial Fund Established in 1944 by a bequest from Marie B.C. Brown in memory of her husband for research fellowships to promising investigators for pursuit of research in the medical sciences, including clinical medicine and public health.

The Dr. George A. Carden, Jr. Fellowship Fund in Infectious Diseases Established in 2018 by a gift from G. Alexander Carden III, M.D., to enhance the fellowship program within the Section of Infectious Diseases by providing stipend and/or research support for undergraduate, graduate, or medical school students or current fellows to work in a biological science or clinical research area of investigation.

The Alexander Brown Coxe (B.A. 1887) Memorial Fellowship Fund Established in 1927 by a gift from the family of Alexander Brown Coxe to be awarded to investigators of promise in the comprehensive field of the biological sciences.

The William Harvey Cushing Fellowship Fund Established in 1928 by a gift from Dr. Harvey Cushing, B.A. 1891, in memory of his son (Yale College Class of 1927) for research in surgery.

The Digestive Disease Endowment Fund Established in 2006 by a gift from Dr. Srinivas Seela and Dr. Harinath Sheela to support the education and academic advancement of postdoctoral fellows.

The Mitchell Edson, M.D. Fund for International Clinical Rotation Established in 2007 by a gift from Mitchell Edson, M.D. 1956, in honor of his fiftieth reunion to support the travel for an international clinical rotation of medical students in an underdeveloped country or a country where there is a pressing health care need.

The Joseph W. Eichenbaum, M.D. 1973 Endowment Fund for Student Research Established in 2005 by a gift from Joseph W. Eichenbaum, M.D., to support the summer research of M.D. students with an interest in the basic sciences under the direction of a faculty member who has a history of providing an extraordinary mentoring and research experience for M.D. students.

The John F. Enders Research Fund Established in 1986 by a bequest from the estate of John F. Enders (Yale Class of 1919, Ph.D. and Nobel Laureate in Medicine) to support medical research fellowships for students and faculty.

The William U. Gardner (M.A. Hon. 1943) Memorial Student Research Fellowship Fund Established in 1989 by a gift from Katherine H. Gardner in memory of her husband to support student research projects related to endocrinological aspects of cancer.

The Richard K. Gershon, M.D. Student Research Fellowship Fund Established in 1985 by gifts from faculty and friends in honor of Richard K. Gershon, M.D. 1959, to support

medical students for a fifth year of medical school to carry out research in immunology or a related discipline.

The Samuel Jordan Graham Fellowship Fund Established in 1961 by a bequest from the estate of E. Norma P. (Mrs. S.J.) Graham in memory of Judge and Mrs. Samuel Jordan Graham to assist students pursuing postgraduate study or research in the School of Medicine. Preference for students specializing in surgery.

The James G. Hirsch, M.D. Endowed Medical Student Research Fellowship Fund Established in 1988 by a gift from the Josiah Macy, Jr. Foundation as a tribute to its late president and member of the Yale Corporation, James G. Hirsch, Class of 1943S, M.D., to support medical students extending their course of study from four to five years to pursue research projects.

The Richard Alan Hirshfield Memorial Fellowship Fund Established in 1961 by a gift from Mr. and Mrs. Jack Hirshfield in memory of their son for students doing research in ulcerative colitis or related diseases or other research projects.

The G.D. Hsiung, Ph.D. Student Research Fellowship Fund Established in 1989 by gifts from the colleagues and friends of Gueh Djen Edith Hsiung, Ph.D., professor emeritus of laboratory medicine, to provide medical students with research fellowships in clinical virology and related projects in viral pathogenesis.

The Charles Linnaeus Ives Fellowship Fund Established in 1924 by a bequest from the widow of Charles Linnaeus Ives, B.A. 1852, for students doing research in pathology.

The Eric P. Kindwall, M.D. 1960 International Clinical Rotation Fund Established in 2006 by a gift from Eric Kindwall, M.D., to support the travel for an international clinical rotation of medical students in an underdeveloped country or a country where there is a pressing health care need.

The Francis G. Kingsley Memorial Fund Established in 1986 by gifts from the friends and family of Francis G. Kingsley to be awarded to young faculty investigators whose research shows great promise.

The Geraldine Lambert Fellowship Fund Established in 2014 by a gift from Caren S. Lambert, 1989 B.A., to create and support a fellowship program to train the next generation of physicians and physician-scientists who will devote their energies to the clinical and scientific understanding of dyslexia (especially dyslexia in children) and its treatment.

The Paul H. Lavietes, M.D. Summer Research Fellowship Fund Established in 1991 by gifts from the family and friends of Paul H. Lavietes, B.S. 1927, M.D. 1930, former clinical professor of medicine and public health at the Yale School of Medicine and medical director of Community Health Care Plan, to provide support for summer research fellowships for promising medical students.

The Vernon W. Lippard, M.D. Student Summer Research Fellowship Fund in Pediatrics Established in 1985 by a gift from the William T. Grant Foundation to honor former dean of the Yale School of Medicine Vernon William Lippard, M.D., Sc.D., to be awarded to

students working in the area of children's behavior within the Department of Pediatrics or the Child Study Center.

The Lo Family Graduate Fellowship Fund Established in 2011 by a gift from Dr. Ka Shui Lo and Dr. Feili Lo for the benefit of senior graduate students (Ph.D. or M.D./Ph.D. candidates) pursuing stem cell research at the Yale School of Medicine.

The Madden Fellowship Fund Established in 2015 by a gift from Edward E. Madden, B.A. 1962, to support fellows at Yale Cancer Center.

The Robert L. McNeil, Jr. Fellowship Fund in Clinical Pharmacology Established in 2001 by a gift from the Philadelphia Foundation to support postdoctoral fellows.

The Medical Student Research Fund Established in 1986 by a gift from an anonymous donor to support students who choose to take a fifth year to pursue in-depth research.

The Richard A. Moggio, M.D. Student Research Fellowship Fund Established in 1996 by a gift from Richard A. Moggio, M.D., to support medical students in their original research efforts toward the completion of their thesis requirement.

The Peter R. Muehrer Scholarship Fund Established in 2017 by a gift from Peter R. Muehrer, M.D. (B.A. 1982), to provide support for postdoctoral fellows within the National Clinician Scholars Program. Preference for fellows who have demonstrated an interest in integrating research or clinical care for mental disorders into their studies.

The Office of International Medical Student Education Fellowship Fund Established in 2015 by a gift from Simeon A. Schwartz, M.D. 1977, to support international elective travel fellowships for medical students.

The Howard A. Pearson Fellowship Fund in Pediatric Hematology/Oncology Established in 1999 by a gift from Paul Newman to support faculty fellows in pediatrics.

The Gustavus and Louise Pfeiffer Research Foundation Fellowship Fund Established in 2015 by a gift from the Gustavus and Louise Pfeiffer Research Foundation to support M.D./Ph.D. students. Preference for students who are pursuing Ph.D. research in neuroscience or a closely related field.

The George G. Posener Endowed Fellowship Fund for Education, Training, and Stem Cell Research in Trauma and Surgical Critical Care Established in 2002 by a gift from George G. Posener in memory of his wife, parents, four sisters, brother (Yale Class of 1938), and two sons and in honor of Dr. Reuven Rabinovici of the Trauma and Surgical Critical Care Section of the Department of Surgery at the Yale School of Medicine to educate and train residents and fellows and support stem cell research in the Department of Surgery.

The George G. and Leah E. Posener Memorial Fellowship Fund in Hematology and Stem Cell Research Established in 1995 by a gift from George G. Posener in memory of his wife and his brother (Yale Class of 1938), who received care at Yale New Haven Hospital, to assist physician-scientists whose research focuses on polycythemia vera and related blood diseases and support stem cell research.

The Bertram H. Roberts Memorial Fund Established in 1955 by gifts from the family, friends, and colleagues of Bertram Roberts for lectures and summer stipends to medical students interested in field study or other projects in the field of social psychiatry.

The Leon Rosenberg Medical Student Research Fund in Genetics Established in 2004 by a gift from Leon E. Rosenberg, M.D., former dean of Yale School of Medicine, for medical students who elect to spend a fifth year engaged in full-time research in the Department of Genetics.

The G.D. Searle Fellowship Fund in Pharmacology Established in 1985 by a gift from G.D. Searle and Company for fellowships in the Department of Pharmacology.

The Robert Shapiro, M.D. Memorial Fellowship Fund in Diagnostic Radiology Established in 2000 by a gift from Dr. and Mrs. Marc D. Shapiro in honor of his father to provide research support in diagnostic interventional procedures for postdoctoral fellows in diagnostic radiology.

The Daniel B. Stryer, M.D., Class of 1990 International Clinical Rotation Fund Established in 2005 by a gift from Professor and Mrs. Lubert Stryer in memory of their son to support the travel for an international clinical rotation of medical students in an underdeveloped country or a country where there is a pressing health care need.

The Taylor Opportunity Student Research Fellowship Fund Established in 2007 by a gift from Robert F. Taylor, M.D., to support the short-term or summer research of medical students with an interest in the basic and/or clinical sciences under the direction of a dedicated faculty member who is committed to providing an extraordinary mentoring and research experience for medical students.

The Thudichum Post-Doctoral Research Fellowship Fund in Neuro-oncology Established in 2005 by a gift from Irene M. Voynick in honor of German medical practitioner and surgeon Johann Ludwig Wilhelm Thudichum, who characterized the chemical composition of the brain and is regarded as the pioneer of neurochemistry, to support Ph.D. or M.D./Ph.D. students in the study of brain tumors utilizing cell biology, neurochemistry, and adult stem cell research.

The Maria Turner, M.D. and Raymond W. Turner, M.D. 1958 International Fellowship Fund Established in 2008 by a gift from Raymond Turner, M.D., to support the travel, living, and relevant preparatory expenses for an international health-related experience of medical students or M.D./Ph.D. students.

The Michael S. Voynick Fellowship Fund in Neuro-oncology Established in 1997 by a gift from Irene M. Voynick for faculty awards in recognition of distinguished contributions in the field of neuro-oncology to be presented during a symposium to promote education in such areas as oncogenesis, novel and effective therapies, and neuroscience.

The Voynick Visiting Fellowship Fund in Neuro-oncology Established in 2001 by a gift from Irene M. Voynick to support visiting faculty fellows who will engage in such investigative areas as tumor excisions and innovative therapies based on tumor cell biology and genetics.

The Jane Danowski Weiss Family Foundation Fund Established in 2000 by a gift from the Jane D. Weiss Family Foundation in memory of Dr. Thaddeus S. Danowski '36, Edwin F. Danowski, and Pelagia V. Danowski Sellers to support medical students in a fifth year of research in the areas of diabetes, stroke, and heart disease.

The Susan Wolf, M.D. (1997) and William Greene, M.D. Fund for International Clinical Rotation Established in 2006 by a gift from Drs. Susan Wolf and William Greene to support the travel for an international clinical rotation of medical students in an underdeveloped country or a country where there is a pressing health care need.

The Yale-Uganda Endocrine Surgery Fellowship Program Fund Established in 2017 by a gift from Laticrete International, Inc., to support surgeons from Uganda who will spend three to four months in training with the endocrine surgery team at Yale School of Medicine and Yale surgeons who will travel to Uganda to provide training, mentoring, and patient care.

The Herman H. and Sarah Zusman Student Research Fellowship Fund Established in 2009 by a gift from the Zusman family to support the summer research of M.D. students with an interest in the basic and/or clinical sciences with a focus on cardiovascular medicine/surgery/physiology.

Honors and Prizes

COMMENCEMENT AWARDS, MAY 2019

Cum laude The degree of Doctor of Medicine cum laude will be conferred on students whose academic performance shows unusual merit. Patawut Bovonratwet, Maxwell Gerard Farina, Rebecca Louisa Fine, Samara Danielle Fox, Aaron Hakim, Sa Rang Kim, Rebecca Liu, Kelsey Burk Loeliger, Amanda Jane Lu, Patrick McGillivray, Kavita Mistry, Sudhakar Venkata Nuti, Derek Ou, Rahil Amyn Rojiani, Sara Tannenbaum, Noel Arthur Joseph Turner, Laura Jeannette Yockey

American Academy of Neurology Award Awarded to recognize a graduating medical student for excellence in clinical neurology. Kelly Michelle Rogers

ACP Internal Medicine Award Awarded to a graduating student who will be entering a categorical or primary care internal medicine residency in Connecticut and has demonstrated outstanding academic achievement and community service. Rebecca Louisa Fine

Norma Bailey Berniker Prize Established in 1970 by bequest of John H. Bailey, B.A. 1900, M.D. 1903. To be awarded to members of the graduating class who give promise of best exemplifying the disciplines and precepts of the Oath of Hippocrates and the Prayer of Maimonides. Prince Antwi, Samara Danielle Fox, Florence Hsiao, Christina Brady Johns, Joongyu Daniel Song

The Campbell Prize Founded in 1900 by bequest from James Campbell, honorary M.A. 1891, Professor of Obstetrics and Gynecology from 1886 to 1899. Awarded to the graduating student who secures the highest score on Step II of the National Board Medical Examination. Evgeniya Tyrtova

Connecticut Academy of Family Physicians Award Established in 1994 to recognize outstanding students entering a career in Family Practice. Not awarded in 2019.

Connecticut Chapter of American College of Surgeons Prize Awarded to a graduating student for excellence in surgical sciences. Elliot Coleman Morse

The Cortlandt Van Rensselaer Creed Award Established in 1999 in honor of Cortlandt Van Rensselaer Creed, the first African American graduate of Yale School of Medicine in 1857. Awarded through peer nomination to a graduating, underrepresented, minority student in medicine and public health who has demonstrated outstanding academic achievement, exemplary leadership, and a significant commitment to the community at large. Herbert Castillo Valladares

Miriam Kathleen Dasey Award Established in 1950 in honor of Miriam Kathleen Dasey, Registrar from 1921 to 1950. Awarded annually to students who by strength of character, personal integrity, and academic achievement give promise of fulfilling the ideal of the compassionate physician. Patawut Bovonratwet, Michael Jarvis Boyle, Lawrence Chan, Eun Sook Choi, Amandine Florence Ghislaine Godier-Furnemont, Sophia Elana Shimer, Nicholas Son Wilcox, Robin Tiffany Wu

The Dean's Prize for Community Service This annual award recognizes the graduating student who, by leadership and service, has made major contributions to the School of Medicine, to the New Haven community, or to the community at large. Herbert Castillo Valladares

Endocrinology Society Medical Student Achievement Award Established in 1997 to recognize a graduating student who has shown special achievement and interest in the general field of endocrinology. Stephen Graham DeVries

The Selma and Karl Folkers Prize in Biomedical Research Awarded to graduating M.D./Ph.D. students whose thesis research has demonstrated excellence in basic cell and molecular biology. Rebecca Liu, Laura West Pappalardo

The Peter Grannum Prize Established in 1990. Awarded to an outstanding African American graduate. This annual award is supported by the Shirley, Maggie and Hugh Comer Fund. Jeremiah Joseph Cross

The Marguerite Rush Lerner Award Awarded to students for outstanding creative writing. Sophie Haeun Chung, Cortlandt Mercy Sellers, Sara Tannenbaum

The M.D./Ph.D. Alumni Award Awarded to graduating M.D./Ph.D. students who have demonstrated outstanding academic achievements, leadership, and service. Kavita Mistry

The M.D./Ph.D. Award Awarded to outstanding members of the graduating M.D./Ph.D. class who have shown excellence in both research and clinical activities. Kelsey Burk Loeliger

New England Pediatric Society Prize Awarded to that member of the graduating class entering pediatrics who in the opinion of peers and faculty best exemplifies those qualities one looks for in a pediatrician: "A competent, caring, good humored person whom I would want to take care of my children." Jonathan L.B. Levinsohn

The Parker Prize Established in 1914 by bequest from Frank J. Parker, Ph.D. 1895, M.D. 1898. Awarded annually to the graduating students who, during the course, have shown the best qualifications for a successful physician. Jeremiah Joseph Cross, Amitte Gail Rosenfeld

The Perkins Prize Awarded to the student who achieves the highest rank on Step I of the National Board Medical Examination. Elliot Coleman Morse

Mila Rainof Award The Mila Rainof Award will be given each year to a graduating Yale medical student entering the field of emergency medicine who, like Mila, has contagious enthusiasm for caring for patients, while bringing attention, kindness, and compassion to each interaction. Jeremiah Joseph Cross

The Dr. David and Arthur Schuman Award of Excellence in Family Practice Awarded annually to recognize a student or resident in the State of Connecticut for academic excellence and contributions to the Connecticut Academy of Family Physicians and other organizations that promote understanding of the specialty of Family Medicine. Not awarded in 2019.

The Society for Academic Emergency Medicine Award Awarded to the student who has demonstrated excellence in the specialty of emergency medicine. Michael Jarvis Boyle

The Leonard Tow Humanism in Medicine Award Supported by the Arnold P. Gold Foundation Established to honor a graduating student who demonstrates the highest standard of compassion and sensitivity in interaction with patients. Chloe Olivia Zimmerman

Lauren Weinstein Award Established in 1992 in memory of Lauren Weinstein (Yale medical student, 1988–1989). Given to students who display courage, perseverance, and compassion and have dared to reach for the best in themselves. Raysa Gabriela Cabrejo

The Milton C. Winternitz Prize in Pathology Established in 1950 in honor of Milton Charles Winternitz, honorary M.A. 1917, Professor of Pathology and Bacteriology, 1917–1925, Anthony N. Brady Professor of Pathology, 1925–1950. Jonathan L.B. Levinsohn

THESIS PRIZES, MAY 2019

Cancer Prize Awarded to a graduating student for an outstanding thesis in cancer. Nicholas Chien-Juei Lee

The Peter F. Curran Prize Established in 1976. To be presented to a graduating medical student for an outstanding thesis. Derek Ou

Wilber G. Downs, M.D., M.P.H., Outstanding Thesis Prize in International Health Established in 1988 for the best thesis in the area of international health. Samara Danielle Fox

The Ferris Prize Established in 1934 and endowed in 1937 by anonymous donors in honor of Harry Burr Ferris, A.A. 1887, M.D. 1890. Awarded to a graduating student for an outstanding thesis. Maxwell Gerard Farina

The William U. Gardner Thesis Prize Established in 1989 by Dr. Gardner's widow and awarded to the graduating student with the most outstanding thesis in the graduating class. Noel Arthur Joseph Turner

The Nicholas J. Giarman Prize Established in 1976. Nicholas Giarman was Professor of Pharmacology, 1949 to 1968. To be presented to a student for an outstanding thesis. Aaron Hakim

The Keese Prize Established in 1880 by bequest from Mary M. Keese in memory of her son, Hobart Keese, M.D. 1855. Awarded annually to a student who presents an outstanding thesis. Renee Muyoka Maina

The Dr. Harold H. Lamport Biomedical Research Prize Established in 1976. To be presented to a student for an outstanding thesis reporting original biomedical research. Patrick McGillivray

The Lidz Prize in Psychiatry Awarded to a graduating student for an outstanding thesis in the field of psychiatry or neuroscience. Rahil Amyn Rojiani

The M.D./Ph.D. Prize Awarded to the graduating M.D./Ph.D. students with the most outstanding dissertation. Laura Jeannette Yockey

Dr. Marvin Moser Prize Established in 2007 by Dr. Marvin Moser for a prize-winning thesis in preventive cardiology, lipid disorders, or hypertension. Praneeth Reddy Sadda

The Dr. Louis H. Nahum Prize Founded in 1973 by bequest from Louis H. Nahum, M.D. 1916. Awarded annually to a member of the senior class of the medical school, who merits such award by virtue of the excellence of the thesis that the student has written as required for the medical degree. Sa Rang Kim

The John P. Peters Prize Established in 1976. To be presented to a student for an outstanding thesis in the area of internal medicine. John P. Peters was Professor of Medicine at Yale, 1927 to 1955. Sudhakar Venkata Nuti

David and Harriet Seligson Thesis Prize Established in 2011 in honor of Dr. David Seligson, the founder of the Department of Laboratory Medicine, for an outstanding thesis in the area of laboratory medicine. Amanda Jane Lu

Surgery Prize Awarded to the senior medical student entering a surgical field, who has done outstanding research during medical school. Patawut Bovonratwet

The Louis G. Welt Prize Established in 1976. To be presented to a student for an outstanding thesis. Louis Welt was Chairman and Professor of Medicine, 1972–1974. Sara Tannenbaum

The Abraham White Prize Awarded yearly to a Yale medical student for outstanding student research. Established in 2010, the prize is in memory of Dr. Abraham White, who served as a distinguished teacher and scholar of Physiological Chemistry at Yale from 1931 to 1948. Rebecca Louisa Fine

STUDENT RESEARCH DAY ORAL PRESENTATIONS, MAY 7, 2019

Maxwell Gerard Farina. *Localized Hippocampal Glutamine Synthetase Knockout: A Novel Model of Mesial Temporal Lobe Epilepsy* (Dr. Tore Eid, Laboratory Medicine)

Rahil Amyn Rojiani. *Drumming to Communicate Emotion: Dual-Brain Imaging Informs an Intervention in a Carceral Setting* (Dr. Joy Hirsch, Psychiatry)

Praneeth Reddy Sadda. *Simulating Fetoscopic Surgery for Twin-to-Twin Transfusion Syndrome* (Dr. Xenophon Papademetris, Radiology and Biomedical Imaging)

Noel Arthur Joseph Turner. *The Impact of B Cell Depletion on Anti-PD-1 Efficacy* (Dr. Marcus Bosenberg, Dermatology)

Laura Jeannette Yockey. *Innate Immune Responses in Zika Virus Control and Pathogenesis* (Dr. Akiko Iwasaki, Immunobiology)

AWARDS TO FACULTY AND HOUSE STAFF, MAY 2018

The Francis Gilman Blake Award Established in 1952 by Nu Sigma Nu. Endowed by Dr. Robert C. Kirk, B.S. 1930, as a memorial to his twin brother, Dr. Gilman D. Kirk, B.S. 1930. Awarded annually to that member of the faculty of the School of Medicine designated by the senior class as the most outstanding teacher(s) of the medical sciences. Gerard J. Kerins, M.D., M.P.A.

Charles W. Bohmfalk Prizes Established in 1989 under the terms of the Alice Bohmfalk Charitable Trust. Prestigious teaching prizes will be awarded annually to individuals who have made outstanding contributions to the teaching program, one in the basic sciences and one in the clinical sciences, as judged by the faculty and students. Basic Sciences: Jordan Pober, M.D., Clinical Sciences: Dana Dunne, M.D.

The Alvan R. Feinstein Award Presented to a Yale School of Medicine faculty member chosen as the outstanding teacher of the year of clinical skills by a committee of chairs of the clinical departments, associate chairs, and students. Michael DiGiovanna, M.D., Ph.D.

The Leah M. Lowenstein Award Presented annually by the Office for Women in Medicine to faculty members who are models of a medical educator whose humane teaching reaches and influences all students regardless of gender, race, or socioeconomic background. These are the traits espoused by the late Leah Lowenstein, a medical educator and first female dean of a coeducational medical school. Howard P. Forman, M.D., M.B.A.

The Leonard Tow Humanism in Medicine Award Presented by the Arnold P. Gold Foundation Established in 1998 to honor the faculty member who demonstrates the highest standard of compassion and sensitivity in interaction with patients. Christine Ngaruiya, M.D., M.Sc., DTMH

The Betsy Winters House Staff Award Presented annually to that member of the House Staff of the Yale-New Haven Medical Center, designated by the graduating class, who has made the most significant contribution to the education of medical students. Todd Spock, M.D., and Emily Pinto Taylor, M.D.

General Information

HUMAN RELATIONS CODE OF CONDUCT

Yale School of Medicine is committed to the promotion of personal and professional development of all individuals in its community, and encourages dialogue that will foster the growth, well-being, and dignity of all its members. In pursuit of these goals, the School is dedicated to maintaining an environment which places the highest priority on collegial relationships, mutual respect, and sensitivity among students, faculty, staff, and patients. An educational community functions best when there is civility and respect for the dignity and worth of each individual.

It must be ensured that our School is free from discrimination and acts of intolerance based on race, gender, sexual orientation, religion, national origin, ancestry, age, or physical handicap. This commitment remains consonant with the obligation to protect open and wide-ranging public discourse. The principle of freedom of expression that might otherwise protect even the most offensive public speech does not protect, nor does it even encompass, a right to threaten the dignity and privacy of an individual. Such personally directed behavior will not be tolerated; it is antithetical to academic values, debilitates its victims, compromises the offenders, and undermines the University's fundamental commitment to individual freedom and respect for all its members. Furthermore, acts of intolerance may destroy the very atmosphere wherein freedom of expression is otherwise tolerated and cherished.

See also http://studentlife.yale.edu/guidance-regarding-free-expression-students-yale.

GRIEVANCE PROCEDURES

The expectation at Yale School of Medicine is that all members of the community will conduct themselves professionally and respectfully. The following statement has been issued by the AAMC regarding institutional standards of behavior in the learning environment:

> The medical learning environment is expected to facilitate students' acquisition of the professional and collegial attitudes necessary for effective, caring, and compassionate health care. The development and nurturing of these attitudes is enhanced and, indeed, based on the presence of mutual respect between teacher and learner. Characteristic of this respect is the expectation that all participants in the educational program assume their responsibilities in a manner that enriches the quality of the learning process.
>
> While these goals are primary to a school's educational mission, it must be acknowledged that the social and behavioral diversity of students, faculty, residents, and staff, combined with the intensity of the interactions between them, will, from time to time, lead to alleged, perceived, or real incidents of inappropriate behavior or mistreatment of individuals.

At Yale there are several mechanisms in place to deal with such incidents, as follows.

Sexual Misconduct, Including Sexual Harassment and Sexual Assault

http://smr.yale.edu

The School of Medicine and Yale University have established procedures and resources to prevent and address sexual misconduct, including sexual harassment and sexual assault. In this bulletin, the section on Resources on Sexual Misconduct in the chapter Yale University Resources and Services provides extensive information and guidance. Faculty, medical students, and postdoctoral fellows may opt to bring an informal or a formal complaint to the University-Wide Committee on Sexual Misconduct or to the Title IX Coordinator of the School of Medicine.

The School of Medicine sponsors regular programming to reduce the harm of campus sexual misconduct. During orientation in the first year and again in the second year before starting clinical rotations, students have mandatory training sessions in preventing and responding to sexual harassment and assault. Also, in the courses (pre-clerkship), the Office of Education sends first- and second-year students a harassment survey to fill out twice a year. In the clerkships, electives, and subinternships, a harassment survey is sent twice a year to third-year students and once a year to fourth-year students. The final clerkship and elective course evaluations have four questions under the learning environment section that inquire about sexual harassment, sexual assault, mistreatment, and abuse.

Racial and Ethnic Harassment

The Office of Diversity, Inclusion, Community Engagement, and Equity, headed by Darin Latimore, M.D. (darin.latimore@yale.edu), chief diversity officer and deputy dean for diversity and inclusion, will work in conjunction with Valarie Stanley, director of the Office for Equal Opportunity Programs, to combat racial and ethnic insensitivity and harassment throughout the School of Medicine. Vigorous steps are taken to investigate any allegation, to counsel the offender, and to recommend disciplinary action, if necessary. In addition, any student, employee, or applicant for programs or employment at Yale who is concerned about affirmative action, equal opportunity, sexual harassment, racial harassment, or fairness in admissions or employment at Yale, either in a general sense or with respect to that individual's own situation, is encouraged to contact the Office for Equal Opportunity Programs (https://equalopportunity.yale.edu). Students who believe that they have been harassed on the basis of race, religion, or ethnic origin by any member of the Yale community can file a complaint with one of the University's human relations counselors, who will investigate the complaint. If a resolution has not been achieved and the student wishes to pursue the complaint further, the student may request the President's Committee on Racial and Ethnic Harassment to consider the matter. For more information, see https://equalopportunity.yale.edu/presidents-procedure-addressing-student-complaints-racial-or-ethnic-harassment.

Peer Advocate Program

The Peer Advocate program was established in 2000 by the associate dean for student affairs and several medical students. It provides students with nonthreatening peer listeners who are available at any time of day or night to discuss strategies, offer reality checks,

and brainstorm solutions to challenging personal, academic, or professional situations, and to point students in the direction of appropriate resources. The Peer Advocates are medical students chosen by their classmates during the first year of medical school for being approachable, trustworthy, mature, thoughtful, and discerning – qualities that should allow them to be good listeners and trusted confidants. The nomination process does not permit campaigning. Peer Advocates serve their fellow students for the duration of medical school.

Dean's and Provost's Procedures for Student Complaints

For detailed information on Yale University complaint procedures, see https://equalopportunity.yale.edu/complaint-procedures.

CURRICULUM MANAGEMENT: EDUCATION COMMITTEE STRUCTURE

Curriculum Management and Integration

The Educational Policy and Curriculum Committee (EPCC) and the School of Medicine's basic science and clinical departments share responsibility for the quality and excellence of our educational program.

The EPCC provides centralized oversight of the curriculum and is responsible for ensuring that it is integrated, coordinated, and designed to achieve the School's overall educational objectives.

The departments, through their faculty, provide the expertise needed to inform the content of specific components in the curriculum (design) and to teach it to the students (implementation).

Both the EPCC and the departments have a role in reviewing, assessing, and modifying the curriculum. The EPCC, through its review committee structure, comprehensively reviews each component of the curriculum and the curriculum as a whole on a regular basis in order to inform, monitor, update, and improve the curriculum. Departments, through their education leaders and teaching faculty, review data about the quality and effectiveness of their curricular and teaching efforts and make adjustments as needed to improve teaching and ensure consistency with the overall goals and guiding principles of the curriculum.

Educational Policy and Curriculum Committee

The education committee structure is designed to (1) integrate, coordinate, and align deliberations and decisions regarding educational policy, guidelines, and procedures with the ongoing implementation, review, and evolution of the curriculum; (2) ensure that there is broad-based faculty representation; and (3) make certain that the committee has full and final decision-making authority.

The EPCC has thirty-two members and is responsible for centralized oversight of the School's educational policies and curriculum, and for ensuring that the educational program is integrated, coordinated, and designed to achieve the School's overarching goals. To achieve this, the EPCC will:

- Provide careful and thorough oversight of the curriculum review process, including the curriculum as a whole as well as its various components
- Promote the development of new ideas and consider recommendations for curricular changes made by its review committees as well as suggestions from students, faculty, and departments
- Review and monitor the School's educational policies to ensure that they are effectively implemented, adhered to, and up to date
- Regularly review and monitor LCME accreditation standards and implement changes as needed to ensure that the educational program is in full compliance with all standards and elements

DECISION-MAKING PROCESS

The deliberations and decisions of the EPCC will be guided by the principles and values embodied in the YSM educational mission statement as well as the Yale system of education. A quorum of ten members must participate, either in person, by phone, or through electronic means including e-mail, in order for decisions to be made. Decisions will be based on a simple majority vote (one more than half of the members voting). In the event of a tie vote, the chair of the committee has the deciding vote.

COMMITTEE MEMBERSHIP

Appointed Members (18) [1]
Associate Dean for Curriculum, Chair
Associate Dean for Student Affairs
Associate Dean for Educational Scholarship/Director, Teaching and Learning Center (TLC)
Associate Dean for Graduate Medical Education
Deputy Dean and Chief Diversity Officer
Associate Director for Curriculum and Educator Assessment, TLC
Associate Director for Student Assessment, TLC
Codirectors of Integrated Course Curriculum [2]
Director of Clerkships
Director of Electives
Director, Clinical Skills Program
Director, M.D./Ph.D. Program
Academic Adviser (rotating)
Curriculum Support Librarian
Chair, Progress Committee
Alumni representative
Deputy Dean for Education, *ex officio*

Elected Faculty Members (7) [2]
Integrated Course Director
Clerkship Director
Elective Director
At-large Faculty (4, elected by the YSM Faculty Advisory Committee)

Students (7)
Elected students[3] (5: 1 representative from each year)
Medical Student Council President
M.D./Ph.D. student representative

1. Appointed members are selected based on their role in medical education, with no term limit.
2. Integrated course, clerkship, and elective directors are nominated by department chairs; directors of medical studies (DMS); fellow integrated course, clerkship, and elective directors; and central curriculum directors. Election of nominated candidates is done by vote of the integrated course, clerkship, or elective directors in the candidate's curricular area. The at-large positions are chosen by the Faculty Advisory Committee using their selection process. Elected faculty positions have a four-year term with reelection permitted.
3. Students are selected by the student body using their election process. These are one-year terms with reelection permitted.

CURRICULUM REVIEW COMMITTEES

The three Curriculum Review Committees work collaboratively with departments, faculty, and students to review and improve individual integrated courses, clerkships, and electives. This includes gathering information, reviewing and analyzing data, and making recommendations that promote:

- use of student evaluations and performance outcome data to improve the curriculum
- use of reliable outcome measures to evaluate student achievement of the learning objectives
- congruence of integrated course, clerkship, and elective objectives with the overarching goals of the curriculum
- use of the most effective teaching methods to achieve the learning objectives
- effective use of formative and summative assessment methods

The Curriculum Review Committees, through their directors, report the results of curricular reviews to the EPCC on a regular basis. Recommendations of the Curriculum Review Committees for changes in the content or teaching methodology within an integrated course, clerkship, or elective based on these reviews can be directly implemented by the integrated course, clerkship, or elective director. However, changes that have broader impact across the curriculum must be brought to the EPCC for consideration and implementation.

Integrated Course Review Committee

The Integrated Course Review Committee is charged with assessing each course in the curriculum at least once every three years and more frequently when deemed necessary by the committee. The reviews provide the integrated course leaders with an evaluation of their course based on student feedback; analysis of course material and instructional sessions; alignment of assessment questions with learning objectives; and comparison of course goals with Yale's overarching curriculum goals, and with national standards. The committee also examines integration of course content with other courses within the curriculum and ensures that we are meeting LCME standards for accreditation.

The integrated course review is a constructive process to help stimulate discussion between courses of intended and unintended content overlap and any omissions in content areas that may not be apparent when viewing courses in isolation. The process

will also identify methods of curriculum delivery that are particularly effective and will provide information on these practices to other courses.

The committee is cochaired by the codirectors of courses and administered by the manager of courses. There are six appointed faculty members: one basic science faculty, four course directors, and one clinical faculty; and four to eight elected students (one or two per class). Other members are one medical school librarian and one representative from the Teaching and Learning Center. The committee meets once or twice a month.

Clerkship Review Committee

The Clerkship Review Committee is charged with assessing each clerkship in the curriculum at least once every four years. The goals of the committee are threefold: (1) to ensure educational quality, innovation, and a supportive learning environment in each of the core clerkships; (2) to provide the clerkship director information regarding themes of student feedback and the integration of clerkship content with other components of the curriculum; and (3) to ensure compliance with LCME educational directives for accreditation.

The clerkship review is a constructive process that aims to stimulate productive discussion among clerkship directors, faculty, staff, students, and leadership in order to support the highest quality educational experience. The review covers multiple aspects of the clerkship: organization, clinical and didactic teaching, patient care, the learning environment, and the clerkship director's analysis and outlook. The process also identifies methods of curriculum delivery that are particularly effective, which can then be provided to other clerkship directors for continuous clerkship improvement.

The committee is chaired by the director of clerkships and administered by the manager of clerkships. The committee is chaired by the director of clerkships and administered by the manager of clerkships. There are six appointed members: two faculty, one Teaching and Learning Center representative, one medical curriculum administrator, one Physician Associate Program faculty, and one curriculum support librarian; and fifteen elected members: one clerkship director/associate director, one clerkship administrator/coordinator, two clinical faculty, one basic science faculty, and ten medical students (two per class; must include at least one M.D./Ph.D. student). The committee meets once a month or more frequently as needed.

Elective Review Committee

The Elective Review Committee is charged with assessing each elective in the curriculum at least once every four years. The goals of the committee are threefold: (1) to ensure educational quality, innovation, and a supportive learning environment in each of the core electives; (2) to provide the elective director information regarding themes of student feedback and the integration of elective content with other components of the curriculum; and (3) to ensure compliance with LCME standards for accreditation.

The elective review is a constructive process that aims to stimulate productive discussion among elective directors, faculty, staff, students, and leadership in order to support the highest quality educational experience. The review covers multiple aspects of the elective: organization, clinical and didactic teaching, patient care, the learning environment, and the elective director's analysis and outlook. The process also identifies methods of curriculum delivery that are particularly effective, which can then be provided to other elective directors for continuous elective improvement.

The committee is chaired by the director of electives and administered by the manager of electives. There are three appointed faculty elective/subinternship directors, five clinical faculty at large, two program coordinators, one Teaching and Learning Center representative, one representative from the registrar, one curriculum administrator, and up to ten medical students (two per class). The committee meets at least once a month or more frequently as needed.

Thesis Committee

The Thesis Committee provides oversight of and recommends policy for all aspects of the medical student thesis program. This includes:

- setting rules and regulations for the thesis requirement
- establishing thesis deadlines
- determining the guidelines and processes for the awarding of thesis honors and graduation prizes, and choosing the recipients
- determining the selection of oral presentations given on Student Research Day

The Thesis Committee regularly reviews the curriculum to ensure that there is adequate time available for thesis research, evaluates the participation and effectiveness of faculty mentors, assesses the quality of the student's research experience, and makes stipend-supported research fellowships available.

The committee is chaired by the director of student research and includes approximately eighteen faculty from both basic science and clinical departments as well as the section of the history of medicine. There are no term limits. Changes in membership of the committee are made by the chair in consultation with the other members of the committee.

The committee meets at least once a year and may meet more often as needed.

Progress Committee

The Progress Committee reviews the academic performance of each student to determine suitability for continued advancement in the curriculum and for graduation. This review includes decisions about graduation, promotion, leaves of absence, special study, remediation, academic probation, suspension, and dismissal. The Progress Committee uses a single and uniform standard for the promotion and graduation of students.

The Progress Committee is chaired by a senior faculty member and includes approximately twelve faculty from both basic science and clinical departments. The associate dean for student affairs, senior registrar, and registrar are *ex officio* (non-voting) members. Faculty serving on the committee are familiar with the curriculum and graduation requirements and have demonstrated a deep interest in the well-being of the students. There are no term limits. Recommendations for changes in membership of the committee are made by the chair in consultation with the deputy dean for education and other members of the Progress Committee. Those recommendations are submitted to the dean, who has final authority for committee membership.

The Progress Committee meets approximately monthly. When a question arises which cannot wait for the next full meeting of the Progress Committee, the chair may call an emergency meeting, convene a subcommittee, or poll the members of the Progress Committee for their opinions by phone or e-mail.

REVIEW OF STUDENTS

Each student's academic progress is reviewed annually, or more frequently as needed, as specified in the Yale School of Medicine Satisfactory Academic Progress Policy. In addition, the Progress Committee considers other relevant information in order to determine if the student is developing the professional attributes needed to become a safe and effective physician, including moral and ethical character, professional behavior, good judgment, sense of responsibility, sensitivity and compassion for individual needs, and emotional stability. In making its decisions, the committee takes into account the academic record of the student, including but not limited to information such as qualifier performance, standardized skills assessments, course commentaries, clerkship evaluations, performance on board exams, as well as letters and reports regarding incidents of unprofessional behavior, personal testimony and special circumstances.

COMMITTEE DECISIONS AND NOTIFICATION

In reviewing the academic progress of students, the Progress Committee makes one of the following determinations:

- Meeting the requirements for satisfactory academic progress
- Not meeting the requirements for satisfactory academic progress, whereby actions may include one of the following:
  Remediation
  Academic Probation
  Suspension
  Dismissal

Students who are making satisfactory progress will not hear directly from the Progress Committee.

If the Progress Committee determines that a student has not demonstrated satisfactory progress or performance in any aspect of the medical school curriculum, remediation will be required. This remediation is designed to provide the student with a structure to address any deficits with the goal of helping the student improve performance to a satisfactory level. When remediation is required, the student will be notified in writing, including the specifics of the required remediation and the consequences of not successfully completing the remediation according to a specified timeline.

If there is a pattern of poor performance or serious violation of the School's code of conduct or professionalism standards, the student may be placed on academic probation concurrent with the remediation, or suspended. The student will be notified in writing of the terms of the academic probation or suspension, including the requirements for having the academic probation or suspension removed as well as the consequences of not meeting these requirements according to a specified timeline.

A student who is unable to meet the academic requirements of the School despite remediation efforts may be dismissed. Additionally, a student who at any time behaves in a manner that is considered incompatible with the ideals of a physician may be dismissed. If dismissal occurs, the student will be notified in writing of the decision.

A summary of the actions taken by the Progress Committee may appear in the student's MSPE, and the student will be notified of this in writing.

APPEAL PROCESS

A student may appeal the decision of the Progress Committee. The appeal process includes two steps:

Step 1 To begin the appeal process, the student must notify the chair of the Progress Committee in writing of the intention to appeal within seven (7) days from the date the student receives notification of the Progress Committee's decision. The student has the right to appear before the committee, and for support may bring an adviser who is a member of the School of Medicine community. The student may not bring legal representation. The committee will consider any additional information brought to its attention by the student in reaching a final decision.

Step 2 Final decisions of the Progress Committee may be appealed to the dean of the School of Medicine. A student wishing to take this step in the appeal process must submit to the dean (or the dean's designate) a written request describing the basis of the appeal within seven (7) days from the date the student receives notification of the Progress Committee's final decision. Appeals may be based on a claim that some pertinent evidence was not taken into account or that the Progress Committee's consideration was unfair, and must describe the basis for such a claim.

The dean (or the dean's designate) will review the appeal and may or may not invite the student to meet. The dean (or the dean's designate) may either issue a final decision, or may remand the case back to the Progress Committee for reconsideration. The dean (or the dean's designate) shall communicate this decision in writing to the student and to the Progress Committee. The dean's decision is final.

ADVISING AT YALE SCHOOL OF MEDICINE

Yale School of Medicine recognizes the special importance of academic advising and career counseling for medical students. The academic advising program provides academic and career guidance to medical students while contributing to their professional development. Academic advisers are knowledgeable about the Yale system of education, as well as curriculum and graduation requirements. They are informed and up-to-date about student assessment, board examinations, residency application processes, extracurricular opportunities at Yale, fifth-year options, joint-degree programs, and the thesis requirement. Advisers are a valuable resource who will follow students' academic and professional performance, offering guidance and feedback throughout their advisees' time at Yale.

Every Yale School of Medicine student is randomly assigned a faculty academic adviser. The six advisers are highly regarded faculty members who have demonstrated dedication to and interest in students and their undergraduate medical education. Twenty percent of each adviser's effort is supported by the dean for this role. The advisers meet periodically with their advisees one-on-one and in groups to offer advice on navigating the journey through medical school and beyond and to help students having academic difficulties or questions. They are responsible for writing their advisees' MSPEs and other letters of support. Students may "opt out" of having their MSPE written by the assigned academic adviser, in which case it will be written by the associate dean for curriculum.

In addition, the associate dean for student affairs is available to all students to assist with problems of any nature, especially personal issues that students may wish to keep separate from their academic progress. The associate dean meets one-on-one with every first-year student and any student requesting a meeting throughout medical school. The associate dean meets weekly with the academic advisers to discuss themes that may emerge regarding students' academic problems in order to bring broader attention to these themes and issues.

LEAVES OF ABSENCE

Students are expected to follow a continuous course of study at the School of Medicine. However, a student who wishes or needs to interrupt 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. Any student who is contemplating a leave of absence should see the associate dean for student affairs to discuss the necessary application procedures.
2. All leaves of absence must be approved by the associate dean. Medical leaves also require the written recommendation of a Yale Health physician, as described below.
3. A student may be granted a leave of absence of one year with possible extension for one additional year. Any approved leave will be for a specified period.
4. International students who apply for a leave of absence must consult with OISS regarding their visa status.
5. A student on leave of absence may complete outstanding work in any course for which extensions have been granted. The student may not, however, fulfill any other degree requirements during the time on leave.
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. A student on leave of absence must notify the associate dean of student affairs in writing of the intention to return at least eight weeks prior to the end of the approved leave. In addition, a returning student who wishes to be considered for financial aid must submit appropriate financial aid applications to the School's financial aid office to determine eligibility.
10. A student on leave who does not return at the end of the approved leave, and does not request and receive an extension from the associate dean, is automatically dismissed from the 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. A student who is in good standing is eligible for a personal leave of absence. The general policies governing all leaves of absence are described above.

To request a personal leave of absence, the student must apply in writing, 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 associate dean finds the student to be eligible, the leave will be approved. In any case, the student will be informed in writing of the action taken. A student who does not apply for a personal leave of absence, or whose application for a personal leave is denied, and who does not register, will be considered to have withdrawn from the 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 associate dean, on the written recommendation of the director of Yale Health or the chief psychiatrist. The general policies governing all leaves of absence are described above. A student who is in good standing 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 associate dean.

The School of Medicine reserves the right to place a student on a mandatory medical leave of absence when, on recommendation of the director of Yale Health or the chief of the Mental Health and Counseling department, the dean of the School determines that, because of a medical condition, the student is a danger to self or others, the student has seriously disrupted others in the student's residential or academic communities, or the student has refused to cooperate with efforts deemed necessary by Yale Health and the dean to make such determinations. Each case will be assessed individually based on all relevant factors, including, but not limited to, the level of risk presented and the availability of reasonable modifications. Reasonable modifications do not include fundamental alterations to the student's academic, residential, or other relevant communities or programs; in addition, reasonable modifications do not include those that unduly burden University resources.

An appeal of such a leave must be made in writing to the dean of the School no later than seven days from the effective date of the leave.

An incident that gives rise to voluntary or mandatory leave of absence may also result in subsequent disciplinary action.

A student who is placed on medical leave during any term will have tuition adjusted according to the same schedule used for withdrawals (see Tuition Rebate and Refund Policy). Before re-registering, a student on medical leave must secure written permission to return from a Yale Health physician.

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 in good standing is eligible for parental leave any time after matriculation.

Any student planning to have or care for a child is encouraged to meet with the associate dean for student affairs to discuss leaves and other short-term arrangements. For many students, short-term arrangements rather than a leave of absence are possible. Students living in University housing units are encouraged to review their housing contract and the related polices of the Yale Housing Office before applying for a parental leave of absence. 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.

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 Yale School of Medicine 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 associate dean for student affairs. 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 School of Medicine 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 School of Medicine 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 associate dean for student affairs to determine if the student remains eligible for guaranteed readmission.
4. The student must notify the School of Medicine 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 School of Medicine of the intent to return; and
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 School of Medicine, 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. The School of Medicine 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 School of Medicine will undertake reasonable efforts to help the student become prepared. If after reasonable efforts, the School determines that the student remains unprepared or will be unable to complete the program or after the School determines that there are no reasonable efforts it can take, the School may deny the student readmission.

INFORMATION SECURITY, POLICY, AND COMPLIANCE

Before graduation, students in the Yale School of Medicine must remove from their personally owned devices (including laptops, smartphones, and portable storage devices) all electronic Protected Health Information (ePHI). In order to ensure compliance with this important policy, students must complete an online survey and attestation regarding their disposition of ePHI that they may have used in their time at Yale. Completed surveys are sent to the Information Security, Policy, and Compliance (ISPC) Office for collection. Students who have not completed this requirement by the set deadline will have their diplomas withheld and will not be able to receive their M.D.

RESIDENCE AND DINING FACILITIES

Edward S. Harkness Memorial Hall

Harkness Hall, located only steps away from the School of Medicine and Yale New Haven Hospital, houses students from the Schools of Medicine, Nursing, and Public Health, the Physician Associate program, and other graduate and professional schools at Yale. Residents of Harkness Hall live in a secure building with single-occupancy bedrooms. Yale administrative offices occupy the first through third floors of the building. The great advantages of living in Harkness Hall are its close proximity to classes and the opportunity it provides in bringing together students from the various medical-related fields in a relaxed social setting. For additional information visit http://housing.yale.edu.

Dining

Café Med, located in Harkness Hall at the School of Medicine, is open from 7:30 a.m. to 7 p.m., Monday through Friday. The menu enhances convenience and choice, with a customizable salad, soup, and rice bar utilizing local and seasonal ingredients; specialty coffees and fresh pastries; a grab-and-go selection of freshly made salads, sandwiches, and entrées; and a daily hot food option. For additional information visit http://hospitality.yale.edu/retail/cafe-med.

DISABILITY INSURANCE

Yale School of Medicine provides a long-term disability program for each active medical student starting in the first year. (A student may not be on a leave of absence, suspended, or In Absentia to Submit.) Coverage applies regardless of any prior medical condition. During medical school, premiums are paid in full by the School. The policy provides options for expanding coverage after leaving the School of Medicine, but premiums then become the responsibility of the insured. Sign-up takes place during orientation in the first week of the first year. Representatives from the insurance company are present to explain and answer questions about the policy. They also make themselves available for an exit interview before graduation to discuss continuation of coverage after leaving medical school.

MEDICAL CENTER SECURITY

Yale Security, a component of Yale Public Safety, maintains a presence throughout the Medical Center area and across the Yale campus on a 24/7 basis, both through uniformed security officers and centrally monitored electronic security systems that include video cameras, electronic access control, intercoms, emergency blue telephones, and intrusion alarm systems.

Yale Security partners with the Yale Police Department by patrolling parking facilities, pedestrian areas, and buildings using marked vehicles, bicycles, three-wheeled Segways, and foot patrols. Security officers are also available to assist with lockouts, perform walking escorts, and provide safe rides.

Yale Security can be reached twenty-four hours a day, seven days a week, by calling 203.785.5555. For additional information regarding public safety at Yale, or to request additional security services for special events, please visit our website at http://publicsafety.yale.edu. And please be sure to download the Yale LiveSafe app onto your smartphone. It's a great tool and a great resource.

THE YALE JOURNAL OF BIOLOGY AND MEDICINE

The *Yale Journal of Biology and Medicine* (YJBM) provides an educational opportunity for students in medicine, public health, nursing, and the biological sciences to gain experience in all aspects of academic publishing. The *Journal* publishes online four times a year through PubMed Central and receives manuscripts on a wide variety of topics in basic and clinical sciences from authors around the world. Alongside participating faculty members, students review and select articles for publication and have the opportunity to

review books and write articles showcasing their research or sharing clinical experiences from Yale and abroad. Student editors are chosen each year from the School of Medicine and the Combined Program in the Biological and Biomedical Sciences. The editorial staff meets monthly. Jeffrey Bender, faculty liaison. website, http://medicine.yale.edu/yjbm.

SPECIAL SUPPORT SERVICES

Office for Women in Medicine

The Office for Women in Medicine (OWM) serves as a focal point for a variety of concerns, both general and specific, within the School and the University. The OWM provides women students, house staff, and faculty access to advisers and mentors and facilitates access by students to professional women in an informal setting. Throughout the year, the office sponsors workshops and seminars on professional development and career opportunities for women in medicine and the sciences that address the broader concerns of women and men in the medical community. These programs are designed to provide an area for interchange, to increase the visibility of women in medicine, to introduce women at Yale School of Medicine to a spectrum of role models, to provide access to notable speakers, and to serve as a forum for relevant issues. The very existence of OWM demonstrates Yale's strong commitment to women and to the creation of a milieu where women at all levels (from beginning students to senior staff and faculty) can develop to full potential. For additional information please visit http://medicine.yale.edu/owm.

Office of the Ombudsperson

The Office of the Ombudsperson is an independent, confidential, neutral, and informal resource to which persons can bring issues with which they are concerned. The ombudsperson serves as a neutral complaint-handler who attempts to ensure that people are treated fairly and equitably. Any matter in the Yale School of Medicine community may be discussed with the ombudsperson. Discussions are not limited in scope and all are held in strict confidence. The ombudsperson has broad powers of inquiry to resolve conflicts and solve problems through mediation, informal third-party intervention, and shuttle diplomacy. The Office of the Ombudsperson supplements, but does not replace, the existing resources for conflict resolution and fair practice available at the Yale School of Medicine. The ombudsperson follows no prescribed sequence of steps and does not participate in any formal grievance process; the function is to listen, advise, suggest options, make recommendations, and investigate informally with the goal of conflict resolution; to consider all sides of an issue; to remain neutral and impartial; and to protect confidentiality. The only exception to this privilege of confidentiality is where there appears to be imminent risk of serious harm. Discussions with the ombudsperson do not constitute formal notice to the School or University. The contact person is Merle Waxman and the office is located at Sterling Hall of Medicine (SHM L-202), 333 Cedar Street, New Haven, CT 06520; confidential line 203.737.4100. See also http://medicine.yale.edu/ombuds.

Office of Diversity, Inclusion, Community Engagement, and Equity

The Office of Diversity, Inclusion, Community Engagement, and Equity (DICE) strives to create an inclusive community for the diverse student body of Yale School of Medicine (YSM) by supporting and celebrating our differences. Though outreach, education, and advocacy DICE aims to promote the creation of the interdisciplinary health care workforce – including innovative physicians, researchers, and scientists – who reflect and serve the diversity of the community. DICE provides outreach to strengthen the pipeline of diverse individuals for health care and biomedical careers, identifying and recruiting talented individuals from diverse backgrounds. It works directly with medical student groups such as the Asian Pacific American Medical Association; the Committee on Diversity, Inclusion, and Social Justice; Outpatient; the Student National Medical Association/Latino Medical Student Association; Women in Medicine; and Yale First Generation/Low Income. And it supports a number of health and science pipeline programs, including the Youth Science Enrichment Program, the Health Professions Recruitment Exposure Program, Yale Summer Enrichment Medical Academy, and the Minority Association of Pre-Med Students Mentorship Program. Supporting and celebrating informative discourse about diversity and inclusion, DICE actively seeks and is responsive to student and trainee feedback; hosts a monthly social for underrepresented medical and Ph.D. BBS students; sponsors a mentorship program for underrepresented students and trainees; and maintains relationships with house staff and faculty organizations that work toward inclusion. DICE partners with local schools and organizations to host community events and supports ongoing community service projects throughout the year, advocating on behalf of vulnerable populations in New Haven. And it supports student advocacy for social justice within and beyond the campus community, partnering with Yale and local organizations to provide informative and actionable dialogue on key issues of social justice. Deputy Dean and Chief Diversity Officer Darin Latimore, M.D., heads the office. Contact persons are Director Linda V. Jackson and Program Coordinator Teresa A. Hines. The office is located at 367 Cedar Street, Suite 320, New Haven CT 06511; telephone, 203.785.7545. For additional information please visit http://medicine.yale.edu/dice.

Computing at the School of Medicine

Computing assistance is available 24/7 for Yale students, faculty, and staff by contacting the ITS Help Desk (203.432.9000, or helpdesk@yale.edu). Assistance is also available at the Sterling Hall of Medicine Walk-in Computer Support Center (WCS-SHM), Monday through Friday from 9 a.m. to 4:30 p.m., located on the lower level of the Medical Library.

For information on the extensive computer facilities in the Medical Library, see the chapter Harvey Cushing/John Hay Whitney Medical Library.

Computer facilities at the Anlyan Center include five teaching classrooms equipped with eight iMac computers for students and one for instructors. This facility allows small-group teaching and interactive use of online resources such as the virtual microscope. The Gross Anatomy Laboratory at the Anlyan Center is also equipped with thirty-four Mac mini computers to provide online anatomy reference resources to complement traditional dissection.

All students can use their own personal computers at a variety of public, library, or teaching space locations that are equipped with wireless network access. Student residents in Harkness Dormitory can use their personal computers in the dorm, which is fully equipped with wired and wireless networking. Residents also have access to two computer clusters on the fifth and eighth floors. Both rooms have two Windows computers and a laser printer.

Yale Information Technology Services (ITS) has made special arrangement with vendors to provide discounted prices to Yale students, staff, and faculty. Information is available at http://its.yale.edu/software-technology/buying-guide. Students who are interested in buying a personal computer, or who simply want advice and information on personal computers or software packages and how to order them, can consult the staff of the Walk-in Computer Support Center.

School of Medicine ID Card Policy

School of Medicine ID cards are issued when a student registers for the first year during orientation. These ID cards open all perimeter doors to the School of Medicine, as well as some interior connector doors. They should be worn visibly at all times while in the Medical Center and presented, upon request, to University officials whose assigned responsibilities authorize them to seek proper identification.

To obtain a replacement ID card, you must go in person to the medical school ID Center. When an ID card is lost, stolen, or no longer functions, the ID Center issues a replacement card with the photograph on record. Malfunctioning ID cards that are returned to the ID Center are replaced at no charge. Lost, stolen, or deliberately damaged cards are replaced at a fee of $20.

Yale New Haven Health Identification Badges

The Yale New Haven Health photo ID badge is issued when a medical student registers for the first year during orientation. This ID badge allows entry to common, basic access points in the hospital. While on some clerkships, additional ID access is allowed depending on the student's service assignment. For students enrolled for more than four years, such as students taking extended study or M.D./Ph.D. students, badges will be activated for a longer period.

The badge includes the student's name, photo, and designation as a medical student at Yale. The first ID badge is free; the replacement cost is $10. Worn out or defective badges are replaced free of charge.

Yale University Resources and Services

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. Yale aspires to:

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

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

The Whitney and Betty MacMillan Center for International and Area Studies (https://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 (https://world.yale.edu/oia) provides administrative support for the international activities of all schools, departments, centers, and organizations at Yale; promotes Yale and its faculty to international audiences; and works to increase the visibility of Yale's international activities around the globe.

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

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

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

CULTURAL AND SOCIAL RESOURCES

There are many ways to keep up-to-date about campus news and events. These include the YaleNews website, which features stories, videos, and slide-shows about Yale people and programs (http://news.yale.edu); the interactive Yale Calendar of Events (http://calendar.yale.edu); and the University's social media channels on Facebook, Twitter, Instagram, Tumblr, LinkedIn, and YouTube.

The Yale Peabody Museum of Natural History, founded in 1866, houses more than thirteen million specimens and objects in ten curatorial divisions: anthropology, botany, entomology, historical scientific instruments, invertebrate paleontology, invertebrate zoology, mineralogy and meteoritics, paleobotany, vertebrate paleontology, and vertebrate zoology. The renowned collections provide crucial keys to the history of Earth and its life-forms, and in some cases are the only remaining traces of animals, plants, and cultures that have disappeared. About 5,000 objects are on public display, including the original "type" specimens—first of its kind—of *Brontosaurus, Stegosaurus,* and *Triceratops*.

The Yale University Art Gallery was founded in 1832 as an art museum for Yale and the community. Today it is one of the largest museums in the country, holding more than 250,000 objects and welcoming visitors from around the world. The museum's encyclopedic collection can engage every interest. Galleries showcase artworks from ancient times to the present, including vessels from Tang-dynasty China, early Italian paintings, textiles from Borneo, treasures of American art, masks from Western Africa, modern and contemporary art, ancient sculptures, masterworks by Degas, van Gogh, and Picasso, and more. Spanning one and a half city blocks, the museum features more than 4,000 works on display, multiple classrooms, a rooftop terrace, a sculpture garden, and dramatic views of New Haven and the Yale campus. The gallery's mission is to encourage an understanding of art and its role in society through direct engagement with original works of art. Programs include exhibition tours, lectures, and performances, all free and open to the public. For more information, please visit https://artgallery.yale.edu.

The Yale Center for British Art is a public art museum and research institute that houses the largest collection of British art outside the United Kingdom. Presented to the University by Paul Mellon (Yale College, Class of 1929), the collection reflects the development of British art and culture from the Elizabethan period to the present day. Free and open to the public. Offers exhibitions and programs, including lectures, concerts, films, symposia, tours, and family events. For more information, please visit https://britishart.yale.edu.

There are more than eighty endowed lecture series held at Yale each year on subjects ranging from anatomy to theology, and including virtually all disciplines.

More than five hundred musical events take place at the University during the academic year. In addition to recitals by graduate students and faculty artists, the School of

Music presents the Yale Philharmonia, the Oneppo Chamber Music Series, the Ellington Jazz Series, the Horowitz Piano Series, New Music New Haven, Yale Opera, Yale Choral Artists, and concerts at the Yale Collection of Musical Instruments. The Yale Summer School of Music/Norfolk Chamber Music Festival presents the New Music Workshop and the Chamber Choir and Choral Conducting Workshop, in addition to the six-week Chamber Music Session. Many of these concerts stream live on the School's website (https://music.yale.edu), the Norfolk website (https://norfolk.yale.edu), and the Collection of Musical Instruments website (https://collection.yale.edu). Additionally, the School presents the Iseman Broadcasts of the Metropolitan Opera Live in HD free to members of the Yale community. Undergraduate organizations include the Yale Bands, the Yale Glee Club, the Yale Symphony Orchestra, and numerous other singing and instrumental groups. The Department of Music sponsors the Yale Collegium, Yale Baroque Opera Project, productions of new music and opera, and undergraduate recitals. The Institute of Sacred Music presents Great Organ Music at Yale, the Yale Camerata, the Yale Schola Cantorum, and many other special events.

For theatergoers, Yale and New Haven offer a wide range of dramatic productions at such venues as the University Theatre, Yale Repertory Theatre, Yale Cabaret, Yale Residential College Theaters, Off Broadway Theater, Iseman Theater, Whitney Humanities Center, Collective Consciousness Theatre, A Broken Umbrella Theatre, Elm Shakespeare Company, International Festival of Arts and Ideas, Long Wharf Theatre, and Shubert Performing Arts Center.

The religious and spiritual resources of the University serve all students, faculty, and staff of all faiths. These resources are coordinated and/or supported through the Chaplaincy (located on the lower level of Bingham Hall on Old Campus); the University Church in Yale in Battell Chapel, an open and affirming ecumenical Christian congregation; and Yale Religious Ministries, the on-campus association of professionals representing numerous faith traditions. This association includes the Saint Thomas More Catholic Chapel and Center at Yale and the Joseph Slifka Center for Jewish Life at Yale, and it supports Buddhist, Hindu, and Muslim life professionals; several Protestant denominational and nondenominational ministries; and student religious groups such as the Baha'i Association, the Yale Hindu Student Council, the Muslim Student Association, the Sikh Student Association, and many others. Hours for the Chaplain's Office during the academic term are Monday through Thursday from 8:30 a.m. to 11 p.m., Friday from 8:30 a.m. to 5 p.m., and Sunday evenings from 5 to 11. Additional information is available at http://chaplain.yale.edu.

ATHLETIC FACILITIES

The Payne Whitney Gymnasium is one of the most elaborate and extensive indoor athletic facilities in the world. This complex includes the 3,100-seat John J. Lee Amphitheater, the site for many indoor varsity sports contests; the Robert J. H. Kiphuth Exhibition Pool; the Brady Squash Center, a world-class facility with fifteen international-style courts; the Adrian C. Israel Fitness Center, a state-of-the-art exercise and weight-training complex; the Brooks-Dwyer Varsity Strength and Conditioning Center; the Colonel William K. Lanman, Jr. Center, a 30,000-square-foot space for recreational/intramural play and varsity team practice; the Greenberg Brothers Track, an eighth-mile indoor

jogging track; the David Paterson Golf Technology Center; and other rooms devoted to fencing, gymnastics, rowing, wrestling, martial arts, general exercise, and dance. Numerous physical education classes in dance (ballet, modern, and ballroom, among others), martial arts, zumba, yoga, pilates, aerobic exercise, and sport skills are offered throughout the year. Yale undergraduates and graduate and professional school students may use the gym at no charge throughout the year. Academic term and summer memberships at reasonable fees are available for faculty, employees, postdoctoral and visiting fellows, alumni, and student spouses. Additional information is available online at https://sportsandrecreation.yale.edu.

During the year various recreational opportunities are available at the David S. Ingalls Rink, the McNay Family Sailing Center in Branford, the Yale Outdoor Education Center in East Lyme, the Yale Tennis Complex, and the Golf Course at Yale. Students, faculty, employees, students' spouses, and guests of the University may participate at each of these venues for a modest fee. Up-to-date information on programs, hours, and specific costs is available online at https://sportsandrecreation.yale.edu.

Approximately fifty club sports come under the jurisdiction of the Office of Outdoor Education and Club Sports. Most of the teams are for undergraduates, but a few are available to graduate and professional school students. Yale undergraduates, graduate and professional school students, faculty, staff, and alumni/ae may use the Yale Outdoor Education Center (OEC), which consists of 1,500 acres surrounding a mile-long lake in East Lyme, Connecticut. The facility includes overnight cabins and campsites, a pavilion and dining hall available for group rental, and a waterfront area with supervised swimming, rowboats, canoes, stand-up paddleboards, and kayaks. Adjacent to the lake, a shaded picnic grove and gazebo are available to visitors. In a more remote area of the facility, hiking trails loop the north end of the property; trail maps and directions are available on-site at the field office. The OEC runs seven days a week from the third week of June through Labor Day. For more information, including mid-September weekend availability, call 203.432.2492 or visit https://sportsandrecreation.yale.edu.

Throughout the year, Yale graduate and professional school students have the opportunity to participate in numerous intramural sports activities. These seasonal, team-oriented activities include volleyball, soccer, and softball in the fall; basketball and volleyball in the winter; softball, soccer, ultimate, and volleyball in the spring; and softball in the summer. With few exceptions, all academic-year graduate-professional student sports activities are scheduled on weekends, and most sports activities are open to competitive, recreational, and coeducational teams. More information is available from the Intramurals Office in Payne Whitney Gymnasium, 203.432.2487, or online at https://sportsandrecreation.yale.edu.

HEALTH SERVICES

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, and students enrolled in the PA Online program (see below), 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.

PA Online candidates Students enrolled in the PA Online program are not eligible for Yale Health Basic Coverage but may enroll in Yale Health Student Affiliate Coverage. This plan includes services described in both Yale Health Basic and Yale Health Hospitalization/Specialty Coverage. Coverage is not automatic; enrollment applications are available directly from the PA Online program, and special enrollment deadlines apply (July 15 for full-year or fall-term coverage; January 15 for spring-term coverage only).

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, students enrolled in the EMBA program, students enrolled in the PA Online program, 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. For PA Online candidates, applications are available directly from the PA Online program, and special enrollment deadlines apply (July 15 for full-year or fall-term coverage; January 15 for spring-term coverage only).

Eligibility Changes

Withdrawal A student who withdraws from the University during the first fifteen days of the term will be refunded the fee paid for Yale Health Hospitalization/Specialty Coverage. The student will not be eligible for any Yale Health benefits, and the student's Yale Health membership will be terminated retroactive to the beginning of the term. The medical record will be reviewed, and any services rendered and/or claims paid will be billed to the student on a fee-for-service basis. Assistance with identifying and locating alternative sources of medical care may be available from the Care Management Department at Yale Health. At all other times, a student who withdraws from the University will be covered by Yale Health for thirty days following the date of withdrawal. Fees will not be prorated or refunded. Students who withdraw are not eligible to enroll in Yale Health Student Affiliate Coverage. Regardless of enrollment in Yale Health Hospitalization/Specialty Coverage, students who withdraw will have access to services available under Yale Health Basic Coverage (including Student Health, Athletic Medicine, Mental Health & Counseling, and Care Management) during these thirty days to the extent necessary for a coordinated transition of care.

Leaves of absence Students who are granted a leave of absence are eligible to purchase Yale Health Student Affiliate Coverage for the term(s) of the leave. If the leave occurs on or *before* the first day of classes, Yale Health Hospitalization/Specialty Coverage will end retroactive to the start of the coverage period for the term. If the leave occurs anytime after the first day of classes, Yale Health Hospitalization/Specialty Coverage will end on the day the registrar is notified of the leave. In either case, students may enroll in Yale Health Student Affiliate Coverage. Students must enroll in Affiliate Coverage prior to the beginning of the term unless the registrar is notified after the first day of classes, in which case, the coverage must be purchased within thirty days of the date the registrar was notified. Fees paid for Yale Health Hospitalization/Specialty Coverage will be applied toward the cost of Affiliate Coverage. Coverage is not automatic, and enrollment forms are available at the Member Services Department or can be downloaded from the website (https://yalehealth.yale.edu/resources/forms). Fees will not be prorated or refunded.

Extended study or reduced tuition Students who are granted extended study status or pay less than half tuition are not eligible for Yale Health Hospitalization/Specialty Coverage. They may purchase Yale Health Student Affiliate Coverage during the term(s) of extended study. This plan includes services described in both Yale Health Basic and Yale Health Hospitalization/Specialty Coverage. Coverage is not automatic, and enrollment forms are available at the Member Services Department or can be downloaded from the website (https://yalehealth.yale.edu/resources/forms). Students must complete an enrollment application for the plan prior to September 15 for the full year or fall term, or by January 31 for the spring term only.

For a full description of the services and benefits provided by Yale Health, please refer to the *Yale Health Student Handbook,* available from the Member Services Department, 203.432.0246, 55 Lock Street, PO Box 208237, New Haven CT 06520-8237.

Required Immunizations

Proof of vaccination is a pre-entrance requirement determined by the Connecticut State Department of Public Health. Students who are not compliant with this state regulation will not be permitted to register for classes or move into the dormitories for the fall term, 2019. Please access the Incoming Student Vaccination Record form for health professions students at https://yalehealth.yale.edu/new-school-medicine-school-nursing-and-pa-program-student-forms. Connecticut state regulation requires that this form be completed and signed, for each student, by a physician, nurse practitioner, or physician's assistant. The form must be completed, independent of any and all health insurance elections or coverage chosen. Once the form has been completed, the information must be entered into the Yale Medicat 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, 2019.

Quadrivalent meningitis All students living in on-campus dormitory facilities must be vaccinated against meningitis. The only vaccines that will be accepted in satisfaction of the meningitis vaccination requirement are ACWY Vax, Menveo, Nimenrix, Menactra, Mencevax, and Menomune. The vaccine must have been given within five years of the first day of classes at Yale. Students who are not compliant with this state regulation will not be permitted to register for classes or move into the dormitories for the fall term, 2019. 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 requires tuberculosis screening for all incoming health professions students. For students in the School of Medicine, this entails providing proof of a PPD or Quantiferon testing done within six months of the start of the fall term. A chest X-ray is required only for individuals known to have previously positive PPD or Quantiferon results.

Hepatitis B In addition, all health professions students are required to provide documentation of three Hepatitis B vaccinations and the laboratory report from a Quantitative Hepatitis B Surface Ab titer. In the event that the titer result is determined to be negative, one vaccine is required, followed by a repeat titer thirty days later. If the second titer result is positive, this requirement is complete. If the second titer result is still negative, then the additional two vaccines are required, followed by a repeat titer thirty days after the final vaccine.

Tdap In addition, all health professions students must show evidence that they have received a tetanus-diphtheria-pertussis booster within the past ten years.

Any students who will be traveling abroad should make an appointment for a travel health consultation at least six to eight weeks prior to departure. Travel health consultations are available through the Student Health Department at Yale Health, and through Passport Health. Additional information is available at https://yalehealth.yale.edu/more/travel-health-services-students. It is especially important that students notify the Travel clinician of travel activities that include working in areas where they might encounter blood or fluid exposure. Such students will be given a supply of antiretroviral medication at no charge. They will also receive instructions about how to handle possible exposure.

OFFICE OF INTERNATIONAL STUDENTS AND SCHOLARS

The Office of International Students and Scholars (OISS) coordinates services and support for Yale's nearly 6,000 international students, faculty, staff, and their dependents. OISS 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-to-yale.

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 (http://oiss.yale.edu) provides useful information to students and scholars prior to and upon arrival in New Haven, as well as throughout their stay at Yale. International students, scholars, and their families and partners can connect with OISS and the Yale international community virtually through 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

The Resource Office on Disabilities (ROD) facilitates accommodations for all Yale students with disabilities who register with and have appropriate medical documentation on file in the ROD. Documentation may be submitted to the ROD even though a specific accommodation request is not anticipated at the time of registration. Early planning is critical. Requests for housing accommodations must be made in the housing application. The required first step for a student with a disability is to contact the Resource Office on Disabilities to initiate the process of obtaining disability-related accommodations; see https://yale-accommodate.symplicity.com/public_accommodation. Registration with the ROD is confidential.

Generally, a student requiring academic accommodations needs to let the ROD know at the start of each term. We ask students to complete this step as soon as their schedule is known. At any time during a term, students with a newly diagnosed disability or recently sustained injury requiring accommodations should contact the ROD. More information can be found on our website, https://rod.yale.edu, including instructions for requesting or renewing accommodations. You can also reach us by phone at 203.432.2324.

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 current or past experience of sexual misconduct involving themselves or someone they care about. SHARE services are confidential and can be anonymous if desired. SHARE can provide professional help with medical and health issues (including accompanying individuals to the hospital or the police), as well as ongoing counseling and support. SHARE works closely with the University-Wide Committee on Sexual Misconduct, the Title IX coordinators, the Yale Police Department, and other campus resources and can provide assistance with initiating a formal or informal complaint.

If you wish to make use of SHARE's services, you can call the SHARE number (203.432.2000) at any time for a phone consultation or to set up an in-person appointment. You may also drop in on weekdays during regular business hours. Some legal and medical options are time-sensitive, so if you have experienced an assault, we encourage you to call SHARE and/or the Yale Police as soon as possible. Counselors can talk with you over the telephone or meet you in person at Acute Care in the Yale Health Center or at the Yale New Haven Emergency Room. If it is not an acute situation and you would like to contact the SHARE staff during regular business hours, you can contact Jennifer Czincz, the director of SHARE (203.432.0310, jennifer.czincz@yale.edu), Anna Seidner (203.436.8217, anna.seidner@yale.edu), Cristy Cantu (203.432.2610, cristina.cantu@yale.edu), Freda Grant (203.436.0409, freda.grant@yale.edu), or John Criscuolo (203.645.3349, 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 Kristina Reech, the Sensitive Crimes & Support coordinator, she can be reached at 203.432.9547 during business hours or via e-mail at kristina.reech@yale.edu. Informational sessions are available with the Sensitive Crimes & Support coordinator to discuss safety planning, available options, etc. The YPD works closely with the New Haven State's Attorney, the SHARE Center, the University's Title IX coordinators, and various other departments within the University. Talking to the YPD does not commit you to submitting evidence or pressing charges; with few exceptions, all decisions about how to proceed are up to you.

Departments and Sections

This section provides information for all departments and some sections in the School of Medicine.

Courses designated *a* meet in the fall term only. Courses designated *b* meet in the spring term only. Courses enclosed in brackets are not offered in the current academic year. Additional information on clinical elective and subinternship experiences is available at https://medicine.yale.edu/education/curriculum/advancedtraining/clinicalelectives.

Faculty listings reflect approved appointments effective April 30, 2019.

ANESTHESIOLOGY

TMP 3, 203.785.2802
https://medicine.yale.edu/anesthesiology

Professors S. Akhtar, P.G. Barash (*Emeritus*), H. Benveniste, C.A. Brandt (*Emergency Medicine*), F.R. Braveman (*Emeritus*), M.M. Burg (*Medicine*), J.G. Collins (*Emeritus*), J. Ehrenwerth (*Emeritus*), M. Fontes, T.M. Halaszynski, P.M. Heerdt, R.L. Hines (*Chair*), L.M. Kitahata (*Emeritus*), C.J. Kopriva (*Emeritus*), R. Lagasse, R.H. LaMotte, L. Meng, P.L. Miller (*Emeritus*), L.E. Niklason, T.H. Oh (*Emeritus*), A.C. Perrino, T.D. Rafferty (*Emeritus*), S.H. Rosenbaum, W. Rosenblatt, K.H. Shelley, R.N. Shiffman (*Pediatrics*), D.G. Silverman (*Emeritus*), R.S. Sinatra (*Emeritus*), N. Vadivelu

Associate Professors A.A. Alian, J. Charchaflieh, S. Garwood, V. Kurup, L.L. Maerz (*Surgery*), G.F. McCloskey, A.D. Oprea, W.M. Popescu, R. Schonberger, J.J. Schwartz, J. Sherman

Assistant Professors C. Al Haddadin, M. Ancuta, S. Antony, R. Aouad, S.I. Assaad, T. Banack, A. Bardia, M.E. Blessing, H. Boules, E. Bukanova, A.M. Bustos, L. Calo, N. Chawla, R. Chow, M. Cortes, S. Dabu-Bondoc, M. Debrosse, R. Deshpande, P. Effraim, A. Eltorai, K. Fardelmann, J. Feinleib, C. Fernandez Robles, L. Ferreira Maracaja Neto, L. Freudzon, D.J. Gaal, A. Gonzalez-Fiol, A. Haque, N. Haralabakis, L.E. Helgeson, K. Hernandez, A. Hernandez Rodriguez, A. Herrera, T. Hickey, N.F. Holt, M.G. Hrycelak, O. Idowu, T. Idowu, S. Kanaparthy, D. Kinney, L.H. Kwan, K. Labib, V. Lan, M. Leonova, J. Li, A.M. Lobo, D. Lombardo, N.A. Lone, A. Malik, P. Mancini, R. Marando, V. Matei, L.D. McKay, P.M. Meeks, H. Mikhael, A. Notarianni, J. Oliver, L. Oliver, J.T. Pan, M. Poole, M. Punjala, J. Quick, K. Rajput, S. Rao, A. Razo Vazquez, I. Rock, R.M. Romero, M.J. Rose, P. Rubin, A. Ruskis, C. Schulten, J. Sramcik, R.G. Stout, C. Szabo, P. Tankha, H.E. Tantawy, J. Tao, D.M. Thomas, T. Wong, J. Zafar, G.X. Zhou, Q. Zhu

Instructors C.L. Almeida, K. Balastriere, C. Bartels, A. Bautista, E. Cardone, T. Cooke, M.S. Cosgrove, S.A. DeMaio, C. Garceau, C. Gibbs, N. Guay, K. Jockel, A.A. Lamacchia, A. Lee, H. Manzolillo, J.A. Marcoulier-Gladu, K. McClintock, M. Michaud, C. Natividad Le, B. Owen, A. Phillips, J. Sacco, A. Silvestri

Senior Research Scientist N. Rajeevan

Research Scientist F.G. Sayward

Associate Research Scientists K. Corcoran, J. Erdos, T. Kawecki, M. Kural, A. Le, H. Lee, A. Lisi, P.G. Mutalik, H. Qian, H. Rajeevan, C. Ramsey, M. Relyea, Y. Solad, R. Wang

Associate Clinical Professor S.B. Stone

Assistant Clinical Professors N. Saidi, I. Vaitkeviciute

Clinical Instructors C. Calabrese, E.M. Chacko, J. Dorsey, E. Fannon, R.P. Hogan, C. Ippolito, E. Jacobs, M.A. Maguire, L. Orozco, N. Pildis, R. Poray, D. Reilly, L. Tracy

Lecturers C.A. Baer, J. Bates, A. Bhargava, D. Colomb, V.N. Garla, B. Kaplan, S. LaCoursiere, P. Nadkarni, G. Sendlewski, Y. Solad

Electives

Anesthesiology Advanced Clinical Elective Individualized full-time program of instruction in anesthesia subspecialties, including cardiovascular, neurosurgical, obstetrical, and pediatric anesthesia. One or two students every two or four weeks. Director: S. Akhtar

Anesthesiology Clinical Research Elective Students are welcome to inquire about participating in ongoing research by the department faculty involving clinical responses to drugs affecting cardiopulmonary, central nervous, and autonomic nervous system; noninvasive cardiovascular monitoring; perioperative coagulation; and other topics. Development of individual research projects is encouraged as well. One or two students every four weeks. Director: L.E. Niklason

Anesthesiology Laboratory Research Elective Students interested in laboratory research projects focused in the neurophysiology and neuropharmacology of the sensations of pain and itch, and in vascular biology, are encouraged to speak with department faculty. Development of individual research projects is encouraged as well. One student every four weeks; additional time recommended.

CELL BIOLOGY

SHM C207, 203.737.5603
https://medicine.yale.edu/cellbio

Professors J. Bewersdorf, C.G. Burd, M.J. Caplan (*Cellular & Molecular Physiology*), L. Cooley (*Genetics*), P. Cresswell (*Immunobiology*), P. De Camilli, J.E. Galán (*Microbial Pathogenesis*), F. Gorelick, V. Greco (*Genetics*), C. Hashimoto (*Emeritus*), D.S. Krause (*Laboratory Medicine*), T.L. Lentz (*Emeritus*), H. Lin, V.T. Marchesi (*Pathology*), M.H. Nathanson, K. Neugebauer (*Molecular Biophysics & Biochemistry*), K.M. Reinisch, J.E. Rothman (*Chair*), M.A. Schwartz, D.K. Toomre, S.L. Wolin (*Emeritus*), Y. Xu (*Adjunct*)

Associate Professors J.S. Bogan (*Medicine*), D.A. Calderwood (*Pharmacology*), D. Colón-Ramos, S.M. Ferguson, M. King, C. Lin, J. Liu (*Microbial Pathogenesis*), C.P. Lusk, M. Mariappan, T. Melia, C. Schlieker (*Molecular Biophysics & Biochemistry*), K. Volynski (*Adjunct*), J. von Blume, Y. Zhang

Assistant Professors D. Baddeley (*Adjunct*), J. Berro (*Molecular Biophysics & Biochemistry*), S. Guo, K. Gupta, X. Su, P.A. Takizawa, S. Wang (*Genetics*), S. Yogev (*Neuroscience*)

Research Scientists A. Ernst, S.S. Krishnakumar, X.N. Liu, C. Qiu

Associate Research Scientists S.J. An, Y. Deng, A.R. Ferguson, L. Geng, K. Grushin, C. Hsieh, X. Hu, K. Kim, F. Li, N. Liu, M. Llaguno, N. Neuenkirchen, F. Pincet, H. Qi, S. Ramakrishnan, L. Schroeder, I.V. Surovtsev, N. Vishnoi, Z. Xi, Y. Zhang, M. Zhong

Lecturer A.C. Vignery

CBIO 501a and 502b, Molecules to Systems This full-year course 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. P.A. Takizawa

CBIO 600a and 601b, Science at the Frontiers of Medicine This full-year graduate seminar for first-year M.D./Ph.D. students—an elective course for M.D. students—matches the progression of topics in the eighteen-month preclinical medical school curriculum and emphasizes the connections between basic and clinical science, human physiology, and disease. It is directed by M.D./Ph.D. program faculty, and many class discussions are led by expert Yale School of Medicine faculty members who select the papers to be read. Students explore scientific topics in depth, learn about cutting-edge research, and improve their presentation skills. The curriculum provides a framework for critically

reading and analyzing papers drawn broadly from the biomedical sciences; this breadth of knowledge is also leveraged in team-based exercises that promote peer-to-peer teaching and learning. Enrollment limited to students who have taken or are currently taking CBIO 501/CBIO 502. F. Gorelick, J.S. Bogan, R. Fitzsimonds, K. Finberg, G. Lister

CBIO 602a/MB&B 602a/MCDB 602a, Molecular Cell Biology 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). T. Melia, D. Breslow, C.G. Burd, M.J. Caplan, V. Horsley, M. King, C.P. Lusk, T.D. Pollard, J.E. Rothman, M.A. Schwartz, J. van Wolfswinkel

CBIO 603a/MCDB 603a, Seminar in Molecular Cell Biology 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. M. King, D. Breslow, C.G. Burd, M.J. Caplan, C.P. Lusk, T. Melia, T.D. Pollard, J.E. Rothman, M.A. Schwartz

CBIO 604b, Systems Cell Biology 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. A. Vignery, J.S. Bogan, M. Brueckner, A. Eichmann, J. Gibson, F. Gorelick, S. Guo, A. Haberman, M. Nathanson, S. Somlo, P.A. Takizawa, J. Wysolmerski

CBIO 606b, Advanced Topics in Cell Biology 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. S.M. Ferguson, C.G. Burd

[**CBIO 611b, Vascular Cell Biology** This course introduces the structure and organ-level physiology of the vascular system, then covers in greater depth the development, regulation, mechanics, and pathology of blood vessels. The major focus is on cellular and molecular mechanisms. The course includes both lectures and reading and discussion of recent literature.]

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

CBIO 701b, Illuminating Cellular Function The focus of the course is on the technical treatment of light microscopy and its applications. The course provides biology and bioengineering students with the knowledge and skills necessary to design and undertake advanced light microscopy experiments. It covers conceptual elements of fluorescence microscopy imaging and analysis (without going too heavily into the theory and math); new advances in super-resolution modalities; biological applications; and hands-on practical work. Enrollment limited to fifteen. D.K. Toomre, J. Bewersdorf

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

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

CBIO 903a or b, Reading Course in Cell Biology Independent study of specific topics in cell biology through directed reading of the literature under faculty supervision. Student may choose any topic and any Yale faculty subject to approval by the Cell Biology DGS. Open to Cell Biology students, and to students in other departments with approval from their respective DGS. Term paper required. K.M. Reinisch

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

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

CBIO 913b/GENE 913b/MCDB 913b, Third Laboratory Rotation Third laboratory rotation for Molecular Cell Biology, Genetics, and Development track students. V. Horsley

CELLULAR AND MOLECULAR PHYSIOLOGY

SHM B147, 203.785.4041
https://medicine.yale.edu/physiology

Professors N.A. Ameen (*Pediatrics*), P.S. Aronson (*Medicine*), A. Bordey (*Neurosurgery*), E.L. Boulpaep (*Emeritus*), C. Canessa, L.G. Cantley (*Medicine*), M.J. Caplan (*Chair*), N. Carrasco, L.B. Cohen, M.E. Egan (*Pediatrics*), B.E. Ehrlich (*Pharmacology*), A. Eichmann, B. Forbush, J.P. Geibel (*Surgery*), G.H. Giebisch (*Emeritus*), J.F. Hoffman (*Emeritus*), L.K. Kaczmarek (*Pharmacology*), D. Lee (*Neuroscience*), G. Lister (*Pediatrics*), P.K. Mistry (*Medicine*), M.N. Nitabach, V.A. Pieribone, P.A. Preisig (*Medicine*), J. Santos-Sacchi (*Surgery*), G.I. Shulman (*Medicine*), F.J. Sigworth, C.L. Slayman (*Emeritus*), S. Tomita, T. Wang, F.S. Wright (*Medicine*), L.H. Young (*Medicine*), D. Zenisek, Z.J. Zhou (*Ophthalmology & Visual Science*)

Associate Professors N.A. Addy (*Psychiatry*), S. Bragiantsev, N. Bamford (*Pediatrics*), J.B. Demb (*Ophthalmology & Visual Science*), T. Eid (*Laboratory Medicine*), E. Gracheva, S. Ishibe (*Medicine*), E. Karatekin, R.G. Kibbey (*Medicine*), J.J. Rinehart, S.K. Singh, A. Tufro (*Pediatrics*), X. Yang (*Comparative Medicine*)

Assistant Professors R. Chang, J.J. Chung, K.T. Kahle (*Neurosurgery*), R. Perry, C. Thoreen

Senior Research Scientists E.L. Boulpaep, D.P. Zecevic

Associate Research Scientists Y. Choi, B.A. Davis, N. Gresko, M. Kannan, M. Mastrotto, S. Meena, J. Nikolaus, J. Platisa-Popovic, S. Ravera, M.A. Reyna, A. Rivetta, P. Sareen, M.M. Tomita, G. Vasan Chandra, Z. Wu, Y. Yang, S. Zhong, J. Zhu

C&MP 550a/ENAS 550a/MCDB 550a/PHAR 550a, Physiological Systems 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. W.M. Saltzman, S. Campbell

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

C&MP 570b/NBIO 570b, Sensory Physiology The course provides an overview of the mammalian special sensory systems, including molecular and cellular bases of vision, audition, taste, olfaction, and somatosensation. Faculty with focus in those areas lead presentations and discussions on peripheral and central mechanisms. D. Zenisek, J. Santos-Sacchi, Z.J. Zhou

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

C&MP 610a and 611b, Mentored Clinical Experience The goals of the course are to introduce MRSP students to aspects of clinically important human diseases. Students explore each disease over three one-and-one-half-hour sessions led by a clinician-scientist who is an expert in the relevant organ system. Students explore two disease processes per term. The first of the three sessions is devoted to a discussion of the clinical presentation, natural history, pathology, epidemiology, treatment, and prognosis of the disease process. During this session students have the opportunity to view gross or microscopic specimens of diseased tissue in association with members of the Pathology faculty. Students are assigned readings in pathology, pathophysiology, and clinical texts to prepare for the first class session. The second session focuses on translational aspects of the disease process. Students read and present papers relevant to the molecular basis of the disease and cutting-edge approaches to its therapy. In the third session students meet with patients who have experienced the disease and/or visit and explore facilities associated with diagnosis and treatment of the disease process. Prior to the third session students receive guidance as to what they will observe and how to approach the experience; and at the end of the session, the group discusses its thoughts and impressions. Students are expected to prepare for sessions, to participate actively, and to be scrupulously respectful of patients and patient facilities. M.J. Caplan

C&MP 620b/NBIO 610b, Fundamentals in Neurophysiology The course is designed for students who wish to gain a theoretical and practical knowledge of modern neurophysiology. Graduate students specializing in neurophysiology and non-neurophysiology are encouraged to attend, as the course begins at a very basic level and progresses to more complicated topics. Topics include properties of ion channels, firing properties of neurons, synaptic transmission, and neurophysiology methodology. V.A. Pieribone, F.J. Sigworth

C&MP 629a and 630b/PATH 679a and 680b/PHAR 501a and 502b, Seminar in Molecular Medicine, Pharmacology, and Physiology 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). D. Nguyen, S. Tomita

C&MP 650b/PATH 660b/PHAR 580b, The Responsible Conduct of Research Organized to foster discussion, the course is taught by faculty in the Pharmacology, Pathology, and Physiology departments and two or three senior graduate students. Each session is based on case studies from primary literature, reviews, and two texts: Francis Macrina's *Scientific Integrity* and Kathy Barker's *At the Bench*. Each week, students are required to submit a reaction paper discussing the reading assignment. Students take turns leading the class discussion; a final short paper on a hot topic in bioethics is required. Staff

C&MP 710b/MB&B 710b, Electron Cryo-Microscopy for Protein Structure Determination 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. Counts as 0.5 credit. C.V. Sindelar, F.J. Sigworth

C&MP 711/MB&B 711, Practical cryo-EM Workshop This laboratory course provides hands-on training in the practical aspects of macromolecular structure determination by cryo-electron microscopy (cryo-EM). Topics include cryo-EM data collection, image preparation and correction, single-particle picking and 2-D classification, 3-D classification, refinement and post-processing, model building, refinement and evaluation. The course includes training in the use of computer programs used to perform these calculations. Prerequisite: C&MP 710/MB&B 710. Y. Xiong, F.J. Sigworth, C.V. Sindelar, K. Zhang

CHILD STUDY CENTER

NIHB 208, 203.785.2540
https://medicine.yale.edu/childstudy

Professors J. Adnopoz, A.T. Arnsten (*Neuroscience*), H. Blumberg (*Psychiatry*), M. Brackett, K. Chawarska, J.P. Comer, W.S. Gilliam, R.A. King, J.F. Leckman, P.J. Lombroso, S. Marans, A.S. Martin, L.C. Mayes (*Chair*), T.J. McMahon (*Psychiatry*), M. Picciotto (*Psychiatry*), M.N. Potenza (*Psychiatry*), D. Reiss, J.E. Schowalter (*Emeritus*), N. Sestan (*Neuroscience*), G. Shahar (*Adjunct*), W.K. Silverman, R. Sinha (*Psychiatry*), A. Slade, J.K. Tebes (*Psychiatry*), F. Vaca (*Emergency Medicine*), F.M. Vaccarino, L.A. Vitulano, F.R. Volkmar, C. Weitzman (*Pediatrics*), S.W. Woods (*Psychiatry*), J. Woolston, H. Zhang (*Public Health*)

Associate Professors D. Barry (*Psychiatry*), M. Bloch, M.J. Crowley, L.E. Fiellin (*Medicine*), D.M. Gordon (*Psychiatry*), M. Hampson (*Radiology & Biomedical Imaging*), E.R. Lebowitz, J.C. McPartland, I. Park (*Genetics*), C. Pittenger (*Psychiatry*), F. Shic (*Adjunct*), M. Smith, C. Stover, D. Stubbe, D. Sukhodolsky, J.M. Wolf

Assistant Professors A. Abyzov (*Adjunct*), M. Best, L. Cardona-Wolenski, A.L. Close, E.H. Connors (*Psychiatry*), G. Coppola, C.J. Cutter, Y. Feng (*Psychiatry*), T.V. Fernandez, S. Fontenelle, C. Frometa, L. Fussner, D. Grodberg, A.R. Gupta (*Pediatrics*), E. Hoffman, P. Lembeck, J. Mayo, H. Millard (*Psychiatry*), C. Moreno, C.L. Olezeski (*Psychiatry*), Y.B. Poncin, K.K. Powell, H. Rutherford, N. Salmaso (*Adjunct*), D. Scheinost (*Radiology & Biomedical Imaging*), L. Taylor, T.C. VanDeusen (*Psychiatry*), P. Ventola, A. Westphal (*Psychiatry*), J. Wilen, S. Yip (*Psychiatry*)

Instructors S. Baddam, S. Guerrier, E. Jarzabek, R. Jou, E. Khondkaryan, J. Lee, K. Maiorana, C. McGirr, R. Muhle, C.S. Pierart

Senior Research Scientist G.M. Anderson

Research Scientists M. Finn-Stevenson, T. Liu, S.L. Macari, Z. Pringle, C. Reyes

Associate Research Scientists C. Bailey, L. Booth, F.E. Brown, R. Ebling, A.M. Erard, J. Floman, M. Goslin, M. Goyette-Ewing, H. Hahn, J. Hoffmann, S. Kim, K. Koenig, A. Landeros, J. Mariani, C. Marin, A. Maupin, A. Naples, S.S. Nicholls, A. Ponguta, D. Simmons, S. Stahl, R. Stern, S. Tomasi, W. Tseng, Q. Wang, E. Warnick, C. Willner, J. Wu

Clinical Professor K.D. Pruett

Assistant Clinical Professors D.M. Aversa, K.F. Bailey, S. Brooke, T. Davila, N. de la Fontaine, L. Dennehy, D.M. Dodge, J. Eisenberg, C. Epstein, G. Epstein-Wilf, J. Gereda, S. Gossart-Walker, K.E. Hanson, B. Kleine, L. Lavalley, A. Levin, N. Libby, G. Lopez-Cohen, M. Lyons, A. Martucci, C. Mills, A. Myers, B.F. Nordhaus, J. Radawich, A. Square, C. Suppies, K. Voccola, V.J. Zecchini

Clinical Instructors L. Ciarleglio, R. Cifarelli, M. de Carvalho, A. Deignan-Kosmides, H.S. Dowling, K. Finch, K. Gereda Marganski, K.L. Goins, B. Graham, G. Hughes,

S. Jackson, K. Kowats, T. Llewellyn, K. Malensek, Y. Odom, C. Parrott, S. Peck, C. Schaefer, M. St. Pierre, V. Stob, B. Torres, K. Trofatter, A. Van Scoyoc, K.M. Williams, M. Wnek

Lecturers B. Aarestrup, N. Akurugoda-Jayalathge, A. Barbosa Torreao Dau, M.A. Ben-Avie, S. Boyd, N.A. Brown, C.J. Cooper, J. Cunningham, J. Davis, A. Gottlieb-Cohen, M. Gunsalus, E. Hardenberg, R. Haymann, S. Heidmann, C.M. Horwitz, N. Kaufman, A. Krishnan, T. Martinez, Y. O'Brien, M. Olinger, N. Perlini, J.P. Platner, P. Rhodeen, D. Rivera, E. Samuel, S. Santora, D.H. Saul, C. Savo, H. Smith-Jackson, T. Tacinelli, S. Taddei, A. Thorne, E.O. Tongul, L. Wilborne, D.L. Williams, G. Zuniga

The Child Study Center is a multidisciplinary academic department of the School of Medicine for the study and care of children from birth through adolescence and their families. Child psychiatrists, psychologists, pediatricians, social workers, psychoanalysts, biomedical scientists, nurses, and other professionals collaboratively engage in research and treatment programs on various aspects of children's growth and development, both normal and deviant. Research programs include child development, psychiatric disorders, social systems and schools, mental retardation, psychosomatic conditions, crisis and trauma, and treatment. Clinical services are provided in general and specialized outpatient clinics, in the Child Psychiatry Inpatient Service in the Children's Hospital of Yale New Haven Hospital, and in the Child and Adolescent Psychiatry Consultation-Liaison Service. The center provides courses and other academic opportunities for undergraduates and graduate students in various disciplines concerned with children and families, as well as specialized training in child psychiatry, psychology, social work, and clinical research.

Electives

Child Study Center Clinical Research Elective This elective entails etiology, clinical manifestations, and treatment of adolescent psychopathology, including eating disorders, depression, suicide, psychosis, delinquency, and the impact of physical and mental disabilities on adolescent development. Reading is supplemented with live and taped clinical material. One student every four weeks. Director: A.S. Martin

Child Study Center Elective The aim of this elective is to provide the student with an intensive experience in infant, child, and adolescent psychiatry. The curriculum includes assessments of normal development and psychopathology in childhood, treatment methods, and research in major disorders of childhood. Students are active team members of the Children's Psychiatric Inpatient Service (CPIS) and the consultation service to the pediatric wards of Yale New Haven Hospital and can take advantage of the wide range of ongoing seminars, conferences, and clinical services in place at the Child Study Center. Teaching methods include seminars, conferences, field observations, ward rounds, and practicals selected by the student following consultation with the director of medical studies and the Child Study Center. One student every four weeks. Director: R.M. Rohrbaugh

COMPARATIVE MEDICINE

BML 330, 203.785.2525
https://medicine.yale.edu/compmed

Professors A.M. Bennett (*Pharmacology*), S. Diano (*Obstetrics, Gynecology & Reproductive Sciences*), V.D. Dixit, M. Hajos (*Adjunct*), J. Hirsch, T.L. Horvath (*Chair*), R.O. Jacoby (*Emeritus*), J.D. Macy, N. Sestan (*Neuroscience*), C.J. Zeiss

Associate Professors C. Fernandez-Hernando, X. Gao, I. Levy, B. Lindenbach (*Microbial Pathogenesis*), M.S. Rodeheffer, P.C. Smith, Y. Suarez, X. Yang

Assistant Professors J.L. Asher, C.J. Booth, M.O. Dietrich, J.A. Goodrich, S.R. Wilson

Research Scientists S.A. Castner, S.R. Compton, J.M. McGrath (*Genetics*), T.P. Nottoli, G. Williams

Associate Research Scientists S. Bai, Z. Liu, G. Mancini, N.L. Price, O. Spadaro, M. Stoiljkovic, B. Stutz Xavier, L. Varela, Y. Youm, X. Zhang

DERMATOLOGY

LCI 501, 203.785.4092
https://medicine.yale.edu/dermatology

Professors R.J. Antaya, J.L. Bolognia, M.W. Bosenberg, I.M. Braverman (*Emeritus*), L. Chen (*Immunobiology*), K.A. Choate, R.L. Edelson (*Chair*), R.A. Flavell (*Immunobiology*), F.M. Foss (*Medicine*), M. Girardi, E.J. Glusac (*Pathology*), V. Greco (*Genetics*), P.W. Heald (*Emeritus*), A. Iwasaki (*Immunobiology*), H. Kluger (*Medicine*), C.J. Ko, D.J. Leffell, H. Lin (*Cell Biology*), J.M. McNiff, R.M. Medzhitov (*Immunobiology*), L.M. Milstone (*Emeritus*), J.S. Pober (*Immunobiology*), M. Sznol (*Medicine*), R.E. Tigelaar (*Emeritus*), L.D. Wilson (*Therapeutic Radiology*)

Associate Professors O.R. Colegio (*Adjunct*), S.E. Cowper, A. Galan, B.A. King, A. Sethi, M.M. Tomayko

Assistant Professors C.G. Bunick, S.R. Christensen, B.G. Craiglow (*Adjunct*), J. Farhadian (*Adjunct*), S. Imaeda, J. Leventhal, I. Lim, P. Myung, I. Odell, S. Ramachandran, K. Suozzi, A. Zubek

Instructors W. Damsky, M. Freudzon, D. Greene, A. Little, G. Panse, S. Perkins, M. Totonchy, M. Vesely

Senior Research Scientists D.E. Brash (*Therapeutic Radiology*), R. Halaban, L.M. Milstone

Associate Research Scientists D.J. Hanlon, K. Katsuno

Clinical Professor I. Dvoretzky

Associate Clinical Professor E.B. Milstone

Assistant Clinical Professor R. Klein

Electives

Dermatology Inpatient Consult Elective Working as integral members of the dermatology consult team, comprised of a dermatology resident and attending physician, students are exposed to dermatologic disease requiring inpatient admission, systemic disease with cutaneous manifestations, and skin complications among hospitalized patients. Students learn about initial evaluation, workup, and differential diagnosis building; the role of biopsy and histologic evaluation; and treatment plan design. Under resident supervision, students evaluate a new consult patient each day and follow this patient for the course of the patient's stay. Students are expected to read intensively on relevant disease processes and formally present this patient to the attending on rounds. Additionally, students research disease and management-related questions that arise on the service and informally present a summary of findings to the attending and resident. Students participate in departmental Grand Rounds and educational conferences and in resident rounds of the inpatient service. Each student identifies a patient with a chronic dermatologic condition, conducts an in-depth interview to learn about how the disease and its

treatment have affected the patient's life, and how life considerations have affected disease management. At the end of the rotation, the student presents a formal case presentation and literature review at Grand Rounds. One student every four weeks. Prerequisite: DERM 120. Directors: M.M. Tomayko, S. Imaeda

Dermatology Outpatient Elective The goal of this course is to ground students in the fundamentals of dermatologic physical examination, diagnosis, and treatment. Students are expected to acquire the skills needed by a primary care physician or surgeon to evaluate dermatological problems independently. Through outpatient experiences at the West Haven VA Medical Center, the Adult and Pediatric Yale Primary Care Clinics, and possibly the Yale Health Center, students are exposed to a variety of primary and referral dermatology services that treat inflammatory and neoplastic skin diseases. Students are also exposed to dermatologic surgery and dermatopathology. Students participate in departmental Grand Rounds and educational conferences, and read and review assigned materials in preparation for a series of case discussions led by faculty. A formal presentation on a topic of the student's choice is required in the final week. One or two students every four weeks; a two-week tailored rotation is available. Director: S. Imaeda

SECTION OF EDUCATION

Office of Education: ESH 304, 203.737.4190
Office of Student Research: ESH 308, 203.785.6633
https://medicine.yale.edu/education/curriculum

Integrated Course Curriculum

MASTER COURSES

Across the Lifespan The goal of this course is for medical students to acquire knowledge of normal and abnormal human development through all stages of life: conception, pregnancy and birth, child and adolescent growth and development, the reproductive years, and middle age and senescence. Material is taught in a variety of formats, including lectures, small-group workshops that discuss patient cases, and laboratories, and in a way that fosters the acquisition of clinical reasoning skills and prepares students to enter clerkships. Open to M.D. and M.D./Ph.D. students only. F. Galerneau, C. Kumar

Attacks and Defenses This course includes content focused on the ability of the body to respond to injury, especially infectious and inflammatory injury. Themes include innate immunity, cellular immunology, infection and immunity, applied topics in immunopathology including autoimmune diseases such as are seen in rheumatology and immunomodulation, infectious disease and antimicrobial therapeutics, and dermatology and musculoskeletal disorders, integrating content areas by interweaving immunology and infection to inform each section of the other's concepts. Human anatomy is introduced and aligned to the musculoskeletal content. There is also an introduction to radiology with specific topics relevant to the anatomy material. Multiple small workshops and laboratories focus on practical aspects of this material including microbiology laboratories; laboratories that focus on histologic aspects of injury and repair; and workshops on clinical approaches and management of common musculoskeletal, infectious, and dermatologic conditions. Open to M.D. and M.D./Ph.D. students only. Lectures may be audited with approval of the course directors. S.M. Campbell, R.J. Homer

Connection to the World 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 functional regionalization in the brain and on the long fiber tracts related to clinical neuroscience. Laboratory sessions examine preparations of human brain to explore anatomical relationships. Lectures in neurophysiology cover neuronal function at the cellular level, with a strong emphasis on the mammalian nervous system. Clinical correlations focus on specific diseases and are presented by one or two faculty members representing both basic and clinical sciences. Throughout the course, lectures in neurology and sensory system clinical correlates are paired with presentations of structure-function relationships. Lectures on the biological basis of behavior are integrated with neurology and psychiatry. Topics in the biological basis of behavior and psychiatry include principles and neural mechanisms of learning and memory, neural systems involved in fear and anxiety, reward and drug addiction,

stress, and neural systems attention. Patients diagnosed with specific diseases aree interviewed by course faculty during clinical correlations and workshops. Teaching formats include lectures, labs, team-based learning, workshops and clinical correlations. Open to M.D., M.D./Ph.D., and Neuroscience Ph.D. students only. The course cannot be audited. C.A. Greer, D.S. Navaratnam

Energy and Metabolism This course integrates physiology, cell biology, pathology, and pathophysiology for the following content areas: metabolism, gastrointestinal, hepatic and pancreatic, endocrinology, and the liver. It includes topics in nutrition, epidemiology and public health, and history of medicine. Open to M.D. and M.D./Ph.D. students only. E.H. Holt, C.R. Kapadia

Genes and Development This course begins with content in the areas of basic human genetics, genetics technology, embryology, and developmental genetics. This is followed by principles of neoplasia and cancer biology, considering neoplasia as a genetically based aberration of normal development and cellular regulation. The course concludes with the topics of clinical oncology and hematology. This content is integrated and sequenced for optimal learning utilizing a variety of teaching methods including lectures, demonstrations, team-based learning, small-group workshops, clinical-pathologic correlations, patient interviews, and labs. Open to M.D. and M.D./Ph.D. students only. A.E. Bale, M.P. DiGiovanna

Homeostasis Homeostasis is one of the fundamental properties of any living organism. The heart, lungs, and kidneys work in concert to provide oxygen to and remove toxins from our cells, and do so continuously from our first breath to our last. This course integrates cardiology, pulmonary, and renal content. The course starts with the renal system prior to the summer break, supported by digital anatomy sessions. Cadaver dissections matched to the organ and systems content of the course begin in the fall. Physiology and pathophysiology of organ systems are integrated in workshops and are taught by both clinical and physiology faculty. The sessions are heavily case-based and aimed at preparing the students for their clinical rotations. Open to M.D. and M.D./Ph.D. students only. D.S. Geller, S. Hull, N. Thande

Introduction to the Profession The first master course in the new curriculum is Introduction to the Profession, or iPro. This is a two-week course in which students have the opportunity to participate in an immersive hospital experience and introduction to New Haven as well as an introduction to bioethics and professional responsibility. Themes emphasized are teamwork and communication, the experience of illness for the patient, and medical decision-making and what goes into it. The premise of iPro is stories. Students reflect on the stories of the patients they meet and hear about, stories of the neighborhoods from which their patients come, the stories of the profession they are entering, and their own stories as they move forward in their professional journeys to become physicians. Open to M.D. and M.D./Ph.D. students only. N.R. Angoff

Scientific Foundations This course integrates essential content from biochemistry, cell biology, epidemiology and public health, genetics, pathology, pharmacology, and physiology to provide first-year medical students with a foundation of knowledge in the basic sciences that underlies modern medicine. The course organizes content from the

above disciplines into the following themes: Building a Body, Cell Communication, Cell Energy, Fluids and Gradients, Gene Expression, Life and Death of a Cell, and Population Health. Additional organ- and systems-related content for the above disciplines is distributed across the remaining pre-clerkship courses, as appropriate. Open to M.D. and M.D./Ph.D. students only. P.A. Takizawa

LONGITUDINAL COURSES

Clinical Skills This course spans the first eighteen months of school for all medical students. Students begin to develop and refine their clinical skills, the essential elements of "doctoring" that physicians use during patient encounters. In Clinical Skills (CS), students learn to communicate with patients, families, and other members of the care team; examine patients; develop clinical reasoning skills; and understand the important role of a student-doctor in a patient's care. Multiple teaching modalities are utilized in CS, but the bulk of the experiences are designed to be hands-on, offering students the opportunity to develop clinical skills with direct faculty observation and feedback, frequently with the use of standardized patients. Throughout CS, emphasis is placed on taking a patient-centered approach to care. Students pass the course by attending all class sessions (attendance is mandatory) and performing a competent history and physical exam in a standardized assessment session at UConn. Course content is practiced and supplemented in the Interprofessional Longitudinal Clinical Experience (ILCE). Director: J. Talwalkar

Human Anatomy This longitudinal course runs concurrently with the master courses of the School of Medicine curriculum. It begins in the second term of first year and is completed at the end of the first term of the second year. Human Anatomy is integrated with the radiology, embryology, and pathophysiology activities of the master courses. Students engage in lectures, conferences, and cadaver dissections. Extensive use is made of computer software and Web-based radiologic, anatomic, and clinical reasoning activities. Four students are assigned to each cadaver; students work collaboratively; interpersonal and group process skills are stressed. Open to M.D. and M.D./Ph.D. students only. W.B. Stewart and staff

Interprofessional Longitudinal Clinical Experience The Interprofessional Longitudinal Clinical Experience (ILCE) is designed to prepare first-year health professional students to function effectively in the clinical environment. This course groups students from Yale School of Medicine, Yale School of Nursing, and the Yale Physician Associate Program to work together at a clinical site alongside faculty mentors. Students work at their sites approximately once a week throughout the first year of school. The program goal is for students to learn with, from, and about other health care professional students early in their training. Students accomplish this by working together to develop their clinical skills, knowledge, and attitudes, in conjunction with each school's individual plan of study. Open to M.D., M.D./Ph.D., PA, and YSN students. Attendance at ILCE sessions is mandatory. Director: K. Wilkins; Codirectors: B.J. Wu, L. Honan, D. Brisette

Medical Coaching Experience (MCE) The MCE is a program for medical students which begins at the end of the ILCE course. Each MCE coach works with a group of four students approximately once a week from mid-April of Year 1 through mid-December

of Year 2. The main purpose of the MCE is to prepare students to successfully complete the standardized history and physical examination assessment at the University of Connecticut and to provide students opportunities to develop the skills they will need on clerkships starting in January of second year. Through the MCE, students see patients with physician coaches and develop their identities as future physicians. Director: B. Wu

Professional and Ethical Responsibility This course runs longitudinally through the first year and features lectures, readings, and small-group case discussions. The course examines the various contexts (social, legal, financial, and organizational) in which the practice of medicine takes place, with a particular focus on principles and approaches to medical ethics. Specific ethical problems in the practice of medicine are addressed, both historical and current, and these issues are considered in the setting of individual patient encounters as well as on the societal level. In addition, practical and ethical aspects of the various components of the U.S. health care system are reviewed. Open to M.D. and M.D./Ph.D. students only. J.S. Hughes and faculty

Responsible Conduct of Research (taught as part of Scientific Inquiry: Research Methods and Responsible Conduct of Research) The Office of Student Research and the M.D./Ph.D. Program have developed a compact ethics course that satisfies the NIH requirements for students supported on training grants, i.e., first- and fifth-year medical students, and M.D./Ph.D. students. Attendance is mandatory by those students. Topics covered include peer review; responsible authorship and publications; policies regarding human subjects; live vertebrate animal subjects in research and safe laboratory practice; collaborative research including collaborations with industry; data acquisition and laboratory tools, management, sharing, and ownership; conflict of interest; mentor-mentee responsibilities and relationships; research misconduct and policies for handling misconduct; the scientist as a responsible member of society, contemporary ethical issues in biomedical research, and the environmental and social impacts of scientific research. Material is taught through lectures with group discussion and case studies. (Six 1.5-hour sessions.) J.N. Forrest S. Alfano, M.J. Caplan, L. Cohen, F. Gorelick, B. Kazmierczak, R.J. Levine, D. Lewin, J.D. Macy, M. Picciotto, D.G. Schatz, S.S. Spangler, M. Waxman

Scientific Inquiry: Research Methods and Responsible Conduct of Research The goal of this course is to instill in students an understanding of the value of the Yale student research program and thesis and to provide a primer for success in the thesis. Emphasis is placed on how to choose an excellent thesis project and mentor in laboratory or clinical research, as well as in the areas of epidemiology and public health, international medicine, or medicine and the humanities. Students are instructed on the importance of the research environment, the selection of the best possible up-to-date methods, the importance of issues related to human investigation, and the requirements for HIC approval of protocols for medical student research. Open to M.D. and M.D./Ph.D. students only. J.N. Forrest, faculty, and staff

Integrated Clerkships

Biopsychosocial Approach to the Patient Clerkship This twelve-week integrated clerkship comprises a six-week rotation in primary care and a six-week rotation in psychiatry. During the six-week primary care component, students spend 5–6 half-days each week working in a practice for adult primary care (i.e., general internal medicine, family medicine, or combined medicine/pediatrics) and 2–3 half-days each week working in a practice for general pediatrics. The psychiatry component of the clerkship includes three weeks of inpatient psychiatry, three weeks of consultation-liaison or emergency psychiatry, and six half-day sessions in a longitudinal outpatient psychiatry or integrated primary care–psychiatry clinic. Primary care and psychiatry each have distinct classroom exercises. However, an integrated classroom curriculum brings students together each Thursday afternoon to explore the many topics that overlap primary care and psychiatry, including mood disorders, anxiety disorders, substance abuse, somatic symptom disorder, and pain. Directors: P. Ellis, K.M. Wilkins; Associate Directors: A.M. Fenick, M. Goldenberg

Medical Approach to the Patient Clerkship This twelve-week integrated clerkship includes internal medicine (eight weeks) and neurology (four weeks) clinical components. Throughout the clerkship, students participate in integrated experiences that address the themes related to hospital-based care such as management of acute disease, diagnostic skills, transitions of care, quality improvement, and organ systems. Directors: D.B. DiCapua, D.W. Dunne; Associate Directors: J. Dewey, K. Gielissen

Surgical Approach to the Patient Clerkship This twelve-week integrated clerkship includes surgery (six weeks, general; three weeks, specialties) and emergency medicine (three weeks) clinical components. Throughout the clerkship students participate in integrated experiences that address themes of the OR experience such as perioperative care, emergency/trauma management, procedures, medical error and patient safety, and anesthesiology. Students also participate in a twelve-week mentoring program during the clerkship. Directors: J. Bod, F. Liu; Associate Directors: C. Gibson, D. Stitelman

Women and Children's Health Clerkship This twelve-week integrated clerkship includes clinical components in obstetrics and gynecology and pediatrics. Students participate in six weeks of OB/Gyn and six weeks of pediatrics, with a mix of inpatient and ambulatory clinical experiences in both specialties. Throughout the clerkship students participate in integrated experiences that cover themes such as health and development, preventive care, sexual health, families and communities, health promotion and disease prevention, and perinatal care. All students attend an evening session with the gynecologic teaching associates. Directors: D.C. Hersh, S.R. Pathy; Associate Directors: S. Baxley, C. Boeras, U. Phatak

Fourth-Year Course

Capstone Course The capstone course is required of fourth-year students in the spring term beginning the week of the internship match. Conceived more than ten years ago as a capstone to four years of medical school training, the course provides a review of some of the knowledge and skills needed for internship and beyond; discipline-specific

bootcamps for hands-on pre-internship training; a forum for a comprehensive and critical evaluation of clinical cases; a chance to review some of the historical and economic factors that inform the practice of medicine; and an opportunity to reflect on the social, ethical, psychological, and even spiritual challenges of a life in medicine. Director: D.I. Rosenthal

Elective Courses

Applied Principles of Clinical Research (First-Year Seminars) – Office of Student Research The purpose of this intensive two-week course is to provide an overview of the objectives, research strategies, and methods of conducting patient-oriented research. Topics include research designs, how to ask a research question, data collection, how to write a protocol, bias in studies, qualitative methods, etc. Emphasis is placed on applying concepts to students' actual research projects. Sessions are workshops that combine didactics and use students' projects to illuminate concepts. Students must have declared interest in conducting patient-oriented research by May of the first year. Consent of instructor required. Two weeks in summer to be announced. Staff

Applied Principles of Clinical Research (Fifth-Year Seminars) – Office of Student Research The purpose of this intensive two-week course is to provide an overview of the objectives, research strategies, and methods of conducting patient-oriented designs, how to ask a research question, data collection, how to write a protocol, bias in studies, qualitative methods, etc. Emphasis is placed on applying concepts to students' actual research projects. Sessions are workshops that combine didactics and use students' projects to illuminate concepts. Students must be funded for one year of research. Consent of instructor required. Two weeks in summer to be announced. Staff

Clinical Longitudinal Elective, Tailored The student participates as an active member of the designated inpatient and/or outpatient service, participating in appropriate clinical cases at YNHH and/or the VA. A completed proposal with specific specialty learning objectives must be submitted to the elective director. The student attends regularly scheduled specialty conferences (to be determined by the student and the clinic preceptor). Assignment may be made weekly, twice monthly, or monthly as determined by the student's laboratory responsibilities and in association with the clinic preceptor. This is the equivalent of a two-week, full-time elective, pass/fail. The specific rotation dates are determined by the elective director. Open to Yale M.D./Ph.D. students only; students must have completed six months of clerkships. Director: T. Taddei

Creating Health Care and Life Science Ventures This course gives students a broad understanding of the major "new venture" opportunities in health care and medicine – health care delivery, health care IT and the digital health landscape, biotechnology, medical devices, and health care process redesign especially in the surgical space. In each of these areas, they learn the canonical path to commercialization including how to identify "unmet clinical needs" market opportunities; who is the customer; how to build interdisciplinary teams; regulatory hurdles to commercialization; and creation of a business strategy. The course is designed for a diverse student body including students from management, natural sciences, medicine, law, nursing, and health care management

programs. The course comprises lectures, raw cases, guest speakers, and in-class projects with coaching from the venture investor community. This thirteen-week class is held at Yale School of Management, Evans Hall, and is open to all medical students. For questions, contact the instructors at christopher.loose@yale.edu or ayesha.khalid@yale.edu. *Also MGT 657*. Directors: C. Loose, A. Khalid

Cushing/Whitney Medical Library Information Survival Skills This two-week elective attempts to fill a void in the student's educational experience related to medical informatics. It is designed to introduce the publication, dissemination, and knowledge cycle of medical information. Using a variety of instructional methods, students develop the skills to access, retrieve, evaluate, and manage information for research and clinical purposes. J. Spak

Evolution and Medicine Flipped curriculum: the lectures are recorded and available online. Each week the assigned lectures and corresponding assigned readings should be viewed/read before coming to class. That assignment is tested with short-answer quizzes and reading responses, which must be submitted before class. Those who have not submitted those responses are not allowed to come to class. Class consists of discussion of the points in the lectures and readings that were found to be difficult and of recent research papers relevant to the topic at hand. The course writing assignment for medical students is to substantially improve the Wikipedia page on a topic of their choice in evolutionary medicine. Enrollment limited to fifteen. Required text: Stearns and Medzhitov, *Evolutionary Medicine* (2015). Director: S. Stearns

Family and Transgender Medicine Elective (Oneonta, New York) This is a unique opportunity to experience the full spectrum of family practice in a small-town environment. In this elective students (1) learn how to approach the practice of family medicine in a small town with limited access to specialists and how to use available resources to provide high-quality care, (2) learn about care coordination with larger health care systems in this practice setting, (3) learn about the practice of medicine in a small community and how physicians are integrated into that community, and (4) develop a family systems-based approach to providing care. The preceptor is a Yale graduate who provides primary care for a diverse population in both the hospital and clinic setting. In addition to both inpatient and outpatient family medicine, the preceptor also has a large practice in transgender medicine for both youths and adults, providing a unique practice opportunity. One student every two or four weeks. Director: P. Ellis

Family Medicine Elective (Middlesex Hospital) This elective exposes students to the wide variety of clinical situations encountered in a national model, community-based family medicine residency program. In offices in Middletown, Portland, and East Hampton, students see and examine patients, present their findings and differential diagnosis, develop a plan of investigation and management with their supervisor, and explain the plan to their patients. Students manage and document care using electronic health records. In Middlesex Hospital, students are members of the team on the family medicine inpatient service, which provides medical, pediatric, newborn, maternity, and consultative care. Formal teaching activities include both didactic and interactive sessions, daily bedside teaching rounds, several weekly conference series, and weekly three-hour

hands-on seminars. All three offices are equipped with facilities for minor surgery, casting, colposcopy, spirometry, audiometry, complete vision screening, electrocardiograms, various cultures, and rapid, enzyme-based diagnostic tests. Patients are from all walks of life and all ages and seek medical care for a wide variety of acute and chronic conditions. The emphasis is on continuity in ambulatory, nursing home, and hospital care. One student every four weeks. Director: M. Cardona

Inflammation This course covers fundamentals of inflammation from a broad biological perspective. Both physiological and pathological aspects of inflammation are the focus of this course, which is primarily for preclerkship medical students. Director: R.M. Medzhitov

Intensive Pedagogical Experience in Laboratory Research Techniques Intensive one-week summer course in biomedical research protocols and techniques is open to first-year medical students at Mount Desert Island Biological Laboratory in Bar Harbor, Maine. Four biomedical research topics are the focus of each course: (1) physiological studies of chloride transport in an intact epithelial organ from Squalus acanthias; (2) ion channel gene expression in a heterologous expression system (Xenopus oocytes); (3) studies in isolated tubule preparations, including immunocytochemistry of phosphorylated vs. non-phosphorylated co-transporters, tissue processing, confocal microscopy, Western blots, and antibody design; (4) molecular biology of membrane proteins and transporters in shark salt gland, including methods in RNA, cDNA, PCR, cloning, and sequencing. J.N. Forrest, B. Forbush, P. Aaronson, L.G. Cantley, and staff

Medical Chinese This is a non-credit, elective course designed to help health care professionals gain a working knowledge of Mandarin to facilitate their daily interactions with Chinese-speaking patients and medical personnel. The course focuses on the integration of authentic resources to develop all four language areas for meaningful communication: speaking, listening, reading, and writing. Emphasis is placed on oral communication with patients and colleagues through simulated communicative activities. Instruction in reading and writing skills focuses on recognition of common medical character combinations for specialized vocabulary and reading and writing standard patient notes. Students also learn about the medical system in China, the culture of physician-patient interactions and medical practice, and the role of traditional Chinese medicine. Course fee of $150 is reimbursed to medical students upon successful completion of the course. Prerequisite: basic proficiency in Mandarin Chinese. For questions contact lsp@yale.edu. Director: YCLS Staff Affiliate

Organization and Leadership This course is an introduction to topics in the field of organizational behavior. It is designed to offer participants an opportunity to explore a variety of concepts that relate to the effective and humane management of organizations. Though medicine was once a profession made up primarily of individual practitioners, it is increasingly true that medical professionals, both researchers and clinicians, are now involved in collective endeavors that require coordinated efforts to produce meaningful results. This is the domain of organizational behavior and the subject matter of this course. D.N. Berg

Palliative/Hospice Medicine Elective (Branford, Connecticut) This fifty-two-bed inpatient program at the nation's first hospice provides intensive palliative care for patients with terminal illness. The medical, psychological, and spiritual needs of these patients and their families are met through the coordinated efforts of an interdisciplinary team (IDT) of physicians, nurses, social workers, pharmacists, clergy, art therapists, and volunteers. Students work one-one-one with an attending physician caring for patients approaching the end of life and their families. They participate fully in admissions, morning rounds, family conferences, and IDT conferences. This elective offers students an opportunity to acquire advanced knowledge and skills in the management of symptoms (pain, anxiety, insomnia, etc.), which will benefit them in their future care of all patients, both those approaching the end of life as well as those who are acutely or chronically ill. It is the only elective in which symptom management receives a major focus. The goal of this elective is to learn to provide optimal symptom management and, as members of the IDT, to learn to care for patients approaching the end of life and to give support to their families. A four-week rotation, which allows for optional time spent with allied services and/or home care, is recommended, although a two-week rotation is available. One or two students every two or four weeks. Director: J. Sacco

Primary Care and Community Health Advanced Clinical Elective at Chinle, Arizona This advanced clinical elective in primary care and community health provides the learner with an immersion experience in primary care at a unique, underserved site: Chinle Health Center. This month-long rotation supervised by Steve Williams, M.D., and colleagues provides an opportunity to work with Navajo on the reservation in rural, northeast Arizona. Students appreciate working with traditional native American healers in a remote, beautiful landscape, addressing health needs created by poverty and injustice, and learning about career opportunities with the Indian Health Service. This elective is offered to senior students, who are expected to assume full responsibility for their patients, under the supervision of expert attending physicians. Director: P. Ellis

Primary Care and Community Health Advanced Clinical Elective at HAVEN (Longitudinal) This advanced clinical elective in primary care and community health provides the learner with an experience in primary care at a unique, underserved site: HAVEN, the Yale student-run free clinic, which serves predominantly Hispanic, adult, uninsured persons. This is an opportunity for students to gain clinical experience and help serve an underserved population in an urban medical site where students will also help teach and supervise students earlier in their training. Students choose eight or fifteen Saturdays to work during the year, flexibly scheduled with oversight by the student leadership at HAVEN. Saturday hours are typically 8 a.m.–2 p.m., beginning with morning meeting, followed by direct patient care, ending with afternoon case presentation and didactic presentation. This elective is offered to senior students, who are expected to assume full responsibility for their patients, under the supervision of attending physicians. Director: B. Richards

Primary Care and Community Health Advanced Clinical Elective in Appalachia Six-week advanced clinical elective in primary care and community health. Director: L.C. Mayes

Primary Care and Community Health Advanced Elective at San Francisco This advanced clinical elective in primary care and community health provides the learner with an immersion experience in primary care at a unique, underserved site: San Francisco Free Clinic. During this month-long rotation supervised by Yale medical school alumni Patricia and Richard Gibbs and colleagues, students assume significant autonomy in seeing diverse patients. Students with interest in Orthopaedics can sometimes accompany Dr. Richard Gibbs to provide orthopaedic care to members of the San Francisco Ballet. This elective is offered to senior students, who are expected to assume full responsibility for their patients, under the supervision of expert attending physicians. Director: P. Ellis

Primary Care Wednesday Evening Clinic This one-year weekly outpatient elective in the Primary Care Center provides experience in the longitudinal care of adults. Students are directly responsible for care of medical problems and preventive care as well as coordination of specialty care for their own patient panel. There are weekly pre-clinic conferences, which include Journal Club and primary care case-centered topics presented by students or specialty attending physicians. The clinic is held every Wednesday evening, 5–9 p.m., except the day before Thanksgiving and between Christmas and New Year's. It is open to a limited number of students who have completed at least half of their clerkships (M.D./Ph.D.) or all of their clerkships (M.D.). Students must have completed the MAP clerkship. Director: P. Oray-Schrom; staffed by rotating attending physicians

Public Speaking for Future Physicians The goal of this eight-week course (mid-September–early December) is to provide students with an opportunity to develop and hone their public speaking skills. The YSM curriculum provides opportunities to develop leadership in some domains, but public speaking as a leadership skill is not formally addressed. As future physicians, students will have to speak effectively to get through to patients, communicate their ideas to colleagues and the medical community, and inform the general public. Science and data cannot speak for themselves. As today's scientific communication crisis has shown, failure to communicate effectively can result in public harm when the public and the scientific community hold divergent views (e.g., the belief that vaccines cause autism). It is therefore vital for students to develop public speaking skills. Each ninety-minute session of the course focuses on a specific theme, ranging from delivery (volume, energy, hand gestures), to impromptu speaking (how to deal with unexpected questions and challenging situations), to content (speaking frameworks, how to make ideas "stickier" and easier to understand). Weekly preparation includes brief reading and small assignments involving reflections on the student's previous speaking performances. The value in the course comes from the numerous opportunities to speak and receive feedback. Each student delivers and receives feedback on at least two formal speeches in each class, one of which is recorded, in addition to warm-up exercises taken from improv and acting. The final class is a speech competition, where students deliver prepared five-minute speeches and vote on a winner. Enrollment limited to eight or nine YSM students. Director: J. Encandela

Seminars in Pediatrics: Bedside to Bench The purpose of these seminars is to begin to understand how interesting questions derived from patients can help us learn more about biologic and pathologic processes. We specifically engage the group in discussions

related to diseases or medical problems that affect infants and children. Students select a topic and faculty preceptor, see a patient with that preceptor, lead a seminar, present the patient briefly to the group, and, most importantly, develop some questions that arise in the course of learning about the patients. C.W. Bogue, M. Brueckner, M.K. Khokha, J.D. Jamieson

Spanish for Health Care Professionals This hybrid course offered in the fall and spring terms by the Yale Center for Language Study meets two times a week: one time in a traditional classroom on campus (face-to-face) and another time online. All students are required to have a laptop, a headset, and access to high-speed Internet to participate in the online component. During the online meetings, students are expected to be in a quiet space where they will be able to participate in online oral discussions. The course site is located in Canvas, and the online meetings use the online conference tool Big Blue Button in Canvas. Open to second- through fifth-year medical students in the fall and to all medical students in the spring. Course fee of $150 is reimbursed to medical students upon successful completion of the course. For questions contact lsp@yale.edu. Director: YCLS Staff Affiliate

Teaching and Learning Center Medical Education Elective The goal of this rotation is to introduce medical students to their role as teachers and better prepare them for their role as teachers before they begin residency. It makes use of didactic lectures, observations, group exercises, and teaching activities to facilitate the development of knowledge, skills, and attitudes necessary to help students develop their experience and identity as teachers as they transition from medical school into residency. The objectives are (1) to develop specific skills that will allow students to teach more effectively in the various clinical and classroom scenarios (work rounds, grand rounds, physical diagnosis rounds, operating room, morning report, noon conference) that they will experience during residency; (2) to observe and learn from role models in the field of medical education and describe the characteristics of effective teachers; (3) to describe the current state of medical education, with a focus on educational theory and evidence derived from the medical education literation; (4) to explore how students can integrate their roles as clinician and educator regardless of career goals; and (5) to develop the attitudes that place a strong emphasis on the value of medical education. Assessment is built into the elective through self-reflection and verbal and written feedback from peers and faculty. These include homework assignments or feedback in group exercises and teaching activities. Students are also asked to self-assess their previous knowledge of and exposure to each of the topics described in the course. All students complete a set of objective structured teaching encounters (OSTEs) at the end of the course, directly observed by faculty facilitators. Maximum of twelve students for two weeks. Director: J. Hafler

Uncertainty in Medicine: Critical Thinking and Decision-Making The goal for this course is to recognize that while much of medical education is traditionally centered on accrual of information for rapid recall, the health care profession is riddled with uncertainty and incomplete information. Health care providers are faced with multidimensional and multidisciplinary problems whose solutions require a combination of rigor, creativity, and collaboration. While our current approach to medical education is only reinforced by emphasis on short-answer standardized tests as metrics of aptitude, this

course aims to combat that emphasis and prepare students for the complexities of the medical field by focusing on critical thinking and problem-solving skills in a case-based collaborative environment. We use case-based exercises to analyze topics that have contemporary relevance to medicine, e.g., development of screening programs for cancer or reporting and reduction of medical error. These exercises utilize a collaborative approach aimed at developing several distinct skills: defining the scope of a complex problem, reducing a problem into definable parts, examining each part from multiple angles, prioritizing the parts and their potential solutions, and committing to an actionable solution while acknowledging unaddressed complexities and unknowns. Open to all medical students. Enrollment limited to twenty. The class meets weekly at noon from mid-June to early August. Director: G. Lister

***The Yale Journal of Biology and Medicine* (*YJBM*)** The course provides an educational opportunity for students in medicine, public health, nursing, and the biological sciences to gain experience in all aspects of academic publishing. The *YJBM* publishes online four times a year through PubMed Central and receives manuscripts on a wide variety of topics in basic and clinical sciences from authors around the world. Alongside participating faculty members, students review and select articles for publication and have the opportunity to review books and write articles showcasing their research or sharing clinical experiences from Yale and abroad. Student editors are chosen each year from the School of Medicine and the Combined Program in the Biological and Biomedical Sciences. The editorial staff meets monthly. Faculty adviser: J.R. Bender

SEMINARS

The Healer's Art This innovative discovery model course in values clarification and professionalism for first- through fourth-year medical students is offered annually at more than ninety U.S. medical schools as well as medical schools around the world. Designed in 1991 by Rachel Naomi Remen, M.D., and offered at the School of Medicine since 1999, the course offers a safe learning environment for a personal, in-depth exploration of the time-honored values of service, healing relationship, reverence for life, and compassionate care. It utilizes principles of adult education, contemplative studies, humanistic and transpersonal psychology, cognitive psychology, formation education, creative arts, and storytelling to present and explore human dimensions of medicine rarely discussed in medical training. Topics include deep listening, presence, acceptance, loss, grief, healing, relationship, encounters with awe and mystery, and self-care practices. The curriculum enables students to uncover and strengthen the altruistic values, sense of calling, and intention to serve that have led them to medicine, creating a firm foundation for meeting the challenging demands of contemporary medical training and practice. In a rigorous standardized course evaluation, the thousands of students nationwide and internationally who take the course every year report that it fills a gap in their existing curriculum and enables them to make the practice of medicine uniquely their own. Faculty are often as profoundly affected by the course as the students, reporting a renewal of their enthusiasm for teaching and their love of medicine. Students and faculty participate together in a discovery model that transcends the divisiveness of expertise to explore service as a way of life. The process-based curriculum takes a highly innovative, interactive, contemplative,

and didactic approach to enabling students to uncover and recognize the personal and universal meaning in the daily work of medicine. Four weeks in Oct.–Nov.; dates to be determined. Director: A.H. Fortin

Life Worth Living What makes a life worth living in medicine? In an era when the prevalence of physician burnout is high, and there is much change in the profession, we ask ourselves, "How should I live my life? What really matters? What makes a life worth living?" We engage these questions in a small-group discussion format, modeled after the course by the same name taught at Yale College (Humanities 411) and adapted for the School of Medicine. This is a course of "applied philosophy," in which we address questions of meaning and purpose in our profession and reflect upon our own practice. In particular, we explore the question "What makes a life worth living in medicine?" We consider original texts and seminal works from Judaism, Buddhism, Christianity, and Islam, as well as contemporary thought leaders and evidence-based research. Special attention is given to the role that money, power, justice, and social prestige play in shaping our profession. Seven weeks in June–Aug.; Th 3–4:30. Director: B.R. Doolittle

Medical (Mal)Practice under the Nazi Regime The main goals of this seminar are to provide information about the activities of medical professionals during the Third Reich, to promote discussion of the history of the profession the students are entering, to foster conversation about key ethical challenges, and to spur contemplation of how this history connects to the present. Although the events under consideration took place about eighty years ago, echoes of the history remain (e.g., the principle of informed consent), and certain issues emerging from the period are still prompting vigorous debate (e.g., the ethics of utilizing data collected during criminal experiments). Most discussions of this period in medical history focus on the deeds of medical practitioners and scientists affiliated with the German regime, but this seminar also examines the behavior of Jewish doctors who utilized their medical training toward a variety of ends in ghettos and concentration camps. As a result, central themes include power dynamics and moral complexity. The seminar is intended for 12–15 students. Class time is a combination of lecture, discussion, and primary source analysis (including watching survivor video testimonies). Preparation for each meeting requires one to two hours of work consisting of reading, watching testimony, and writing responses. No prior knowledge of German or Holocaust history is required. Four weeks in May–June; W 5–6:30. Director: S.J. Siegel

EMERGENCY MEDICINE

464 Congress Avenue, Suite 260, 203.785.2353
https://medicine.yale.edu/emergencymed

Professors C. Baum (*Pediatrics*), S.L. Bernstein, M. Bogucki, C.A. Brandt, K. Cheung, D.C. Cone, D. Della-Giustina, G. D'Onofrio (*Chair*), J.D. Dziura, D.A. Fiellin (*Medicine*), S.M. Powsner (*Psychiatry*), K. Santucci (*Pediatrics*), A. Ulrich, F. Vaca

Associate Professors L.D. Arnold (*Pediatrics*), M. Auerbach (*Pediatrics*), K.A. Bechtel (*Pediatrics*), M. Chawarski (*Psychiatry*), L. Chen (*Pediatrics*), M.X. Cicero (*Pediatrics*), L.V. Evans, J. Goulet, A.L. Hsiao (*Pediatrics*), K. Jubanyik, M. Langhan (*Pediatrics*), C. Moore, H. Mowafi, B. Safdar, A. Tomassoni, C. Wira

Assistant Professors F. Abujarad, P. Agrawal, A. Aydin, D. Bernstein, D. Boatright, J.W. Bonz, D.R. Camenga, S. Chekijian, E. Coupet, M. Dashevsky, R. Dreyer, B. Emerson (*Pediatrics*), A. French, K. Goldflam, M. Goldman (*Pediatrics*), D. Harriman, R. Harrison, K. Hawk, S. Jarad, R. Liu, E. Melnick, E.P. Monico, H.C. Moscovitz, C.M. Ngaruiya, V. Parwani, A. Pickens, E. Reid, A. Riera (*Pediatrics*), E.A. Samuels (*Adjunct*), J. Sather, A. Selvam (*Adjunct*), A.F. Tarabar, R. Taylor, S. Thomas, G.Y. Tiyyagura (*Pediatrics*), A. Tsyrulnik, R. Van Tonder, A. Venkatesh, A. Wong

Instructors S. Baldeo, C. Baloescu, R. Bayer, T. Beardsley, J. Belsky, J. Bod, R.F. Coughlin, J.I. Daley, R. Heckmann, R. Hipona, C. Jean, D. Joseph, M. Joseph, O. Kovalerchik, J. Kovar, M. Lyon, M. Newton, S. Ravi, J. Ray, C. Sagnella, E. Schned, J. Scofi, A. Shah, V. Verghese, D. Vining, A. Waltman, D. Wood

Senior Research Scientist M.V. Pantalon

Associate Research Scientist C.H. Lee

Associate Clinical Professors M. Hommel (*Pediatrics*), S.A. Walsh (*Pediatrics*)

Assistant Clinical Professors K.J. Burns, C. Rambus, I. Schwartz

Lecturers L. Almonte, K. Baker, T. Balga, G. Bernardi, N. Bliss, J. Bria, S. Campbell, R.E. Chen, C. Choi, J. Ciarleglio, A. Cieply, T.E. Cohen, S. Colella, G. Demers, C. Dill, D. Dinh, K. Duplessis, L. Eddy, G. Faherty, K. Finnucan, L. Franzman, M. Gargano, K. Haskins, H. Herr, A. Hirschman, M. Hosker, K. Huth, E. Kelleher, T. Kimberly, R. Kissane, J. Knickerbocker, J. Koziel, J. Kulas, R. Lachapelle, D. Leonard, N. Linden, D.S. MacMillan, A. Meiman, T.A. Morris, D. O'Reilly, M. Pabom, M. Paridis, R. Patel, A. Pazienza, S. Pouliot, D. Purdy, D. Ryan, M. Simonov, V. Sinha, E. Taillon, S. Verity, J. Walker, S. Welch, H.B. White, M. Young

Clerkship

Surgical Approach to the Patient Clerkship This twelve-week integrated clerkship includes surgery (six weeks, general; three weeks, specialties) and emergency medicine (three weeks) clinical components. Throughout the clerkship students participate in integrated experiences that address themes of the OR experience such as perioperative

care, emergency/trauma management, procedures, medical error and patient safety, and anesthesiology. Students also participate in a twelve-week mentoring program during the clerkship. Directors: J. Bod, F. Liu; Associate Directors: C. Gibson, D. Stitelman

Electives

Emergency Medicine Point-of-Care Ultrasound Elective A two- or four-week experience that introduces the student to the use of diagnostic and procedural ultrasound at the bedside. Educational ultrasounds are performed by the student on emergency department patients using ultrasound equipment in the ED. Attention is paid to image acquisition, machine optimization, and image interpretation. Diagnostic pelvic, vascular, cardiac, pulmonary, biliary, trauma, and soft-tissue sonography are introduced. In addition, there are opportunities for the student to participate in supervised ultrasound-guided procedures (central and peripheral vascular access, abscess drainage, paracentesis). The bulk of time is spent performing ultrasounds in the emergency department, with one half-day a week spent reviewing recorded examinations. Educational materials are provided. While the focus of this rotation is the sonographic evaluation of the emergency patient, students considering almost any specialty may benefit as clinician-performed ultrasound continues to expand. This elective is dedicated solely to the experience and practice of point-of-care ultrasound in the ED. Students are assigned daily scanning shifts that do not carry any clinical responsibility but offer exposure to the clinical environment. It is not the same as the combined Emergency Medicine/Ultrasound Subinternship, in which the student is primarily assigned clinical shifts to demonstrate knowledge, proficiency, and workflow, and also receives exposure to ultrasound through a few scan shifts and image review sessions. Maximum of four students every two or four weeks. Director: R. Liu

Medical Simulation Elective During this two- or four-week elective at the Yale Center for Medical Simulation (YCMS), students gain an immersive experience participating in medical simulation for medical education within the Yale School of Medicine. Students participate as learners in high-fidelity medical simulation cases and procedural sessions on topics related to the students' desired specialty/topic of interest. Students also participate in medical simulation as educators and facilitators by participating as actors in medical simulation cases for medical students and residents rotating through YCMS. Students have the opportunity to participate in all educational activities within YCMS including simulation cases, debriefing sessions, procedural sessions, and in-situ simulations (simulations that take place in the clinical environment). Students also create and program a medical simulation case on their topic of interest under the mentorship of YCMS faculty, using evidence-based medicine resources. Students are given one-on-one instruction on how to program their case. Students can also participate in simulation-based journal clubs, a simulation debriefing course, and simulation-based medical student precede sessions. Maximum of four students every two or four weeks. Director: L.V. Evans

Pediatric Emergency Medicine Elective Fourth- and fifth-year students have the opportunity to evaluate and manage a broad range of acute medical and surgical complaints while honing their clinical skills under direct attending supervision, including thirty-six clinical hours per week in the pediatric emergency department. Education during clinical shifts is augmented by pediatric emergency medicine fellow education

conferences and one-on-one teaching sessions with the elective director. Participation in teaching conferences and mock codes is required. One student every four weeks; a tailored rotation is available. Prerequisites: pediatric rotation, EPIC inpatient training, and EPIC ED e-learning. Director: P.L. Aronson

Subinternships

Combined Emergency Medicine/Ultrasound Subinternship At Yale New Haven Hospital, combined emergency medicine/ultrasound subinterns complete a four-week rotation comprised of twelve clinical shifts, four scanning shifts dedicated to bedside ultrasound, and didactic activities. On clinical shifts, subinterns are expected to function as interns, evaluating patients primarily, managing multiple patients simultaneously, and presenting directly to the senior resident and attending physician. Students see a broad case mix in the emergency department and are expected to generate coherent, problem-focused, differential diagnoses. They are involved in all aspects of patient care including updating patients and families, calling consultants, and performing procedures. They rotate with a variety of attendings and are exposed to faculty from all sections of the emergency department, but they spend a majority of their shifts with ultrasound-trained faculty to maximize their ability to incorporate bedside ultrasound into clinical evaluation. Scanning shifts are dedicated to the skills of performing and interpreting bedside ultrasounds and are typically supervised by a senior resident or ultrasound fellow. Attention is paid to image acquisition, machine optimization, and image interpretation. Diagnostic pelvic, vascular, cardiac, pulmonary, biliary, trauma, and soft-tissue sonography are introduced. In addition, there are opportunities for the student to participate in supervised ultrasound-guided procedures (central and peripheral vascular access, abscess drainage, paracentesis). This is an advanced elective. Applicants must have completed or plan to complete an Emergency Medicine rotation prior to starting this elective. One or two students every four weeks. Director: J. Bod

Emergency Medicine Subinternship At Yale New Haven Hospital, emergency medicine subinterns complete a four-week rotation comprised of clinical shifts and didactic activities. Students complete sixteen shifts of eight hours' duration. Students are expected to function as interns, evaluating patients primarily, managing multiple patients simultaneously, and presenting directly to the senior resident and attending physician. Students see a broad case mix in the emergency department and are expected to generate coherent, problem-focused, differential diagnoses. They are involved in all aspects of patient care including updating patients and families, calling consultants, and performing procedures. They rotate with a variety of attendings and are exposed to faculty from the sections of education, ultrasound, critical care, global health, administration, and EMS. Didactic activities for subinterns include resident educational conference, ultrasound image review, and simulation. Prerequisites: Internal Medicine and General Surgery Clerkships. Maximum of eight students every four weeks. Director: J. Bod

GENETICS

SHM I308, 203.785.2649
https://medicine.yale.edu/genetics

Professors A.E. Bale, S.J. Baserga (*Molecular Biophysics & Biochemistry*), W.R. Breg (*Emeritus*), M. Brueckner (*Pediatrics*), K.A. Choate (*Dermatology*), L. Cooley, D.C. DiMaio, P.G. Gallagher (*Pediatrics*), J.E. Gelernter (*Psychiatry*), A.J. Giraldez (*Chair*), P.M. Glazer (*Therapeutic Radiology*), V. Greco, J.R. Gruen (*Pediatrics*), M. Gunel (*Neurosurgery*), K.K. Hirschi, A.L. Horwich, K.K. Kidd (*Emeritus*), R.P. Lifton (*Adjunct*), H. Lin (*Cell Biology*), M.J. Mahoney (*Emeritus*), S.M. Mane, A. Mani (*Medicine*), M.N. Nitabach (*Cellular & Molecular Physiology*), C.M. Radding (*Emeritus*), V. Reinke, J. Rothberg, M.R. Seashore (*Emerita*), N. Sestan (*Neuroscience*), S. Somlo (*Medicine*), J.B. Sweasy (*Therapeutic Radiology*), P.J. Tattersall (*Laboratory Medicine*), S.M. Weissman, T. Xu (*Adjunct*), H. Zhao (*Public Health*)

Associate Professors C. Cotsapas (*Neurology*), D. Greif (*Medicine*), M. Hammarlund, M.K. Khokha (*Pediatrics*), P. Li, J. Lim, J. Lu, S. Nicoli, J. Noonan, I. Park, C. Scharfe, Z. Sun, A. Xiao

Assistant Professors K. Bilguvar, S. Chen, S. Krishnaswamy, M. Lek, B. Lesch, M. Muzumdar, M. Spencer-Manzon, S. Wang, F. Wilson (*Medicine*), H.Z. Zhang

Senior Research Scientist K.K. Kidd

Research Scientists W.A. Fenton, A.M. Hudson, N.B. Ivanova, J. Knight, J. Lopez-Giraldez, J.M. McGrath, A.J. Pakstis, L. Petti, S. Weatherbee

Associate Research Scientists J. Beaudoin, L.M. Boyden, A. Canaan, H. Chai, P.R. Clark, N. Gandotra, S. Golla, C. Hendry, P. Jain, M. Kudron, A. Lek, D. Li, Y. Li, D. Ma, S. Mehta, M. Nagy, S. Park, A. Popa, Y. Tanaka, D. van Dijk, C. Vejnar, Z. Wang, J. Wen, Q. Yang, J. Zhang, C. Zhao, D. Zhao

GENE 555a/CB&B 555a/CPSC 553a, Machine Learning for Biology 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. S. Krishnaswamy

GENE 625a/MB&B 625a/MCDB 625a, Basic Concepts of Genetic Analysis 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. J. Lu

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

GENE 655a/CBIO 655a, Stem Cells: Biology and Application 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. I.-H. Park, H. Lin

GENE 675a and 676b, Graduate Student Seminar: Critical Analysis and Presentation of Scientific Literature 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. V. Greco

[**GENE 703b, The Mouse in Biomedical Research** This course describes aspects of comparative genomics, construction of genetically altered mice, mouse phenotyping, and study design relevant to the use of mice in the study of human disease. Prerequisites: undergraduate-level knowledge of genetics and mammalian anatomy and physiology.]

GENE 734b/MB&B 734b/MBIO 734b, Molecular Biology of Animal Viruses Lecture course with emphasis on mechanisms of viral replication, oncogenic transformation, and virus-host cell interactions. B.D. Lindenbach, D.C. DiMaio

GENE 743b/MB&B 743b/MCDB 743b, Advanced Eukaryotic Molecular Biology 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. M.W. Hochstrasser, K. Neugebauer, M. Simon

GENE 749a/MB&B 749a, Medical Impact of Basic Science 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. J.A. Steitz, S. Chang, I.G. Miller, K. Neugebauer, D.G Schatz, S. Takyar

GENE 760b, Genomic Methods for Genetic Analysis 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. J. Noonan

GENE 777b/MCDB 677b, Mechanisms of Development 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 biweekly take-home problems. Z. Sun

GENE 800a/E&EB 800a, Seminar in Molecular Evolution This weekly seminar, a continuation of the highly successful Colloquium on Molecular Evolution, covers topics in the general area of molecular evolution. Past topics have included evolution of transcription factors, the role of epigenetics in evolutionary processes, and detecting selection in DNA sequences. Speakers generally come from Yale: faculty, postdocs, and graduate students. We solicit speakers as the term progresses, and we invite volunteers to let us know if they want to present ongoing research for input from other participants. Graduate students may take the course for credit, but it is not graded. Credit is given for attendance at at least two-thirds of meetings; sign-in for students taking the course for credit is held at each session. J. Powell, B. Lesch

GENE 840a and b, Medical Genetics Elective Students participate in the diagnosis and management of fetuses, children, and adults with genetic disorders or who are at risk for genetic disorders. Patients are assigned to students for counseling and diagnostic evaluation, and for presentation at conferences. A laboratory experience in one of our genetics laboratories (Cytogenetics, Biochemical, and Molecular) is arranged according to the interest of the student. Twenty hours per week. One or two students every two or four weeks. Director: M. Spencer-Manzon

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

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

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

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

GENE 913b/CBIO 913b/MCDB 913b, Third Laboratory Rotation Third laboratory rotation for Molecular Cell Biology, Genetics, and Development track students. V. Horsley

GENE 921a or b, Reading Course in Genetics and Molecular Biology Directed reading with faculty. Term paper required. Prerequisite: permission of Genetics DGS.

GLOBAL HEALTH

Office of International Medical Student Education: ESH 214, 203.785.5937
http://medicine.yale.edu/globalhealth

EMD 566b/HPM 566b, Critical Issues in Global Health The course focuses on critical challenges to the health of the poor in low- and middle-income countries and pays particular attention to how these health gaps can be addressed in low-cost and highly effective ways. The course covers the architecture, politics, and governance of global health; key trends in approaches to meeting the health needs of the poor in low- and middle-income countries; and how science and technology can be harnessed for this purpose. It examines the burden of disease and the determinants of this burden; covers the leading causes of illnesses, disability, and preventable death from communicable and noncommunicable diseases, with special attention to women and children; and focuses particular attention on key health systems issues and recent efforts to overcome them, especially in low-income settings. Required of students in the Global Health Concentration at YSPH and YSN. K. Khoshnood (YSPH)

GH 700/EPH 591, Global Health Foundations Global Health Foundations is a term-long, weekly elective intended for students in the health professions to develop an understanding of key aspects of global health research and practice. The objective is for students to attain a good understanding of key issues upon which they may base future research, service, and clinical pursuits in the field of global health. As the course involves students and faculty from all of the health professions, its participatory and collaborative nature provides a rich environment for interdisciplinary dialogue. Required of students in the Global Health Concentration at YSPH and YSN, and of students in the Certificate in Global Medicine program at YSM. Faculty advisers: G. Friedland, T. Rabin, S. Shenoi (YSM); P. Ryan-Krause (YSN); M. Skonieczny (YSPH); R. Gonzalez-Colaso (PA)

GH 701, Topics in Global Medicine Topics in Global Medicine is a student-led, case-based seminar that provides participants with a broad knowledge base in current globally important health issues. Each session focuses on a specific health concern and aims to integrate issues concerning epidemiology and prevention along with diagnosis and treatment in a case-based format and clinically relevant fashion. The specifics of medical management are not the priority for this course. Importantly, the course provides a forum for interactive discussions of the health issues that pose unique challenges in resource-limited settings. Most sessions are collaborative—a faculty instructor is paired with one or two students, and the team works together to research and present the topic. Typically, each session includes a one-hour lecture by the presenting team followed by a half-hour interactive discussion facilitated by the student presenters. The discussion format is flexible and will be guided by the particular session topic. The content might focus on ethical concerns, interesting research questions, preventive strategies, etc. The course is designed for students in all of the health profession programs, specifically physician associate (PA), nursing (YSN), medicine (YSM), and public health (YSPH) students who have an interest in the clinical aspects of global health; it is open to all members of the Yale community. Active participation is expected, whether by way of presenting a

topic, leading a discussion session, or participating in the discussion. Upon completion of this course, students are able to (1) appreciate the spectrum of clinical diseases, both communicable and noncommunicable, affecting persons in low- and middle-income countries (LMIC); (2) identify the major principles and challenges of providing medical care in LMIC; (3) broadly outline methods of diagnosis, prevention, and treatment for diseases encountered in resource-limited settings; (4) appreciate the importance of public health interventions in dealing with these diseases; and (5) have the opportunity to collaborate with a faculty member on the presentation of a topic of interest. Participation in this class is highly encouraged for students and residents interested in applying for an international rotation.

HISTORY OF MEDICINE

SHM L132, 203.785.4338
https://medicine.yale.edu/histmed

Professors N. Rogers, J.H. Warner

Associate Professor J. Radin

Assistant Professors H.M. Cowles (*Adjunct*), J.L. Schwartz (*Public Health*)

Yale College and Graduate School courses open to medical students:

HSHM 207a/AMST 236a/EVST 318a/HIST 199a, American Energy History The history of energy in the United States from early hydropower and coal to present-day hydraulic fracturing, deepwater oil, wind, and solar. Topics include energy transitions and technological change; energy and democracy; environmental justice and public health; corporate power and monopoly control; electricity and popular culture; labor struggles; the global quest for oil; changing national energy policies; the climate crisis. Staff

HSHM 211b/EVST 211b/G&G 211b/HIST 416b, Global Catastrophe since 1750 A history of the geological, atmospheric, and environmental sciences, with a focus on predictions of global catastrophe. Topics range from headline catastrophes such as global warming, ozone depletion, and nuclear winter to historical debates about the age of the Earth, the nature of fossils, and the management of natural resources. Tensions between science and religion; the role of science in government; environmental economics; the politics of prediction, modeling, and incomplete evidence. W. Rankin

HSHM 215a/HIST 140a, Public Health in America, 1793 to the Present A survey of public health in America from the yellow fever epidemic of 1793 to AIDS and breast cancer activism at the end of the past century. Focusing on medicine and the state, topics include quarantines, failures and successes of medical and social welfare, the experiences of healers and patients, and organized medicine and its critics. N. Rogers

HSHM 237b/HSAR 282b/WGSS 282b, Renaissance Bodies: Art, Magic, Science An introduction to issues surrounding the representation of the body in both art and science, spanning from the late Middle Ages to the seventeenth century, and with a particular focus on the Northern Renaissance. Topics include medicine, reproduction, witchcraft, the gender spectrum, torture, race, disability, desire, dreams, and theories of imagination and invention. Sections and assignments make ample use of the Yale collections. Previous experience with art history welcome but not required. M. Bass

HSHM 241a/AFAM 170a/HIST 479a, Sickness and Health in African American History A history of American medicine through the African American experience covering the period of slavery through #BlackLivesMatter. Oriented around the complex dynamics of medical abuse and medical resistance, key themes include medicine and slavery; gender and reproduction; medical experimentation and ethics; the rise of racial science; lynching and vigilante violence; segregation and public health; African-descended approaches to

health and healing; the rise of the African American medical profession; and black health activism from slavery to #BlackLivesMatter. C. Roberts

HSHM 321b/HIST 244, The Cultures of Western Medicine: A Historical Introduction A survey of Western medicine and its global encounters, encompassing medical theory, practice, institutions, and healers from antiquity to the present. Changing concepts of health, disease, and the body in Europe and America explored in their social, cultural, economic, scientific, technological, and ethical contexts. J.H. Warner

HSHM 406a/HIST 150Ja, Health Care for the Urban Poor Exploration of the institutions, movements, and policies that have attempted to provide health care for the urban poor in America from the late nineteenth century to the present, with emphasis on the ideas (about health, cities, neighborhoods, poverty, race, gender, difference, etc.) that shaped them. Topics include hospitals, health centers, public health programs, the medical civil rights movement, the women's health movement, and national health care policies such as Medicare and Medicaid. S. Abedin

HSHM 407b/HIST 289Jb/HSAR 399b/HUMS 220b, Collecting Nature and Art in the Preindustrial World A history of museums before the emergence of the modern museum. Focus on: cabinets of curiosities and *Wunderkammern,* anatomical theaters and apothecaries' shops, alchemical workshops and theaters of machines, collections of monsters, rarities, and exotic specimens. P. Bertucci

HSHM 415a/HIST 179Ja, Historical Perspectives on Science and Religion The engagement between science and religion from a historical standpoint and a multicultural perspective. The Islamic, Jewish, Buddhist, and Christian traditions; the roots of modern creationism; salvation expectations and the rise of modern science and technology. General knowledge of Western and world history is expected. I. Dal Prete

HSHM 422a/HIST 467Ja, Cartography, Territory, and Identity Exploration of how maps shape assumptions about territory, land, sovereignty, and identity. The relationship between scientific cartography and conquest, the geography of statecraft, religious cartographies, encounters between Western and non-Western cultures, and reactions to cartographic objectivity. Students make their own maps. No previous experience in cartography or graphic design required. W. Rankin

HSHM 433b/HIST 419Jb/WGSS 419b, Gender and Science Exploration of the dual potential of the sciences to reinforce received ideas about gender or to challenge existing sexual and racial hierarchies; the rise of the ideas and institutions of the modern sciences as they have reflected and shaped new notions of femininity and masculinity. D. Coen

HSHM 453b/E&EB 336b/HUMS 336b, Culture and Human Evolution Examination of the origins of human modernity in the light of evolutionary and archaeological evidence. Understanding, through a merger of evolutionary reasoning with humanistic theory, the impact of human culture on natural selection across the last 250,000 years. G. Tomlinson

HSHM 454a/HIST 445Ja, Natural History in History The changing meaning and practice of natural history, from antiquity to the present. Topics include: technologies and epistemologies of representation, the commodification of natural specimens and

bioprospecting, politics of collecting and display, colonial science and indigenous knowledge, and the emergence of ethnography and anthropology. Students work on primary sources in Yale collections. P. Bertucci

HSHM 468b/HIST 260Jb, Sex, Life, and Generation Theories and practices of life, sex, and generation in Western civilization. Politics and policies of conception and birth; social control of abortion and infanticide in premodern societies; theories of life and gender; the changing status of the embryo; the lure of artificial life. I. Dal Prete

HSHM 471a or b, Directed Reading Readings directed by members of the faculty on topics in the history of science, medicine, or public health not covered by regular course offerings. Subjects depend on the interests of students and faculty. Weekly conferences; required papers. Staff

HSHM 473b/HIST 403Jb, Vaccination in Historical Perspective For over two centuries, vaccination has been a prominent, effective, and at times controversial component of public health activities in the United States and around the world. Despite the novelty of many aspects of contemporary vaccines and vaccination programs, they reflect a rich and often contested history that combines questions of science, medicine, public health, global health, economics, law, and ethics, among other topics. This course examines the history of vaccines and vaccination programs, with a particular focus on the twentieth and twenty-first centuries and on the historical roots of contemporary issues in U.S. and global vaccination policy. Students gain a thorough, historically grounded understanding of the scope and design of vaccination efforts, past and present, and the interconnected social, cultural, and political issues that vaccination has raised throughout its history and continues to raise today. J.L. Schwartz

HSHM 475b/HIST 128Jb, Race and Disease in American Medicine An exploration of the history of race and disease in American medicine from the late nineteenth century to the present, focusing on clinical practice and clinical research. We discuss cancer, psychiatric disease, sickle cell disease, and infectious diseases including tuberculosis and HIV. We examine the role of race in the construction of disease and the role of disease in generating and supporting racial hierarchies, with special attention to the role of visibility and the visual in these processes. We also consider the history of race and clinical research, and the implications of racialized disease construction for the production of medical knowledge. S. Abedin

HSHM 479b/EVST 368b/HIST 491Jb/RLST 368b, The History of the Earth from Noah to Darwin Young earth creationism and flood geology have long been among the most divisive features of American culture and politics. Yet a basic postulate is shared across the spectrum: for better or worse, the old age of the Earth is regarded as the recent product of a secular science, consistently rejected by traditional Christianity. This seminar challenges this long-established narrative by uncovering the surprising boldness, complexity, and societal diffusion of premodern debates on the history of the Earth, and of humankind itself. Students have opportunity to explore the nature, assumptions, and methods of Earth sciences before the advent of modern geology, to question ingrained assumptions about their relation to religion and society, and to place outstanding issues into historical perspective. How have the great monotheistic religions dealt with the

possibility of an ancient Earth? Was a young creation always important in traditional Christianity? If not, what led to the emergence of young Earth creationism as a force to be reckoned with? What are the intellectual roots of American preadamism, which claims that the black and white races were created at different times and do not descend from the same ancestor? These and other questions are addressed not only through scholarly literature in the field, but also with the analysis of literary, visual, and material sources available on campus. I. Dal Prete

HSHM 481a/AFAM 213a/HIST 383Ja, Medicine and Race in the Slave Trade Examination of the interconnected histories of medicine and race in the slave trade. Topics include the medical geography of the slave trade from slave prisons in West Africa to slave ships; slave trade drugs and forced drug consumption; mental and physical illnesses and their treatments; gender and the body; British and West African medicine and medical knowledge in the slave trade; eighteenth-century theories of racial difference and disease; medical violence and medical ethics. C. Roberts

HSHM 656a/HIST 949a/HSAR 832a, Photography and the Sciences Does photography belong in the history of art, or does its status as an "automatic" or "scientific" recording technique and its many uses in the sciences distinguish its history from that of earlier visual media? How does photography look when we approach it from the cultural history of science? How might its role in the sciences have shaped photographic aesthetics in the arts? This course examines the making of photography's discursive identity as an experimental and evidentiary medium in the sciences, from its announcement to the public in 1839 to the digital innovations of the present day. We take a historical and archival perspective on uses for (and debates over) photography in different fields of the natural and human sciences, grounded in visits to photographic collections at Yale. C. Ramalingam

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

HSHM 701a/AMST 878a/HIST 930a, Problems in the History of Medicine and Public Health 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. J.H. Warner

HSHM 702b/HIST 931b, Problems in the History of Science Close study of recent secondary literature in the history of the physical and life sciences. An inclusive overview of the emergence and diversity of scientific ways of knowing, major scientific theories and methods, and the role of science in politics, capitalism, war, and everyday life. Discussions focus on historians' different analytic and interpretive approaches. D. Coen

HSHM 710b/HIST 921b, Problems in Science Studies 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. J. Radin

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

HSHM 719a/HIST 917a, Natural History in History The changing meaning of natural history, from antiquity to the nineteenth century. Topics include technologies and epistemologies of representation, the commodification of natural specimens and bioprospecting, politics of collecting and displaying, colonial science and indigenous knowledge, the emergence of ethnography and anthropology. Students work on primary sources in Yale collections. P. Bertucci

HSHM 736b/HIST 943b/WGSS 730b, Health Politics, Body Politics A reading seminar on struggles to control, pathologize, and normalize human bodies, with a particular focus on science, medicine, and the state, both in North America and in a broader global health context. Topics include disease, race, and politics; repression and regulation of birth control; the politics of adoption; domestic and global population control; feminist health movements; and the pathologizing and identity politics of disabled people. N. Rogers

HSHM 744b/AMST 839b/HIST 743b, Readings in Environmental History Readings and discussion of key works in environmental history. The course explores major forces shaping human-environment relationships, such as markets, politics, and ecological dynamics, and compares different approaches to writing about social and environmental change. P. Sabin

HSHM 749b/HIST 925b, Visual and Material Cultures of Science The seminar discusses recent works that address the visual and material cultures of science. Visits to Yale collections, with a particular emphasis on the History of Science and Technology Division of the Peabody Museum. Students may take the course as a reading or research seminar. P. Bertucci

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

HSHM 916a/HIST 920a, Advanced Research in History of Science and Medicine This course explores the role of travel in the making of scientific knowledge from the Renaissance to the Enlightenment. It focuses on museums and cabinets of curiosities; voyages of explorations and scientific journeys; correspondence networks, espionage, and colonialism; scientific imagery and fictional travels. D. Coen

The Section of the History of Medicine is a freestanding unit in the School of Medicine engaged with research and teaching in the history of medicine, the life sciences, and public health. In addition to instruction for medical students, including mentoring M.D. theses, the faculty collaborates with colleagues in the History Department and the Program in the History of Science and Medicine, which offers graduate programs leading to the M.A., Ph.D., and combined M.D./Ph.D. degrees and an undergraduate major in the History of Science/History of Medicine. The Section contributes to the Program's colloquia and Distinguished Annual Lectures, workshops, and symposia in medical history. Through research and teaching, the faculty seeks to understand medical ideas, practices, and institutions in their broad social and cultural contexts, and to provide intellectual tools to engage with the challenges faced by contemporary medicine.

IMMUNOBIOLOGY

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Professors J.R. Bender (*Medicine*), M.W. Bosenberg (*Dermatology*), A.L. Bothwell, H. Bottomly (*Emeritus*), L. Chen, T.H. Chi (*Adjunct*), J.E. Craft (*Medicine*), P. Cresswell, V.D. Dixit (*Comparative Medicine*), R.A. Flavell, D. Hafler (*Neurology*), K. Herold, A. Iwasaki, S. Kaech (*Adjunct*), P.B. Kavathas (*Laboratory Medicine*), R.M. Medzhitov, J.S. Pober, C.R. Roy (*Microbial Pathogenesis*), D.G. Schatz (*Chair*)

Associate Professors S.C. Eisenbarth (*Laboratory Medicine*), A.M. Haberman, S.H. Kleinstein (*Pathology*), M.A. Kriegel (*Adjunct*), J. MacMicking (*Microbial Pathogenesis*), E.R. Meffre, K.C. O'Connor (*Neurology*), J.P. Pereira, C.V. Rothlin

Assistant Professors E.F. Foxman (*Laboratory Medicine*), N. Joshi, H. Li (*Adjunct*), C. Lucas, N. Palm, A. Ring, C. Wilen (*Laboratory Medicine*)

Research Scientists E.E. Eynon, T.D. Manes, A.F. Nassar

Associate Research Scientists N. Arshad, W. Chae, H. Chen, Y. Chen, X. Han, A. Jayakumar, X. Jiang, E. Kaffe, N.C. Kirkiles-Smith, E.B. Kopp, Y. Li, A. Matthews, E. Roulis, J. Rui, F. Santori, H. Saribasak, D. Sengupta, R.B. Seth, M. Taura, Z. Tobiasova, M. Tokuyama, J. Wang, H. Yu, T. Zhang, Y. Zhang, L. Zheng, X. Zhou, G. Zhu

For a complete listing of immunology-related courses, see http://bbs.yale.edu.

IBIO 503b, Responsible Conduct of Research, Refresher Course 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 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. E.R. Meffre and staff

IBIO 531b, Advanced Immunology 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. N. Palm

[**IBIO 532b, Inflammation** This course covers fundamentals of inflammation from a broad biological perspective, with a focus on both physiological and pathological aspects of inflammation.]

[**IBIO 536a, Advanced Immunology Seminar: Neuroimmunology** 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** 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 538a, Immunobiology Seminar: Cancer Immunology This seminar covers principles of cancer immunology and the role of immunotherapy in oncology. Emphasis is placed on understanding mechanisms of disease and therapeutic interventions. Prerequisite: IBIO 531 or a similar course that provides a solid foundation in fundamental immunology. Enrollment limited to twenty-two; preference given to Immunobiology students taking the course as a degree requirement. A. Ring, M.W. Bosenberg, N. Joshi

IBIO 539b, Immunobiology Seminar: Human Immunology This seminar covers principles of human diseases caused by defects in immune defenses (immunodeficiency) or self-tolerance (autoimmunity). Emphasis is placed on understanding mechanisms of disease and therapeutic interventions. Prerequisite: IBIO 531 or a similar course that provides a solid foundation in fundamental immunology; may be waived for highly motivated students. C. Lucas, K. Herold, E.R. Meffre

[**IBIO 540a, Translational Immunobiology** This course is designed to introduce immunobiology Ph.D. students to translational research and medicine. The course is arranged in modules, each of which focuses on a specific disease with a conspicuous immunological component. Each module consists of (1) didactic sections: covering disease phenotype, underlying immunobiology and pathology, and mechanisms of treatment approaches including their limitations; (2) patient contact: the view of the disease from the patient's perspective including symptoms and treatment options; and (3) clinical section: taking place in the hospital environment, where students are exposed to disease management approaches. The combination of medical knowledge and personal interaction with patients and their physicians provides a new perspective to immunobiology Ph.D. students that will broaden their basic science training and enable them to work more confidently at the interface of research and medicine and facilitate collaborations with clinical investigators. Enrollment limited to twenty-five. Prerequisites: IBIO 530 and 531.]

IBIO 600a, Introduction to Research: Faculty Research Presentations Introduction to the research interests of the faculty. Required of all first-year Immunology/BBS students. Pass/Fail. C.V. Rothlin

IBIO 601b/CB&B 601b, Fundamentals of Research: Responsible Conduct of Research 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. Staff

IBIO 611a, Research Rotation 1 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. C.V. Rothlin

IBIO 612b, Research Rotation 2 See description under IBIO 611a. C.V. Rothlin

IBIO 613b, Research Rotation 3 See description under IBIO 611a. C.V. Rothlin

INTERNAL MEDICINE

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Professors C. Abraham, H.G. Allore, R.J. Alpern, F. Altice, P.S. Aronson, P.W. Askenase, H. Aslanian, L. Bastian, W.P. Batsford (*Emeritus*), A. Baumbach (*Adjunct*), J.R. Bender, F.J. Bia (*Emeritus*), M.J. Bia (*Emerita*), H.J. Binder (*Emeritus*), L.K. Bockenstedt, J.L. Boyer, A.E. Broadus (*Emeritus*), R. Bucala, L.M. Buckley, M.M. Burg, B.A. Burtness, H.S. Cabin, L.G. Cantley, L. Chen (*Immunobiology*), G.L. Chupp, M.W. Cleman, G.W. Cline, L.S. Cohen (*Emeritus*), D.L. Coleman (*Emeritus*), J.P. Concato, L.M. Cooney, J.E. Craft, S.T. Crowley, L. Dembry, G.V. Desir (*Chair*), V.T. DeVita, M.A. Drickamer (*Emeritus*), T.P. Duffy (*Emeritus*), J.D. Dziura (*Emergency Medicine*), J.P. Eder, A. Eichmann, J.A. Elias (*Emeritus*), J.J. Farrell, D.G. Federman, D.A. Fiellin, E. Fikrig, R.L. Fisher, R.N. Formica, J.N. Forrest, A.H. Fortin, F.M. Foss, L. Fraenkel (*Adjunct*), T.R. Fried, G. Friedland (*Emeritus*), C.S. Fuchs, G. Garcia-Tsao, R.H. Gifford (*Emeritus*), T.M. Gill, J.A. Goffinet (*Emeritus*), S.D. Gore, F. Gorelick, M.L. Green, C.P. Gross, R.J. Groszmann (*Emeritus*), S.G. Haskell, R. Herbst, K. Herold, K.K. Hirschi, R.I. Horwitz (*Emeritus*), J.S. Hughes, S.J. Huot, J. Hwa, K.L. Insogna, S.E. Inzucchi, C. Jaffe (*Emeritus*), D. Jain (*Pathology*), P.A. Jamidar, E.A. Jonas, A.C. Justice, N. Kaminski, F.S. Kantor (*Emeritus*), C.R. Kapadia (*Emeritus*), B. Kazmierczak, W.N. Kernan, H. Kim (*Radiology & Biomedical Imaging*), H. Kluger, A.I. Ko (*Public Health*), M.J. Kozal, H.M. Krumholz, M. Kryger, J. Lacy, L. Laine, R.J. Lampert, M. Landry (*Laboratory Medicine*), A.J. Lansky, F.A. Lee, P. Lee (*Adjunct*), R.J. Levine (*Emeritus*), R.C. Lilenbaum, J.K. Lim, X. Llor, P. LoRusso, M.J. Mamula, A. Mani, R.A. Marottoli, J.C. Marsh (*Emeritus*), R.A. Matthay (*Emeritus*), W. Mehal, P.K. Mistry, V. Mohsenin, R.R. Montgomery, M.H. Nathanson, P.G. O'Connor, C.R. Parikh (*Adjunct*), A.J. Peixoto, M.A. Perazella, K.F. Petersen, D. Petrylak, P.A. Preisig, D.D. Proctor, L. Pusztai, V.J. Quagliarello, A. Rastegar, C. Redlich, D.L. Rimm (*Pathology*), H.M. Rinder (*Laboratory Medicine*), M.E. Robert (*Pathology*), J.D. Roberts, C. Rochester, M.G. Rose, S.H. Rosenbaum (*Anesthesiology*), L.E. Rosenfeld, M.B. Russi, M.M. Sadeghi, R. Safirstein, M. Schilsky, M.A. Schwartz, L. Scoutt (*Radiology & Biomedical Imaging*), W.C. Sessa (*Pharmacology*), A.C. Shaw, R.S. Sherwin (*Emeritus*), G.I. Shulman, M.D. Siegel, M. Simons, A.J. Sinusas, B.R. Smith (*Laboratory Medicine*), A. Sofair, S. Somlo, R. Soufer, M. Strazzabosco, B. Sumpio (*Surgery*), R. Sutton, M. Sznol, L. Tanoue, M.E. Tinetti, P. Varkey, E. Velazquez, R.J. Vender, F.S. Wright, B. Wu, J.J. Wysolmerski, L.H. Young, B.L. Zaret (*Emeritus*)

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Associate Research Scientists A. Abulizi, O. Akide Ndunge, M. Amenduni, G. Arora, M. Aslan, K. Balestracci, K. Blenman, K. Blount, V. Boddupalli, S. Brown, Y. Cai, M. Canavan, R. Chen, Y. Chuang, B.G. Coon, A. Coppi, F. Corti, D. Costello, V. Donempudi, J. Dong, K. Dong, X. Du, S. Dufour, M. Duval, M. Embacher, C. Fernandes, A. Gallagher, R. Gao, E. Gonzalo Gil, K. Gordon, V. Gunasekharan, X. Guo, A. Gupta, E. Habtemichael, A. Hajduk, D.A. Hakim, H. Harshvardhan, J. Hens, J. Hillion, Y. Hu, C. Huang, Y. Huang, J. Jeong, Z. Jiang, V. Kakade, S. Krishnan, A. Kumar, H. Lee, J. Lee, P.P. Licznerski, C. Linares, S. Liu, Y. Lu, G. Lynn, X. Ma, J. Madera, M. Marczyk, A. Marlier, J. Martinez, K. Minges, N. Mnatsakanyan, S. Mohanty, S. Nair, J. Nouws, N. Olivares Strank, L. Qin, V. Ramgolam, M. Riaz, N. Ricard, M. Rodrigues, J.M. Rozanova, J. Ruan, Y. Saito, A. Seth, M. Shin, A. Shojaee, M.H. Stowe, B. Sun, H. Sun, S. Sutton, N. Tai, K. Tanaka, R. Taoutel, T. Tebaldi, R. Thomson, X. Tian, L. Wallace, F. Warner, Y. Xie, N. Xylourgidis, M. Yang, T. Yarovinsky, C. Yoon, S. Youn, A. Zelenev, D. Zhang, F. Zhang, X. Zhang, Y. Zhang

Clinical Professors J. Borak, C. McPherson, D.N. Podell

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Lecturers D. Acampora, R. Ahmadi, K. Bober-Sorcinelli, L.F. Cantley, L. Fay, J. Ferholt, A. Flitcraft, B. Green, P. Greif, K. Hampapur, T. Hartenstein, S. Holland, A.H. Jafri, J. Kenkare, R.C. Klein, R. Linden, R.I. Lovins, R.R. Mahali, M. McDaniel, C. Morren, R. Nadkarni, A. Papsun (*Psychiatry*), S. Pryor, S. Punekar, I. Rojkovskiy, S. Saffo, I. Schiopescu, G. Singh, M. Slade, R. Smith, L. Street, D. Viveiros, Y. Wang, S. Williams

Clerkships

Biopsychosocial Approach to the Patient Clerkship This twelve-week integrated clerkship comprises a six-week rotation in primary care and a six-week rotation in psychiatry. During the six-week primary care component, students spend 5–6 half-days each week working in a practice for adult primary care (i.e., general internal medicine, family medicine, or combined medicine/pediatrics) and 2–3 half-days each week working in a practice for general pediatrics. The psychiatry component of the clerkship includes three weeks of inpatient psychiatry, three weeks of consultation-liaison or emergency psychiatry, and six half-day sessions in a longitudinal outpatient psychiatry or integrated primary care–psychiatry clinic. Primary care and psychiatry each have distinct classroom exercises. However, an integrated classroom curriculum brings students together each Thursday afternoon to explore the many topics that overlap primary care and psychiatry, including mood disorders, anxiety disorders, substance abuse, somatic symptom disorder, and pain. Directors: P. Ellis, K.M. Wilkins; Associate Directors: A.M. Fenick, M. Goldenberg

Medical Approach to the Patient Clerkship This twelve-week integrated clerkship includes internal medicine (eight weeks) and neurology (four weeks) clinical components. Throughout the clerkship, students participate in integrated experiences that address the themes related to hospital-based care such as management of acute disease, diagnostic skills, transitions of care, quality improvement, and organ systems. Directors: D.B. DiCapua, D.W. Dunne; Associate Directors: J. Dewey, K. Gielissen

Electives

Allergy and Immunology Elective Students attend the Allergy & Immunology Clinic for adults at the Yale Allergy & Immunology Center in North Haven and the Allergy & Immunology Pediatric Clinic at Long Wharf. It is recommended that they attend the weekly Allergy and Clinical Immunology Seminar, followed by case discussions and Journal Club. They may also join in consultations with the Allergy & Immunology service

at Yale New Haven Hospital. Prerequisite: Immunobiology course. One or two students every two or four weeks. Director: C. Price

Analytical Clinical Cardiology Elective This rotation emphasizes a rigorous history and physical exam to develop a differential diagnosis to guide the care of patients in the hospital and clinic. Supplementary reading on topics arising from the management of the patients is an important component of the experience. Interested students should discuss their goals prior to the rotation. One student every two weeks. Director: J.E. Gage

Cardiology Elective The student participates in the daily activities of the inpatient cardiology consult service, including rounds, consultations, and conferences, and gains exposure to procedures such as cardiac catheterization, stress testing, echocardiography, nuclear imaging, and electrocardiography. The training experience emphasizes the physiologic basis for clinical manifestations and therapy of cardiovascular diseases. A collection of pertinent review articles is provided. Limited to one student at Yale New Haven Hospital every four weeks and one student at the VA Connecticut Healthcare System, West Haven, every two or four weeks. Directors: J. Brennan, C. Ionescu (YNHH); B.J. Malm (VAMC)

Cardiovascular Imaging Clinical Elective Working directly with the attending faculty, cardiology fellows, physician assistant, nurses, and imaging technologists within the imaging laboratories, students are involved with interviewing and examining patients referred for cardiac stress testing and learn about the appropriate use of multimodality cardiovascular imaging. They participate in the performance of both exercise and pharmacological stress imaging studies, as well as other targeted molecular imaging, and gain direct training and supervision in the performance and interpretation of these studies. In addition to the clinical training and exposure, students learn related cardiovascular physiology and gain exposure to other advanced imaging technology for the evaluation of cardiac and skeletal muscle perfusion and function in patients with suspected cardiovascular and peripheral vascular disease. Students also participate in weekly didactic conferences related to cardiovascular medicine and cardiovascular imaging. At times, customized electives may be designed with the program director in developing areas of cardiovascular imaging, and in cardiovascular research methodology. One student every two or four weeks. Director: A.J. Sinusas

Critical Care Elective Senior students participate in critical care medicine activities in the medical intensive care unit (MICU). The emphasis is on evaluation and acute management of respiratory failure, shock, and sepsis, and on the use of invasive monitoring. The physiological basis of disease and the rationale for therapeutic interventions are also emphasized. One student every two or four weeks. Director: A. Uzunpinar

Endocrinology Elective The student participates as an active member of the endocrine training program, making daily rounds with the endocrine fellows, residents, and attending physicians. The student works primarily on the inpatient consult service at Yale New Haven Hospital and has the opportunity to attend selected endocrine clinics at YNHH and the West Haven VA Medical Center. The student also participates in the regularly scheduled metabolism-endocrine conferences. Full-time. One student every two or four weeks. Director: S.E. Inzucchi

Gastroenterology Elective The student is an integral part of the inpatient GI consult service, working primarily in an inpatient setting. This is an opportunity to see a wide variety of gastrointestinal problems and patients, with discussion and review. Open to fourth-year students only. One or two students every two or four weeks. Directors: A. Masoud (two-week); A. Masoud, S.Jakab (four-week)

Geriatric Medicine Elective An introduction to the continuum of care for older adults. Students gain an understanding of the various geriatric syndromes that affect functions in the aging population and learn to identify basic geriatric syndromes such as memory loss, delirium, depression, falls, and polypharmacy. In addition, they are exposed to care planning, palliative care, and end-of-life care issues in a variety of settings, including hospital, subacute long-term care and outpatient sites, and system-wide consultation services. Prerequisite: Internal Medicine clerkships. One student every two or four weeks. Director: G.J. Kerins

Hematology Elective This elective provides intensive exposure to clinical hematology by direct participation in the activities of a regular clinical hematology service. Students work up new patients and consults in rotation with the fellows and residents, and attend outpatient clinics. Students participate in daily hematology ward rounds and bone marrow readings, and in weekly inpatient and outpatient clinical reviews and clinical research conferences. One student every two or four weeks. Director: A.I. Lee

Hepatology Elective The student is an integral part of the inpatient liver service, working primarily in an inpatient setting. This is an opportunity to see a wide variety of liver problems and patients, with discussion and review. Open to fourth-year students only. One or two students every two or four weeks. Director: S. Jakab

Infectious Disease Elective This elective offers a robust learning experience in general infectious diseases, including the diagnostic evaluation and management of common community-acquired and nosocomial infections in a diverse patient population, as well as infections in the immunocompromised patient. There are opportunities for learning in subspecialty areas such as medical microbiology, transplant ID, HIV/AIDS, hospital infection control, antimicrobial stewardship, and sexually transmitted diseases. Students participate as active members of the consultation and training program in infectious diseases at Yale New Haven Hospital and are expected to attend and participate in daily attending rounds, microbiology rounds four times a week, weekly clinical case conferences, and monthly journal clubs. Evaluations are based primarily on performance in clinical case presentations on the consult service. One student every two or four weeks. Director: O. Ogbuagu

Internal Medicine Ambulatory Elective (WEC) Director: P. Oray-Schrom

Medical Intensive Care Elective This elective provides an opportunity to participate in the acute management of common medical emergencies. Students are on call in the medical intensive care unit (MICU) at Yale New Haven Hospital every fourth day with an intern and resident pair, assisting them in the admission of patients. Students follow patients in the MICU, assist in their care with the intern and resident, and are expected to present during rounds. Although students are exposed to a variety of ICU-based

procedures, there are limited "hands-on" opportunities. Prerequisite: Internal Medicine Clerkship. No overnight responsibilities. One or two students every two or four weeks. Director: S. Honiden

Nephrology Elective This elective in clinical nephrology offers the student an opportunity for in-depth learning regarding problems in fluid and electrolyte disturbances, acute renal failure, chronic renal failure, and hypertension. Emphasis is placed on problem recognition, pathophysiologic diagnosis, evidence-based clinical judgment, and management based on pathophysiologic principles. The primary activity involves the inpatient consultation service in which the student works up and follows several patients per week and participates in daily rounds with the attending physicians, postdoctoral fellows, and residents on service. An introduction to hemodialysis, peritoneal dialysis, renal transplantation, and renal biopsy histology is also provided. One student every two or four weeks. Director: J. Turner

Occupational and Environmental Medicine Elective This rotation is designed to provide senior medical students (and PA and nursing students) with an introduction to the principles and practice of occupational and environmental medicine, including exposure, assessment, and evaluation of disease causality. Students learn how to evaluate workplace and environmental exposures and assess the contribution of such exposures to patients' diseases. In addition, students participate in ongoing didactic and research conferences and workplace surveillance programs, and they visit workplaces and other environmental sites that are being evaluated for their role in disease causation. Students are exposed to the varied opportunities for careers in this discipline. One student every two or four weeks. Directors: B. Linde, M. Pensa

Oncology Elective This is an advanced elective offered to students who have completed the third-year Internal Medicine Clerkship. It is designed to expose students to all aspects of clinical medical oncology by direct participation in the daily disease-specific outpatient oncology clinics at Yale Cancer Center. Working closely with the medical oncology fellows and attending physicians, students have the opportunity to work up patients with new cancer diagnoses and participate in the ongoing care of patients with diverse cancer diagnoses. Students participate as active members of the medical oncology training program, attending the regularly scheduled daily clinical conferences as well as weekly disease-specific multidisciplinary tumor boards and medical oncology fellow education conferences. Although the emphasis of the elective is on outpatient oncology in disease-specific units, students can also opt to work with the inpatient oncology team at Yale New Haven Hospital. Rotations at the VA Cancer Center can be arranged as well. Maximum of three students every two or four weeks. Director: S.M. Stein

Pulmonary Elective This elective is designed to provide students with an in-depth knowledge of respiratory diseases through consults on the patient care floors and through didactic sessions and directed reading. Students become an integral part of the pulmonary and critical care (PCCM) section consult service, working with the attending physician and PCCM fellow(s). From two to six new consults on average are seen daily. Students work closely with faculty and staff of the pulmonary group and participate in daily consulting and rounds. Students assist in the examination and treatment of

patients with various cardiopulmonary diseases, including tuberculosis, chronic obstructive airway disease, asthma, lung cancer, bacterial and fungal lung infection, and other diagnostic problems. They receive practical instruction in chest images and pulmonary function tests and their interpretation, and in clinical and laboratory methods used for diagnosis and management, including intensive respiratory care and respiratory therapy, and they have an opportunity to observe fiberoptic bronchoscopy. Weekly didactic lectures are given in a number of areas relating to airway pharmacology, lung cell biology, and lung immunology (respiratory cells, immunologic reactions, etc.). Students are expected to learn (1) the differential diagnosis and treatment of respiratory disorders, (2) how to interpret pulmonary function tests, and (3) how to read a chest radiograph and understand the essentials of a chest CT scan. One student every two or four weeks. Director: B. Clark

Re-Entry to Clinical Medicine Elective The goal of this elective is to reinforce students' clinical skills following their time away from clinical medicine. The emphasis is on history taking, physical examination skills, interpretation of data, morning presentations, medical terminology, patient communication, and coordination of care. Students are assigned to a team that consists of one intern, one resident, and one attending physician; or they may be assigned to a hospitalist team that consists of one attending physician and possibly a PA. Students are expected to perform at the clerkship level, performing admission history and physical exams, and following/presenting patients on daily rounds, with supervision. History, physical diagnosis, and laboratory interpretation skills are emphasized. One student every two or four weeks. Director: T.H. Taddei

Rheumatology Elective Students work closely with the faculty member and fellow assigned to the inpatient consultative service at both Yale New Haven Hospital and the West Haven VA Medical Center. They attend rounds and evaluate patients with rheumatic conditions and other diseases with rheumatic manifestations. In addition, they participate in outpatient clinics, including two arthritis clinics and two general rheumatology clinics, and attend two weekly conferences sponsored by the Section of Rheumatology. One student every two or four weeks. Director: J. Evans

Subinternships

Ambulatory Subinternship This one-year weekly outpatient subinternship in the adult Primary Care Center provides experience in the longitudinal care of Internal Medicine patients. Students are directly responsible for care of medical problems and preventive care as well as coordination of specialty care for their own patient panel. The clinic is held every Wednesday evening, 5:15–8:30 p.m., except the day before Thanksgiving and between Christmas and New Year's. Students are responsible for three patient visits/sessions. Weekly pre-clinic conferences begin at 4:45 and include journal club and primary care case-centered topics presented by students. The subinternship is open to a limited number of students who have completed at least half of their clerkships (M.D./Ph.D.) or all of their clerkships (M.D.). Students must have completed the Medical Approach to the Patient clerkship. Completion of the Biopsychosocial Approach to Health Clerkship (clerkship components—Primary Care and Psychiatry) is highly recommended. Director: P. Oray-Schrom

Internal Medicine Subinternship The subinternship offers students the opportunity to function in the role of an intern on an Internal Medicine inpatient team at Yale New Haven Hospital or West Haven VA Medical Center. Students join a team consisting of an upper-year medical resident and an attending physician and are responsible for admitting patients, writing admission and daily progress notes, presenting cases on rounds, communicating with consultants, ordering medications and tests, and serving as the front-line physician for patients admitted to the hospital. Students are responsible for managing approximately half the number of patients typically managed by an Internal Medicine intern. The subinternship offers an outstanding opportunity to prepare for internship, whether the student intends to pursue a career in Internal Medicine or another specialty. Prerequisites: third-year Internal Medicine clerkships. Four weeks. Director: M.D. Siegel

INVESTIGATIVE MEDICINE

2 Church Street South, Suite 114, 203.785.6842
https://medicine.yale.edu/investigativemedicine

Professors K.S. Anderson (*Pharmacology*), J.E. Craft (*Medicine*), J.D. Dziura (*Emergency Medicine*), D.A. Fiellin (*Medicine*), T.M. Gill (*Medicine*), F. Gorelick (*Medicine*), J.R. Gruen (*Pediatrics*), H.M. Krumholz (*Medicine*), C.R. Parikh (*Adjunct; Medicine*), G. Tellides (*Surgery*), M.E. Tinetti (*Medicine*)

Associate Professor L.S. Dugdale

IMED 625a, Principles of Clinical Research 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. Consent of instructor required. Two weeks, July 22–August 2, 2019. E.D. Shapiro

IMED 630a, Ethical Issues in Biomedical Research 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. L. Ferrante

IMED 635a or b, Directed Reading in Investigative Medicine 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. E.D. Shapiro

IMED 645a, Introduction to Biostatistics in Clinical Investigation 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. Consent of instructor required. Two weeks, July 8–19, 2019. V. Shabanova

IMED 655b, Writing Your Career Development (K-type) Grant 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. E.D. Shapiro

IMED 660a, Methods in Clinical Research, Part I 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. E.D. Shapiro

IMED 661a, Methods in Clinical Research, Part II 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. E.D. Shapiro

IMED 662b, Methods in Clinical Research, Part III 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. E.D. Shapiro

IMED 670b, Writing Your First Independent Investigator-Initiated (R-type) Grant 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. E.D. Shapiro

IMED 680b/B&BS 680b, Topics in Human Investigation 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. J.E. Craft

IMED 900a and 901b, Independent Research E.D. Shapiro

LABORATORY MEDICINE

PS 210, 203.688.2286
https://medicine.yale.edu/labmed

Professors A. Baumgarten (*Emeritus*), S.M. Campbell, S. Chang, R.K. Donabedian (*Emeritus*), J.G. Howe, S.D. Hudnall (*Pathology*), P.I. Jatlow (*Emeritus*), P.B. Kavathas, D.S. Krause, M. Landry, J.A. Longtine, P. McPhedran (*Emeritus*), H.M. Rinder, J.L. Sklar (*Pathology*), B.R. Smith (*Chair*), E.L. Snyder, G.E. Stack, P.J. Tattersall

Associate Professors T. Eid, S.C. Eisenbarth, A.M. Haberman (*Immunobiology*), J. Hendrickson, R.R. Montgomery (*Medicine*), I. Nash, C. Tormey, Z. Walther (*Pathology*), M. Xu (*Pathology*)

Assistant Professors A. Bersenev, L.M. Bow (*Surgery*), J.M. El-Khoury, A. Finkelstein (*Pathology*), E.F. Foxman, E. Gehrie (*Adjunct*), A. Gokhale (*Adjunct*), R. Harb (*Adjunct*), R.G. Hauser, D.R. Peaper, H. Sanchez (*Pathology*), W. Schulz, A. Siddon, R. Torres, C. Wilen, A.J. Williams (*Adjunct*)

Instructor B. Bahar

Senior Research Scientists G. Anderson (*Child Study Center*), X. Zhu

Research Scientists L. Devine, P. Gu, R. Rai

Associate Research Scientists Y. Lu, I.S. Mihaylov, E.M. Olson, G. Uthaman, P. Zhang

Lecturers P.E. Marone, R.L. Ross, L. Stump, C.J. Torre

Electives

Anatomic Pathology and Laboratory Medicine Combined Elective The goals for anatomic pathology are to understand the basic principles of diagnostic anatomic pathology and its role in clinical medicine. The goals for laboratory medicine are to learn appropriate usage and interpretation of laboratory tests and to gain a better understanding of the theoretical, technological, and clinical underpinnings of laboratory medicine. This elective is appropriate for students considering a career in laboratory medicine and/or pathology, and for all students who will use laboratory and pathology tests in their careers. One or two students every four weeks. Director: A. Adeniran

Laboratory Medicine Clinical Elective This elective offers rotations through the clinical laboratories, including Blood Bank, Therapeutic Apheresis, Clinical Chemistry, Toxicology, Hematology and Coagulation, Flow Cytometry, Immunology, Molecular Diagnostics, Microbiology, and Virology. Students work closely with residents, fellows, attending physicians, and laboratory staff; work up clinical cases under supervision; and attend morning report, case conference, journal club, clinical rounds, and didactic sessions. Students also have the opportunity to work with the resident on call for at least one weekend day during the elective. Students can rotate through all laboratories or focus on specific laboratories of interest. The goals of the elective are to learn appropriate usage and interpretation of laboratory tests, and to gain a better understanding of the theoretical and

clinical underpinnings of laboratory medicine. This elective is appropriate for students considering a career in laboratory medicine or combined laboratory medicine and pathology, but also for all students who will use clinical laboratory testing in their careers. One or two students every two or four weeks. Director: M. Landry

Laboratory Medicine Sessions The purpose of the Laboratory Medicine Sessions is to introduce third-year medical students and PA students to basic concepts of laboratory diagnosis. On the first afternoon of their Internal Medicine clerkship at Yale New Haven Hospital, students rotate through four laboratories—Chemistry, Hematology, Blood Bank, and Microbiology/Virology—where faculty demonstrate principles of laboratory medicine using clinical case materials. Different test methods and clinical cases are presented. M. Landry and associates

MICROBIAL PATHOGENESIS

BCMM 336E, 203.737.2404
https://medicine.yale.edu/micropath

Professors M. Cappello (*Pediatrics*), E. Fikrig (*Medicine*), J.E. Galán (*Chair*), E. Groisman, B.I. Kazmierczak (*Medicine*), W.H. Mothes, C.R. Roy, R. Sutton (*Medicine*)

Associate Professors C. Ben Mamoun (*Medicine*), C.S. Dela Cruz (*Medicine*), A. Goodman, R.M. Johnson (*Medicine*), P. Kumar (*Medicine*), B.D. Lindenbach, J. Liu, J.D. MacMicking

Assistant Professors Y. Ho, H. Rego

Research Scientist M. Lara-Tejero

Associate Research Scientists C.C. Butan, D. Chetrit, J. Choi, E. Crabill, T. Geiger, E. Guo, B. Kim, P. Kumar, W. Li, A. Meir Ben Efraim, A. Pal, E. Park, H.N. Ramanathan, H. Salvail, S. Steiner, Y. Takeo, P.D. Uchil, S. Zhang, D. Zheng

The following courses in the Graduate School of Arts and Sciences are open to medical students with permission of the DGS.

MBIO 530a/IBIO 530a/MCDB 530a, Biology of the Immune System 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. E.R. Meffre and staff

MBIO 601b, Fundamentals of Research: Responsible Conduct of Research 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. Staff

MBIO 670a, 671b, 672b, Laboratory Rotations Rotation in three laboratories. Required of all first-year graduate students. W.H. Mothes

MBIO 680b/EMD 680b, Molecular and Cellular Processes of Parasitic Eukaryotes 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. C. Tschudi

MBIO 685b, The Biology of Bacterial Pathogens II 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. A. Goodman

MBIO 686a, The Biology of Bacterial Pathogens I 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. E. Groisman

[**MBIO 700b, Seminal Papers on the Foundations of Modern Microbiology** A required course for Microbiology first- and second-year students; not for credit. The course is offered every other year, alternating with MBIO 703/704, 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.]

MBIO 701a and 702b, Research in Progress 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. W.H. Mothes

MBIO 703a and 704b, Microbiology Seminar Series 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. W.H. Mothes

MBIO 705b, Evasion of Host Defense by Viruses, Bacteria, and Eukaryotic Parasites The course, in student seminar format, is required of all first- and second-year Microbiology graduate students. Subjects include strategies employed by viruses, bacteria, or eukaryotic parasites to evade either cell intrinsic defenses, such as programmed cell death or innate immune sensing, or responses operating at the level of the organism, such as the adaptive immune response. Staff

MBIO 734b/GENE 734b/MB&B 734b, Molecular Biology of Animal Viruses Lecture course with emphasis on mechanisms of viral replication, oncogenic transformation, and virus-host cell interactions. B.D. Lindenbach, D.C. DiMaio

MOLECULAR BIOPHYSICS AND BIOCHEMISTRY

336 Bass, 203.432.5662; SHM C106, 203.785.4935
https://mbb.yale.edu

Professors K.S. Anderson (*Pharmacology*), S.J. Baserga, S. Chang (*Laboratory Medicine*), E.M. De La Cruz, D.C. DiMaio (*Genetics*), D.M. Engelman, A. Garen, M.B. Gerstein, N.F. Grindley (*Emeritus*), M.W. Hochstrasser (*Chair*), J. Howard, M.R. Koelle, A.J. Koleske, W.H. Konigsberg, M. Lemmon (*Pharmacology*), P. Lengyel (*Emeritus*), I.G. Miller (*Pediatrics*), A.D. Miranker, K. Neugebauer, L.J. Regan (*Emeritus*), K.M. Reinisch (*Cell Biology*), D.G. Schatz (*Immunobiology*), R.G. Shulman (*Emeritus*), F.J. Sigworth (*Cellular & Molecular Physiology*), D.G. Söll, M.J. Solomon, J.A. Steitz, S.A. Strobel, K.R. Williams, C. Zimmer (*Adjunct*)

Associate Professors T.J. Boggon (*Pharmacology*), W.V. Gilbert, E. Karatekin (*Cellular & Molecular Physiology*), C. Schlieker, M. Simon, C.V. Sindelar, S. Takyar (*Medicine*), Y. Xiong

Assistant Professors J. Berro, N. Malvankar, C. Paulsen, K. Zhang

Research Scientists W. Cao, E.J. Folta-Stogniew, T.T. Lam, J.S. Rozowsky, K. Tycowski, J. Wang, S. Wu (*Pharmacology*)

Associate Research Scientists A. Alexandrov, J. Berk, V. Botti, F. Cassarotti Parronchi Navarro, J. Deacon, P. Emani, D.A. Hiller, R. Jain, S. Kumar, S. Liu, I. Lomakin, S. Lou, R. Ma, M. Machyna, S. Melnikov, A. Olson, R. Park, A. Sachpatzidis, S. Tausta, P. Tsai, G. Wang, J. Warrell, R.S. Wilson, S. Yalcin, R. Yang, J. Zhang, Y. Zuo

Lecturer A.B. Pawashe

MB&B 500a/MCDB 500a, Biochemistry 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. R.R. Breaker, D.M. Engelman

MB&B 517b/ENAS 517b/MCDB 517b/PHYS 517b, Methods and Logic in Interdisciplinary Research This half-term PEB class is intended to introduce students to integrated approaches to research. Each week, the first of two sessions is student-led, while the second session is led by faculty with complementary expertise and discusses papers that use different approaches to the same topic (for example, physical and biological or experiment and theory). Counts as 0.5 credit toward graduate course requirements. C. O'Hern

MB&B 520a, Boot Camp Biology 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. C. O'Hern

MB&B 523b/CB&B 523b/ENAS 541b/PHYS 523b, Biological Physics 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. B. Machta

MB&B 562b/AMTH 765b/CB&B 562b/ENAS 561b/INP 562b/MCDB 562b/PHYS 562b, Modeling Biological Systems II This course covers advanced topics in computational biology. How do cells compute, how do they count and tell time, how do they oscillate and generate spatial patterns? Topics include time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form; mechanics of cell shape and motion; spatially heterogeneous processes; diffusion. This year, the course spends roughly half its time on mechanical systems at the cellular and tissue level, and half on models of neurons and neural systems in computational neuroscience. Prerequisite: a 200-level biology course or permission of the instructor. T. Emonet, D. Clark, J. Howard

MB&B 591a/ENAS 991a/MCDB 591a/PHYS 991a, Integrated Workshop This required course for students in the PEB graduate program involves a series of modules, co-taught by faculty, in which students from different academic backgrounds and research skills collaborate on projects at the interface of physics, engineering, and biology. The modules cover a broad range of PEB research areas and skills. The course starts with an introduction to MATLAB, which is used throughout the course for analysis, simulations, and modeling. C. O'Hern

MB&B 600a, Principles of Biochemistry I 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. M. Simon, M.R. Koelle, C. Paulsen

MB&B 601b, Principles of Biochemistry II 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. C. Schlieker, J.A. Steitz

MB&B 602a/CBIO 602a/MCDB 602a, Molecular Cell Biology 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). T. Melia, D. Breslow, C.G. Burd, M.J. Caplan, V. Horsley, M. King, C.P. Lusk, T.D. Pollard, J.E. Rothman, M.A. Schwartz, J. van Wolfswinkel

MB&B 625a/GENE 625a/MCDB 625a, Basic Concepts of Genetic Analysis 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. J. Lu

MB&B 630b/MCDB 630b, Biochemical and Biophysical Approaches in Molecular and Cellular Biology This course introduces the theory and application of biochemical and biophysical methods to study the structure and function of biological macromolecules. The course considers the basic physical chemistry required in cellular and molecular biology but does not require a previous course in physical chemistry. One class per week is a lecture introducing a topic. The second class is a discussion of one or two research papers utilizing those methods. Does not count for graduate course credit for BQBS graduate students. T.D. Pollard, K.S. Anderson, T.J. Boggon, K.M. Reinisch, F.J. Sigworth

MB&B 635a/ENAS 518a, Quantitative Approaches in Biophysics and Biochemistry 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 600a or equivalents, or permission of the instructors. J. Berro, N. Malvankar, Y. Xiong

MB&B 650a and 651b, Lab Rotation for BQBS First-Year Students Required of all first-year BQBS graduate students. Credit for full year only. K. Neugebauer

MB&B 675a, Seminar for First-Year Students Required of all first-year BQBS graduate students. K. Neugebauer, K.S. Anderson

MB&B 676b, Responsible Conduct of Research Designed for students who are beginning to do scientific research. The course seeks to describe some of the basic features of life in contemporary research and some of the personal and professional issues that researchers encounter in their work. Approximately six sessions, run in a seminar/discussion format. Required of all first-year BQBS graduate students. S.J. Baserga, D.C. DiMaio, D.M. Engelman, M.R. Koelle, A.D. Miranker, D.G. Schatz, M. Simon, S.A. Strobel, Y. Xiong

MB&B 710b/C&MP 710b, Electron Cryo-Microscopy for Protein Structure Determination 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. Counts as 0.5 credit. C.V. Sindelar, F.J. Sigworth

MB&B 711/C&MP 711, Practical cryo-EM Workshop This laboratory course provides hands-on training in the practical aspects of macromolecular structure determination by cryo-electron microscopy (cryo-EM). Topics include cryo-EM data collection, image preparation and correction, single-particle picking and 2-D classification, 3-D classification, refinement and post-processing, model building, refinement and evaluation. The course includes training in the use of computer programs used to perform these calculations. Prerequisite: MB&B 710/C&MP 710. Y. Xiong, F.J. Sigworth, C.V. Sindelar, K. Zhang

MB&B 720a, Macromolecular Structure and Biophysical Analysis 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. Y. Xiong, S.J. Baserga, J. Howard, N. Malvankar, K. Zhang

MB&B 725b, Cryo-Electron Microscopy and X-ray Crystallography for Macromolecular Structure A rigorous introduction to the principles of X-ray crystallography and electron microscopy of cryogenic specimens (cryo-EM). The course is intended for students who are planning to carry out structural studies using these techniques, or who wish to obtain in-depth knowledge for critical analysis of published structures. F.J. Sigworth

MB&B 730a, Methods and Logic in Molecular Biology 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. M.J. Solomon, S. Holley, A.J. Koleske, C. Schlieker, M. Simon

MB&B 734b/GENE 734b/MBIO 734b, Molecular Biology of Animal Viruses Lecture course with emphasis on mechanisms of viral replication, oncogenic transformation, and virus-host cell interactions. B.D. Lindenbach, D.C. DiMaio

MB&B 743b/GENE 743b/MCDB 743b, Advanced Eukaryotic Molecular Biology 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. M.W. Hochstrasser, K. Neugebauer, M. Simon

MB&B 749a/GENE 749a, Medical Impact of Basic Science 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. May not be taken by MB&B B.S./MS. students for graduate course credit. J.A. Steitz, S. Chang, I.G. Miller, K. Neugebauer, D.G. Schatz, S. Takyar

[**MB&B 750b, Biological Membranes** 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 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. M.B. Gerstein, M. Simon

MB&B 753b, Biomedical Data Science: Mining 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 752b 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. M.B. Gerstein, M. Simon

MB&B 754b, Biomedical Data Science: Modeling 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 752b 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. M.B. Gerstein, M. Simon

[**MB&B 760a, Principles of Macromolecular Crystallography** 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.]

MB&B 800a, Advanced Topics in Molecular Medicine 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). S.J. Baserga, W.H. Konigsberg

MB&B 900a or 901b, Reading Course in Biophysics 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 or 903b, Reading Course in Molecular Genetics 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 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.

NEUROLOGY

LCI 910, 203.737.1860
https://medicine.yale.edu/neurology

Professors T. Allison (*Emeritus*), J.M. Baehring, H. Blumenfeld, J. Booss (*Emeritus*), D.M. Greer (*Adjunct*), J. Grutzendler, D. Hafler (*Chair*), L.J. Hirsch, B. Jabbari (*Emeritus*), R.D. Kerns (*Psychiatry*), J.D. Kocsis, E.D. Louis, R.H. Mattson (*Emeritus*), L.R. Ment (*Pediatrics*), J.W. Prichard (*Emeritus*), P. Rakic (*Neuroscience*), B.A. Shaywitz (*Pediatrics*), S. Spudich, S.M. Strittmatter, F. Testa (*Pediatrics*), C.H. Van Dyck (*Psychiatry*), S.G. Waxman

Associate Professors H.H. Altalib, N. Bamford, W. Cafferty, S.S. Chandra, C. Cotsapas, R.K. Fulbright (*Radiology & Biomedical Imaging*), S. Ghosh, E.J. Gilmore, D.Y. Hwang, B. Khokhar, B.B. Koo, J.J. Moeller, D.S. Navaratnam, K.C. O'Connor, H.S. Patwa, O.C. Petroff, D. Pitt, L. Sansing, J. Schindler, K.N. Sheth, J.J. Sico, J. Thomas

Assistant Professors L.M. Airas (*Adjunct*), H. Amin, K. Becker, V. Benitez (*Pediatrics*), C. Benjamin, N. Blondin, F.C. Brown, Z.A. Corbin, J. Dearborn-Tomazos (*Adjunct*), K.V. Desai, K. Destefano, K. Detyniecki (*Adjunct*), J. Dewey, M. Dhakar (*Adjunct*), D. DiCapua, M. Dominguez-Villar (*Adjunct*), G. Falcone, P. Farooque, A.A. Fisayo, P. Fu, P. Gopal (*Pathology*), C.H. Gottschalk, A. Herlopian, C. Ionita (*Pediatrics*), A.S. Jasne, B. Keung, V. Knight (*Pediatrics*), A.A. Kohli (*Ophthalmology & Visual Science*), D. Kuruvilla, C.D. Litchman, P. Lleva, E. Longbrake, C. Loomis, C.B. Maciel (*Adjunct*), N. Makhani (*Pediatrics*), D. Matuskey (*Radiology & Biomedical Imaging*), K.A. McVicar (*Pediatrics*), A. Meyer (*Adjunct*), J. Morris, R. Narula, S. Novella, R. Nowak, A. Patel, N.H. Petersen, I.H. Quraishi, B. Roy, A. Rusk, A. Salardini, S. Sanamandra, S. Schaefer, E. Sharp, Z.B. Sheikh (*Adjunct*), A. Sivaraju, S. Stoll, S. Tinaz, H. Tokuno, B. Tolchin, S. Towns, B. Tseng, N. Tzikas, D.C. Volpe, S. Wesley, H.P. Zaveri

Instructors C.I. Carrion, S. Farhadian (*Medicine*), A. Fesharaki-Zadeh (*Psychiatry*), C. Kim, M. Lincoln

Senior Research Scientist S.D. Dib-Hajj

Research Scientist J. Bai

Associate Research Scientists M. Estacion, C. Gomis Perez, R. Gunasekara, E.C. Gunther, N.C. Hernandez, J. Huang, M.A. Kostylev, K. Lankford, S. Lee, M. Mitrovic, G.D. Ponath, K. Raddassi, D. Sizova, T. Sumida, A.M. Szekely, H. Takahashi, A. Tan, B. Tanaka, L. Tong, X. Wang, S.A. Wilson, L. Zhang, P. Zhao

Clinical Professor S. Levy (*Pediatrics*)

Associate Clinical Professors N.S. Werdiger, R.S. Young (*Pediatrics*)

Assistant Clinical Professors R. Duckrow, D. Machado, D. Richardson, M. Rosen (*Orthopaedics & Rehabilitation*), M.J. Stransky

Lecturer L. Bandaru

Clerkship

Medical Approach to the Patient Clerkship This twelve-week integrated clerkship includes internal medicine (eight weeks) and neurology (four weeks) clinical components. Throughout the clerkship, students participate in integrated experiences that address the themes related to hospital-based care such as management of acute disease, diagnostic skills, transitions of care, quality improvement, and organ systems. Directors: D.B. DiCapua, D.W. Dunne; Codirectors: J. Dewey, K. Gielissen

Electives

Neurology Clinical Elective (Tailored) Students work directly with attending faculty, chief residents, and junior residents as well as other medical students, rotators, and support staff. A series of special didactic conferences on the most important topics in neurology are provided, and the student also participates in departmental conferences and seminars. An assessment of history taking, neurological examining skills, and problem assessment is performed by an attending faculty member with each student. At times, other customized electives may be designed with the program director in areas such as epilepsy, stroke, movement disorders, neuroimmunology, etc., as well as clinical neurophysiology and research methods. Prerequisite: completion of the neurology portion of Medical Approach to the Patient. One student every two weeks. Director: D.B. DiCapua

Neurology Consult Service Elective Under the supervision of the neurology consult resident and attending physician, students evaluate patients referred for neurologic consultation from other inpatient services at Yale New Haven Hospital. Students also participate in academic activities of the department. Open to fourth- and fifth-year students only. One student every four weeks. Director: D.B. DiCapua

Neurology Ward Service Elective Under appropriate supervision, students directly examine, diagnose, and manage patients on the neurology ward service at Yale New Haven Hospital; attend daily teaching rounds; and attend a series of special didactic conferences on the most important topics in neurology. Open to fourth- and fifth-year students only. One student every four weeks. Director: D.B. DiCapua

Subinternship

Neurology Subinternship This advanced elective offers students the opportunity to work at a higher level of independence and responsibility equivalent to that of an intern on the neurology ward service at Yale New Haven Hospital. Working with attending faculty, senior and junior residents, and support staff, students directly examine, diagnose, and manage patients and attend daily teaching rounds, special didactic conferences, and seminars on the most important topics in neurology. Students hone their ability to obtain an accurate neurological history, perform and interpret a neurological examination, recognize the appropriate indications for ordering laboratory studies, and interpret the results of these studies. The goal is for the student to recognize and understand less common neurological problems, including multiple sclerosis, Parkinson's disease and other movement disorders, neuromuscular diseases, dementia, central nervous system

infections, and tumors of the nervous system. At times, other customized subinternships may be designed with the program director in areas such as epilepsy, stroke, movement disorders, neuromuscular medicine, neuroimmunology, and neurocritical care. Prerequisite: completion of the neurology portion of Medical Approach to the Patient. One student every four weeks. Director: D.B. DiCapua

NEUROSCIENCE

SHM C303, 203.785.4323
https://medicine.yale.edu/neuroscience

Professors A.F. Arnsten, H. Blumenfeld (*Neurology*), M.C. Crair, P. De Camilli, S. Diano (*Obstetrics, Gynecology & Reproductive Sciences*), R.J. DiLeone (*Psychiatry*), R.S. Duman (*Psychiatry*), J.E. Gelernter (*Psychiatry*), C.A. Greer, J. Grutzendler (*Neurology*), M. Gunel (*Neurosurgery*), J. Hirsch (*Psychiatry*), T.L. Horvath (*Comparative Medicine*), E.A. Jonas (*Medicine*), J.D. Kocsis (*Neurology*), A.J. Koleske (*Molecular Biophysics & Biochemistry*), J.H. Krystal (*Psychiatry*), R.H. LaMotte (*Anesthesiology*), D. Lee, C. Leranth (*Obstetrics, Gynecology & Reproductive Sciences*), C. Li (*Psychiatry*), P.J. Lombroso (*Child Study Center*), D.A. McCormick (*Emeritus*), M.N. Nitabach (*Cellular & Molecular Physiology*), G.D. Pearlson (*Psychiatry*), M. Picciotto (*Psychiatry*), V.A. Pieribone (*Cellular & Molecular Physiology*), M.N. Potenza (*Psychiatry*), P. Rakic, J. Santos-Sacchi (*Surgery*), N. Sestan, G.M. Shepherd, R. Sinha (*Psychiatry*), S.M. Strittmatter, J. Taylor (*Psychiatry*), S. Tomita, F.M. Vaccarino (*Child Study Center*), C.H. Van Dyck (*Psychiatry*), S.G. Waxman (*Neurology*), D. Zenisek (*Cellular & Molecular Physiology*), Z. Zhou (*Ophthalmology & Visual Science*)

Associate Professors M. Alreja (*Psychiatry*), C.J. Bruce, W. Cafferty (*Neurology*), J.A. Cardin, S.S. Chandra, D. Colón-Ramos, K.P. Cosgrove (*Psychiatry*), J.B. Demb (*Ophthalmology & Visual Science*), S. Ferguson (*Cell Biology*), E. Gracheva, M. Hammarlund, M.J. Higley, I. Levy (*Comparative Medicine*), J. Lim, A. Louvi (*Neurosurgery*), D.S. Navaratnam (*Neurology*), J. Noonan (*Genetics*), M.L. Schwartz, J.V. Verhagen

Assistant Professors R. Chang, M.O. Dietrich (*Comparative Medicine*), G. Dragoi (*Psychiatry*), J.L. Gerrard (*Neurosurgery*), J. Guo, E. Hoffman (*Child Study Center*), M. Jadi (*Psychiatry*), J. Jeanne, C.A. Kwan (*Psychiatry*), J. Murray (*Psychiatry*), A. Nandy, H. Seo (*Psychiatry*), S. Yogev

Senior Research Scientists N. Carnevale, M. Hines

Research Scientists A. Duque, Y. Morozov, L.D. Selemon, M. Wang

Associate Research Scientists J.I. Arellano, Y. Cai, J. Choi, D. Franjic, J. Greenwood, F. Gulden, J. Hawk, S. Hayashi, N. Kaur, S. Kim, H. Komuro, H. Li, M. Li, M. Lorente Galdos, L.N. Marenco, R. McDougal, N. Micali, E. Mohns, T.M. Morse, A. Moura da Costa e Sousa, Q. Perrenoud, S. Pochareddy, B.G. Rash, G. Santpere Baro, L. Shao, M. Shibata, M. Skarica, A. Tebbenkamp, C. Tebbencamp, Z. Vrselja, Y. Wu, Z. Xuan

The interdisciplinary research programs of Yale neuroscience faculty are central to Yale's Interdepartmental Neuroscience Program (INP). This unique, broad-based training program is best described as a "department without walls," with the primary purpose of providing students with a maximum of diversity and depth in the most important areas of neuroscience research. The training program draws on the knowledge and expertise of more than 100 faculty members, representing more than twenty departments in both

the Faculty of Arts and Sciences and the School of Medicine, ranging from psychiatry to pharmacology, from cell biology to computer science. Although each faculty member has strong department affiliations, the INP faculty functions as a cohesive and collaborative unit whose aim is to foster in graduate students an appreciation of and familiarity with the breadth of neuroscience and to create an environment in which students are encouraged to study problems from several perspectives.

The INP seeks to produce neuroscientists with both specialized knowledge and a broad-based understanding of the discipline. This is accomplished in part through a core curriculum which is designed to ensure a comprehensive understanding of modern neuroscience. For more information on courses and on requirements for the combined M.D./Ph.D. degree program, see Interdepartmental Neuroscience Program in the Graduate School of Arts and Sciences bulletin (https://catalog.yale.edu/gsas).

NEUROSURGERY

TMP 4, 203.785.2805
https://medicine.yale.edu/neurosurgery

Professors K.M. Abbed, J.M. Baehring (*Neurology*), H. Blumenfeld (*Neurology*), A. Bordey, R.A. Bronen (*Radiology & Biomedical Imaging*), V.L. Chiang, R.T. Constable (*Radiology & Biomedical Imaging*), N.C. DeLanerolle (*Emeritus*), C.C. Duncan, C.A. Greer, M. Gunel (*Chair*), M.H. Johnson (*Radiology & Biomedical Imaging*), C.C. LaMotte (*Emeritus*), L. Meng (*Anesthesiology*), J.M. Piepmeier, D.D. Spencer, A.N. Van den Pol

Associate Professors M.L. DiLuna, J.T. King, A. Louvi, C.C. Matouk, J. Schindler, K.N. Sheth (*Neurology*), J. Zhou

Assistant Professors F. Bahrassa, J. Bartolomei, C. Benjamin, A. Boylan, P. Doherty, T. Eid (*Laboratory Medicine*), J. Gerrard, R. Hebert, K. Kahle, L. Kolb, M. Laurans, J. Moliterno Gunel, S. Omay, K. Wu

Research Scientists E. Erson Omay, K. Mishra, K. Yasuno

Associate Research Scientists T. Barak, S. Coskun, R. Dhaher, A. Ercan-Sencicek, O. Henegariu, L.S. Hsieh, H.T. Lee, J. Liu, E. Martin-Lopez, S. Nishimura, D. Rai, D. Spergel

Subinternship

Neurosurgery Subinternship The subinternship allows senior medical students the opportunity to vastly extend their breadth of knowledge of neurological diseases and how they are managed both surgically and nonsurgically. Subinterns function essentially as a supervised intern, working closely with the cohesive group of mid-level providers, residents, and attending physicians in the inpatient, outpatient, and operating room settings. Subinterns are expected to participate in the evaluation and management of assigned patients, pre-round with writing of ICU notes, make rounds and attend clinics, assist in ICU procedures and surgeries, and attend academic conferences. Subinterns are expected to present their scholarly work at one of our academic conferences. The service is a busy one, and subinterns will have a wide range of surgical and clinical experiences. Examples of surgeries frequently encountered include, but are not limited to, aneurysm surgery with craniotomy or endovascular coiling or stenting; carotid endarterectomy; pediatric skull and spine reconstruction and repairs; brain tumor surgery, including awake craniotomy, epilepsy surgery, transnasal surgery, and deep brain stimulation; and spine surgery, including minimally invasive and deformity correction surgery. Required of all Yale School of Medicine students planning to enter the match for neurosurgery. Maximum of four students every four weeks. M.L. DiLuna

OBSTETRICS, GYNECOLOGY, AND REPRODUCTIVE SCIENCES

FMB 307, 203.785.4212, Janice Crabtree, Manager of Medical Education
https://medicine.yale.edu/obgyn

Professors A.M. Arici, M. Azodi, T.C. Chai (*Urology*), J.A. Copel, T. D'Hooghe (*Adjunct*), S. Diano, A.J. Duleba (*Adjunct*), O. Harmanli, S.A. Higgins (*Therapeutic Radiology*), R.B. Hochberg (*Emeritus*), T.L. Horvath (*Comparative Medicine*), P. Hui (*Pathology*), E.I. Kohorn (*Emeritus*), C. Leranth, P.E. Levi Setti (*Adjunct*), H. Lin (*Cell Biology*), C.J. Lockwood (*Adjunct*), W.E. Longo (*Surgery*), S. Munne (*Adjunct*), K. Oktay (*Adjunct*), M.J. Paidas (*Adjunct*), L. Pal, P. Patrizio, S. Pecorelli (*Adjunct*), M. Polan, U.M. Reddy, A.D. Santin, P.M. Sarrel (*Emeritus*), P.E. Schwartz, D.B. Seifer, E.U. Seli, H.S. Taylor (*Chair*), K.A. Yonkers (*Psychiatry*), H. Zhang (*Public Health*)

Associate Professors V.M. Abrahams, M.O. Bahtiyar, G.S. Daftary (*Adjunct*), F. Galerneau, X. Gao (*Comparative Medicine*), A. Gariepy, J.B. Henrich (*Medicine*), G. Huang, Y. Huang, J.L. Illuzzi, M. Khokha (*Pediatrics*), H.S. Lipkind, U. Magriples, V. Parkash (*Pathology*), C.M. Pettker, E. Ratner, L.M. Rickey (*Urology*), A.K. Sfakianaki, D. Silasi, N.L. Stanwood, X. Xu, L. Zamore

Assistant Professors S. Abdel-Razeq, S. Baxley, R.S. Bercik, K.H. Campbell, Y. Cho, J. Chung (*Cellular & Molecular Physiology*), J. Cron, V.B. Desai (*Adjunct*), L.L. Fan, M.C. Fishman, C.A. Flannery, A.N. Kallen, R. Kaza, P.H. Kodaman, K. Kohari, W. Mak (*Adjunct*), G. Menderes, A. Merriam, O. Onibokun, S. Pathy, F. Seifi, S.S. Sheth, M. Silasi, D.H. Stitelman (*Surgery*), R. Tal, E.A. Topran, A.V. Vash-Margita, R.J. Welsh, S.D. Whirledge, Y. Yang

Instructors G. Altwerger, R. Calix, V.L. Chase, S. Collins, A. Cutler, M. Dombrowski, V. Flores, O. Grechukhina, V. Greenberg, C. Han, A.M. Kotlyar, W.K. Leung, M. McAdow, K. Mehlhaff, S.A. Mehta, A.S. Miller, A. Mor, M. Negi, P.M. Popiel, S. Simpson, J. Yeh, B. Zeybek

Senior Research Scientists A. Alvero, S.M. Guller, R.B. Hochberg, G.B. Huszar, N.S. Stachenfeld

Research Scientists H.J. Kliman, G. Krikun, Z. Lin, R. Mamillapalli

Associate Research Scientists S. Bellone, J.F. Culhane, D. Kelk, J. Kim, Y. Liu, J. Lo, L. Lundsberg, S. Nichols-Burns, R. Tedja, S. Titus, L. Zammataro, Y. Zhu

Clinical Professors M. Minkin, S. Vermund (*Public Health*)

Associate Clinical Professor S.J. Fleischman

Assistant Clinical Professors R. Chosak, D.M. Lima

Clinical Instructor C. Negron

Clerkship

Women and Children's Health Clerkship This twelve-week integrated clerkship includes clinical components in obstetrics and gynecology and pediatrics. Students participate in six weeks of OB/Gyn and six weeks of pediatrics, with a mix of inpatient and ambulatory clinical experiences in both specialties. Throughout the clerkship students participate in integrated experiences that cover themes such as health and development, preventive care, sexual health, families and communities, health promotion and disease prevention, and perinatal care. All students attend an evening session with the gynecologic teaching associates. Directors: D.C. Hersh, S.R. Pathy; Associate Directors: S. Baxley, C. Boeras, U. Phatak

Electives

Family Planning Elective This two- or four-week elective provides hands-on experience in family planning in diverse clinical settings. Family planning clinics provide resources to enable couples to determine whether, when, and how often to have children, with special consideration to birth spacing and maternal and child health. The student is exposed to contraceptive counseling and options counseling (abortion, adoption, parenthood). Contraceptive counseling and care include insertion of long-acting reversible contraceptive methods (LARC, IUDs, and implants). In addition, the student participates in first-trimester ultrasound, medical and surgical abortions, medical and surgical management of early pregnancy failures, and intrauterine fetal demise. Clinical settings include outpatient visits and operating room experience at Yale New Haven Hospital and Planned Parenthood in New Haven. Prerequisite: core Ob/Gyn clerkship. One student every two or four weeks. Director: N.L. Stanwood; Associate Directors: A. Gariepy, S.M. Richman

Pediatric and Adolescent Gynecology Elective This two-week elective provides hands-on experience in pediatric and adolescent gynecology in both inpatient and outpatient clinical settings. In the mornings, students attend rounds with the supervising attending physician and residents. Students are exposed to acute common as well as rare pediatric and adolescent gynecologic disorders and can expect to participate in the care of girls and adolescent females with vulvar conditions, abnormal pubertal development, bleeding disorders, gastrointestinal diseases, reproductive issues stemming from endocrine disorders (PCOS and others), collagen vascular disorder, developmental and physical delays, disorders/differences of sexual development, and postoperative complications. Students obtain histories and perform examinations on newly admitted patients or consult patients. Bedside discussions regarding diagnosis, work up, and treatment are encouraged. Prerequisite: core Ob/Gyn clerkship. One student every two weeks. Director: A.V. Vash-Margita

Subinternships

Gynecologic Oncology Subinternship The purpose of the gynecologic oncology subinternship is to enhance the student's knowledge of the diagnosis and management of women with gynecologic malignancies. The student is exposed to all modalities of treatment for gynecologic malignancies including radical gynecological surgery, chemotherapy, and radiation therapy. The student is expected to be an integral part of the team

in the management of the patients admitted to the service. The student admits patients and takes part in their care throughout the subinternship period. In addition to operating room exposure, extensive experience is gained in the postoperative management of these patients. In the ambulatory setting, the student is exposed to the outpatient management of cancer, chemotherapy, and colposcopy. On a weekly basis, the student also attends divisional teaching sessions and the multidisciplinary tumor conference. There is no night call. The recommended text is *Clinical Gynecologic Oncology* (DiSaia). Prerequisite: core Ob/Gyn clerkship. One student every four weeks. Director: E. Ratner

Maternal Fetal Medicine Subinternship The Maternal Fetal Medicine division offers a four-week high-risk obstetrics elective for fourth-year medical students. The student functions as a subintern and team member in the care of high-risk obstetrical patients at Yale New Haven Hospital. In addition to inpatient duties, the student attends the outpatient clinic once a week. Students also participate in prenatal ultrasound sessions as well as labor and delivery activities. Numerous didactic conferences are held during the rotation. It is recommended that students use the text *Williams Obstetrics* (Cunningham) to prepare for this experience and for research during the rotation. Evaluation of the student is based on clinical performance, participation at rounds, and the student's presentation of an evidence-based case review to members of the MFM division. Prerequisite: core Ob/Gyn clerkship. Students are expected to work two weekend days of their choice. One student every four weeks. Director: F. Galerneau

Pediatric and Adolescent Gynecology Subinternship This four-week subinternship provides hands-on experience in pediatric and adolescent gynecology in both inpatient and outpatient clinical settings. In the mornings, students attend rounds with the supervising attending physician and residents. Students are exposed to acute common as well as rare pediatric and adolescent gynecologic disorders and can expect to participate in the care of girls and adolescent females with vulvar conditions, abnormal pubertal development, bleeding disorders, gastrointestinal diseases, reproductive issues stemming from endocrine disorders (PCOS and others), collagen vascular disorder, developmental and physical delays, disorders/differences of sexual development, and postoperative complications. Students obtain histories and perform examinations on newly admitted patients or consult patients. Bedside discussions regarding diagnosis, work up, and treatment are encouraged. Prerequisite: core Ob/Gyn clerkship. One student every four weeks. Director: A.V. Vash-Margita

Reproductive Endocrinology and Infertility Subinternship The Reproductive Endocrine and Infertility (REI) division offers a four-week elective for fourth- and fifth-year students. In addition to gaining knowledge of human reproductive endocrine function, students are introduced to disruptions in physiology and function, which can lead to endocrinological and infertility disorders. Common problems seen in REI practice include female and male infertility, recurrent pregnancy loss, polycystic ovarian syndrome, anovulation, amenorrhea, endometriosis, chronic pelvic pain, abnormal uterine bleeding, and uterine leiomyomas. Exposure to Advanced Reproductive Technologies (ART) is integrated into this elective. In addition to clinical activities in the office and the hospital, students have the opportunity to attend division conferences. Evaluation is

based on clinical performance in the office and the operating room, and on an evidence-based presentation on an REI topic of interest. Recommended text: *Clinical Gynecological Endocrinology & Infertility* (Speroff). Prerequisite: core Ob/Gyn clerkship. One student every four weeks. Director: P.H. Kodaman

Urogynecology and Reconstructive Pelvic Surgery Service Subinternship Offered by the Section of Urogynecology and Reconstructive Pelvic Surgery. Students are taught about the normal and abnormal physiology and function of the female pelvic floor and are introduced to the diagnosis and management of female pelvic floor disorders, namely lower urinary tract disorders, pelvic organ prolapse, and defecatory disorders. Common problems encountered by urogynecologists include urinary incontinence, recurrent urinary tract infections, cystocele, rectocele, uterine prolapse, vaginal vault prolapse after hysterectomy, microscopic hematuria, dyspareunia, interstitial cystitis, anal incontinence, and constipation. Exposure to advanced pelvic floor reconstructive surgery is also integrated into this elective. In addition to clinical activities in the office and the hospital, students have the opportunity to attend section didactics. Evaluation is based on clinical performance in the office and the operating room, participation in didactics, and an evidence-based presentation on a urogynecology topic of interest. Prerequisite: core Ob/Gyn clerkship. One student every four weeks. Director: O. Harmanli

OPHTHALMOLOGY AND VISUAL SCIENCE

40 Temple Street, 3rd floor, 203.785.2020
https://medicine.yale.edu/eyes

Professors R.A. Adelman, M. Coca-Prados (*Emeritus*), M.C. Crair (*Neuroscience*), N. Daw (*Emeritus*), B.M. DeBroff, L.V. Del Priore (*Chair*), C. Gonzalez (*Emeritus*), L.J. Rizzolo (*Surgery*), M.L. Sears (*Emeritus*), M. Shields (*Emeritus*), D. Silverstone, J.H. Sinard (*Pathology*), V. Vasiliou (*Public Health*), C.J. Zeiss (*Comparative Medicine*), D. Zenisek (*Cellular & Molecular Physiology*), Z. Zhou

Associate Professors J.B. Demb, J.J. Hoh (*Public Health*), I. Kim, K.M. Stoessel, C. Teng

Assistant Professors J.H. Chow, V. Diaz, M. Fields, A.A. Fisayo (*Neurology*), M. Howard, J.E. Kempton, A.A. Kohli, N.E. Kombo, R. Lim, J. Liu, J.F. Martone, A. Musto, K. Nwanyanwu, P.C. Palmisano, J. Rotruck

Instructors D. Agarwal, I. Kirchner, F. Makkouk, E. Volker

Research Scientists H.H. Cai, S. Lee

Associate Research Scientists M. Chen, J. Gong, J. Park

Associate Clinical Professors P. Gaudio, A.D. Rose, G. Shafranov, C.A. Sklar

Assistant Clinical Professors D.A. Bacal, P.J. Branden, N. Chaudhry, A.J. Daccache, P.A. Ecker, J.S. Elman, P.M. Falcone, H.E. Fazzone, J. Geffin, W.I. Larrison, E.S. Lim, M. Sohrab, D. Tom, J.M. Weisz

Clinical Instructors S.B. Castracane, T.H. Cronin, M. Dombrow, O. Faridi, Y. Kostina, D.H. Levinson, P.A. Marks, P.E. Masi, S.W. Meskin, D. Rudich, O. Shakir, M.R. Shapiro, J.E. Silbert, A.P. Swan

Elective

Ophthalmology and Visual Science Clinical Elective This intensive two- or four-week elective consists of ten half-day sessions per week. Students observe in specialty clinics and ophthalmic surgery. More advanced students evaluate patients in a general ophthalmology clinic. Students are expected to participate in departmental conferences and review independent study material provided by the department. Subspecialty experience includes cornea and external eye disease, glaucoma, neuro-ophthalmology, oculoplastics, retinal disease, and strabismus. By the end of the elective, students should be able to recognize the four most common causes of profound blindness and be able to identify vision-threatening and non-vision-threatening causes of a red eye; perform an external eye exam; use an ophthalmoscope to identify the optic nerve and be able to describe it; and have some familiarity with the slit lamp. Students who do the four-week elective are expected to do a presentation on a topic in ophthalmology at the end of the rotation. Evaluation is based on clinic performance, the case discussions, and the presentation. Teaching settings include the Yale Eye Center, the Yale Health Center, the Eye Clinic at

the West Haven VA Medical Center, and the Cornell Scott-Hill Health Center. Prerequisite: second-year ophthalmology module or equivalent. Maximum of three students every two or four weeks; a tailored rotation is also available. Director: N.E. Kombo

ORTHOPAEDICS AND REHABILITATION

YPB 133, 203.785.2579
https://medicine.yale.edu/ortho

Professors M.R. Baumgaertner, C.G. Carpenter (*Emeritus*), T.O. Carpenter (*Pediatrics*), D.R. Cooperman, G.E. Friedlaender, J.N. Grauer (*Interim Chair*), A.H. Haims (*Radiology & Biomedical Imaging*), M.C. Horowitz, P. Jokl (*Emeritus*), L.D. Katz (*Radiology & Biomedical Imaging*), K.J. Keggi (*Emeritus*), F.Y. Lee, M.I. O'Connor, M.M. Panjabi (*Emeritus*), R.R. Pelker, T.S. Renshaw (*Emeritus*)

Associate Professors J.V. Eswarakumar, M.P. Leslie, D.M. Lindskog, M.J. Medvecky, J.S. Reach, L. Rubin, C.R. Swigart, P.G. Whang, B. Yoo

Assistant Professors D. Arsoy, K. Donohue, M. Dundas, J.A. Fretz, D. Frumberg, E.C. Gardner, D. Gibson, D. Gutierrez, A. Halim, L. Hanke, E. Holder, X. Luo, N. Morgado-Vega, R. Pepperman, R. Raju, M. Rosen, A.S. Socci, C. Tifford, A. Varthi, R.J. Walls, D. Wiznia, J. Wu

Instructors P. Coutinho, B. Green, S.B. Gross, A. Kadar

Senior Research Scientist P. Jokl

Associate Research Scientists J. Back, S. Lee

Assistant Clinical Professors G.A. Gorecki, D.C. Novicki, M.M. Pressman, J. Sumner

Clinical Instructor E.J. Carlson

Elective

Physical Medicine and Rehabilitation Introduction This two-week elective provides the fourth-year student with exposure to the specialty of PM&R under the direction of attending physiatrists. Students gain clinical experience and participate in the evaluation and rehabilitation management of patients with various disabling conditions such as stroke, acquired brain injury, amputation, multiple trauma, arthroplasty, acute and chronic musculoskeletal conditions, and spinal cord injury. In addition to management of the medical care of patients with disabilities, students gain an understanding of the rehabilitation team approach, which is an integral part of the overall management of such patients. Students also have the opportunity to participate in the management of patients with acute and chronic pain. Management of a patient's care through interaction with other health professionals such as neurologists, orthopaedic surgeons, psychiatrists, social workers, occupational therapists, speech and language pathology therapists, and physical therapists is an integral part of the elective. Students participate in the interdisciplinary rehabilitation team meetings held regularly in the inpatient rehabilitation setting and are exposed to the treatment modalities and therapeutic and diagnostic interventions performed by physiatrists. These interventions can include, but are not limited to, therapeutic exercise, therapeutic modalities (heat, cold, functional electrical stimulation, biofeedback), intrathecal baclofen, and therapeutic injection procedures such as interventional spine injections, corticosteroid joint injections, and botulinum toxin

injections. Students may also be exposed to diagnostic tools such as electro diagnostic testing (electromyography or EMG and nerve conductions studies) and musculoskeletal ultrasound. Learning to take a comprehensive rehabilitation history and performing complete musculoskeletal and functional examinations are emphasized. Students also have the opportunity to observe their assigned patients during the patient's course of rehabilitation therapies. Clinical settings may include inpatient consultations in Yale New Haven Hospital (both York Street and St. Raphael campuses); outpatient consultations at the YNHH Center for Musculoskeletal Care in Stamford, Old Saybrook, and/or North Haven; outpatient consultations with the Physiatry group at the West Haven VA Medical Center; and inpatient rehabilitation care of patients admitted to the YNHH inpatient rehabilitation unit (IRU) at the Rehabilitation and Wellness Center located within Milford Hospital. One student every two weeks. Director: M.L. Rosen

Subinternship

Orthopaedics and Rehabilitation Subinternship Students are active members of one of seven orthopaedic teaching teams: Adult Reconstruction and Orthopaedic Oncology, Orthopaedic Trauma and Fracture Care, Pediatric Orthopaedics, Spine Surgery, Hand and Upper Extremity Surgery, Sports Medicine and Arthroscopic Surgery, and Foot and Ankle Surgery. Students assist in the management of orthopaedic inpatients and receive operating room experience in both the inpatient and outpatient settings. Participation in the orthopaedic outpatient clinics provides experience in the evaluation and treatment of common musculoskeletal conditions. It is recommended that students take call with the orthopaedic resident in the emergency room to gain insight into the principles of acute fracture management. Clinic and operating room experiences are supplemented by weekly subspecialty conferences and the residents' education program. Maximum of five students every four weeks. Director: M.P. Leslie

PATHOLOGY

Lauder Hall 108, 203.785.2759
https://medicine.yale.edu/pathology

Professors M.W. Bosenberg (*Dermatology*), R. Bucala (*Medicine*), S. Chang (*Laboratory Medicine*), K. Choate (*Dermatology*), Y. Choi (*Emerita*), J. Costa (*Emeritus*), S. Downing (*Emeritus*), G.E. Friedlaender (*Orthopaedics & Rehabilitation*), P.G. Gallagher (*Pediatrics*), E.J. Glusac, R.J. Homer, S.D. Hudnall, P. Hui, P. Humphrey, D. Jain, M. Kashgarian (*Emeritus*), J.H. Kim (*Emeritus*), Y. Kluger, C.J. Ko (*Dermatology*), D.S. Krause (*Laboratory Medicine*), G. Kupfer (*Pediatrics*), F.Y. Lee (*Orthopaedics & Rehabilitation*), J.A. Longtine, J.A. Madri (*Emeritus*), V.T. Marchesi, J.M. McNiff (*Dermatology*), W. Min, G. Moeckel, R. Morotti, J.S. Morrow (*Chair*), J.S. Pober (*Immunobiology*), M. Prasad, D.L. Rimm, M.E. Robert, J.K. Rose (*Emeritus*), J.H. Sinard, J.L. Sklar, D.F. Stern, F. Tavassoli (*Emeritus*), A.B. West (*Emeritus*)

Associate Professors A. Adeniran, R. Bindra (*Therapeutic Radiology*), D. Braddock, N. Buza, G. Cai, H. Chun (*Medicine*), S.E. Cowper (*Dermatology*), C. Fernandez-Hernando (*Comparative Medicine*), A. Galan (*Dermatology*), J.A. Gibson, L. Hao, M. Harigopal, E. Herzog (*Medicine*), A.J. Huttner, R. Jensen (*Therapeutic Radiology*), S.G. Katz, S.H. Kleinstein, D. Kowalski, T. Kyriakides, W. Laskin, A. Levi, R.R. Montgomery (*Medicine*), I. Nalbantoglu, D. Nguyen, Z. Pan, V. Parkash, K. Politi, Y. Qyang (*Medicine*), Y. Suarez (*Comparative Medicine*), M.M. Tomayko (*Dermatology*), N. Wajapeyee, Z. Walther, M. Xu, Q. Yan, X. Zhang

Assistant Professors R. Abi Raad, R. Baldassarri, A.L. Barbieri, R. Celli, P. Cohen, K. Cole, K. Finberg, A. Finkelstein, J.A. Fretz (*Orthopaedics & Rehabilitation*), P. Gopal, I. Hahn, S. Hattangadi (*Pediatrics*), M. Levine, D. McGuone, P. Myung (*Dermatology*), M.M. Pinto, E. Reisenbichler, H. Sanchez, K. Schalper, A. Siddon (*Laboratory Medicine*), S. Vilarinho (*Medicine*), S. Wong, I. Yildiz

Instructors A. Darbinyan, J. Eskendri, G. Panse (*Dermatology*), K. Rabe

Senior Research Scientists M. Kashgarian, J.H. Kim, J.A. Madri, J.K. Rose, A.B. West

Research Scientists Y. Bai, P. Gershkovich

Associate Research Scientists A. Arnal Estape, R. Camp, J. Cao, D. Chen, A. Ducler, P. Gaule, R. Gupta, Y. Jin, S. Lang, Z. Levine, R. Means, A. Nagarajan, A. Porciuncula, P.M. Rabinovich, M.C. Stankewich, J. Wang, G. Yang, M. Yin, H. Zhang, H. Zhou

Associate Clinical Professor I. Nash (*Laboratory Medicine*)

School of Medicine Courses

Anatomic Pathology and Laboratory Medicine Combined Elective The goals for anatomic pathology are to understand the basic principles of diagnostic anatomic pathology and its role in clinical medicine. The goals for laboratory medicine are to learn appropriate usage and interpretation of laboratory tests and to gain a better understanding of the theoretical, technological, and clinical underpinnings of laboratory medicine. This

elective is appropriate for students considering a career in laboratory medicine and/or pathology, and for all students who will use laboratory and pathology tests in their careers. One or two students every four weeks. Director: A. Adeniran

Anatomic Pathology Elective The department offers an elective to medical students in the third or fourth year that provides a broad experience in general diagnostic techniques. Students have opportunities to participate in autopsy pathology, cytopathology, and surgical pathology. A daily diagnostic conference is scheduled for both residents and students. In addition to direct responsibilities in autopsy and surgical pathology areas, the student has opportunities to participate in electron microscopy, immunohistochemistry, molecular diagnostics, and flow cytometry techniques. One or two students every two or four weeks. Director: A. Adeniran

Autopsy Pathology This course provides participation in the autopsy service with house staff in pathology. It covers proper performance of the autopsy including dissection, documentation and reporting, presentation of autopsy findings, and communication of medical opinions formed from the autopsy. The work includes involvement in dissection of cases, review of gross pathology, submission of sections for histology, review of microscopic slides, preparation of reports of findings, and involvement in investigative procedures related to necropsy material. Opportunities exist for correlation studies with previous biopsies and for clinical investigative and cell biologic techniques in relation to necropsy material and attendance. Six weeks minimum, enrollment limited to two students.

Neuropathology Elective The student shadows a neuropathologist at work. As experience is gained, core functions of tissue evaluation, processing, and examination can be performed by the student. Two- or four-week rotations. Director: A.J. Huttner

Pathological Basis of Human Disease Fundamental principles underlying the pathological alterations in function and structure that constitute the reaction of the organism to injury. Pathology of diseases involving neoplasia and special organs and systems. Correlation of the clinical and anatomical manifestations is emphasized. R.J. Homer and staff

Graduate Courses

PATH 620a, 621b, 622b, Laboratory Rotations in Experimental Pathology Laboratory rotations for first-year graduate students. T. Kyriakides

PATH 625a, Pathobiology of Neurodegeneration Aging individuals throughout the world suffer debilitating mental incapacities collectively known as dementia. Alzheimer's disease (AD), the most prevalent form, was first described more than one hundred years ago and remains an enigma despite several decades of intensive scientific research. AD is now the costliest chronic disease in the United States and will bankrupt the health care system if solutions are not discovered. This course explores what we know about its causes, its complications, and the rationale behind the treatments that are now available. Toxic protein deposits predicted by the amyloid hypothesis are widely regarded as primary causes, but our inability to design effective anti-amyloid treatments has turned our attention to many other contributing pathogenic factors, including blood vessel damage

and inflammation. Recent studies suggest that the incidence of dementia is declining, testimony to the idea that effective preventive measures could rescue large numbers of vulnerable people. The course explores in depth what these might be. It focuses on the analysis of primary research data and is geared to the interests of students planning a career in brain-related research in academics or industry. Two-hour weekly sessions involve student presentations of critical publications, followed by discussion. Topics covered include amyloid hypothesis; toxic mutations; animal models; immune therapy; ApoE4; small blood vessel damage; inflammation; memory; brain training; protective lifestyles; false alarms and uncertain claims; and economics of dementia. Prerequisite: students interested in this course should e-mail a brief description of their background and future goals to vincent.marchesi@yale.edu. Enrollment limited. V.T. Marchesi

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

PATH 640a/B&BS 640a, Developing and Writing a Scientific Research Proposal The course covers the intricacies of scientific writing and guides students in the development of a scientific research proposal on the topic of their research. All elements of an NIH fellowship application are covered, and eligible students submit their applications for funding. Enrollment limited to twelve. K. Politi

PATH 650b, Cellular and Molecular Biology of Cancer A comprehensive survey of cancer research from the cellular to the clinical level. The relation of cancer to intracellular and intercellular regulation of cell proliferation is emphasized, as are animal models for cancer research. Background in molecular genetics and cell biology is assumed. Open to advanced undergraduates with permission of the instructor. D.F. Stern

PATH 660b/C&MP 650b/PHAR 580b, The Responsible Conduct of Research Organized to foster discussion, the course is taught by faculty in the Pharmacology, Pathology, and Physiology departments and two or three senior graduate students. Each session is based on case studies from primary literature, reviews, and two texts: Francis Macrina's *Scientific Integrity* and Kathy Barker's *At the Bench*. Each week, students are required to submit a reaction paper discussing the reading assignment. Students take turns leading the class discussion; a final short paper on a hot topic in bioethics is required. Staff

PATH 670b, Pathobiology Mechanisms of human disease from a pathologic perspective. Includes sections devoted to systemic pathobiology, hematologic disease, gastrointestinal disease, renal disease, and cancer genetics. Subjects covered include cell and tissue injury, disordered physiology, inflammatory disease, and neoplastic disease. Enrollment limited. S.D. Hudnall, A.J. Huttner, G. Moeckel, J.S. Morrow, J.L. Sklar

PATH 679a/680b/C&MP 629a/630b/PHAR 501a/502b, Seminar in Molecular Medicine, Pharmacology, and Physiology 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). D. Nguyen

PATH 681a/B&BS 681a, Advanced Topics in Cancer Biology 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 650b 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. K. Schalper

PATH 682b, Cancer Clinical Translation This course builds on basic cancer biology knowledge to study the impact of scientific knowledge on real-world clinical oncology issues through didactic sessions, working tumor board attendance, and workshop discussions. The first half of the course emphasizes practical issues in moving research ideas into the clinic, design and execution of standard and novel forms of clinical trials, and statistical analysis of clinical trial data. The second half covers the perspectives of clinicians on the most important outstanding biological questions that should be addressed by cancer investigators. Enrollment limited, with priority given to Cancer Biology Training Program trainees. Advanced undergraduates or graduate students may be admitted with permission of the organizers. Class days vary depending on speaker availability. Prerequisite: PATH 681a. S.G. Katz

PATH 690b, Molecular Mechanisms of Disease This course covers aspects of the fundamental molecular and cellular mechanisms underlying various human diseases. Many of the disorders discussed represent major forms of infectious, degenerative, vascular, neoplastic, and inflammatory disease. Additionally, certain rarer diseases that illustrate good models for investigation and/or application of basic biologic principles are covered in the course. The objective is to highlight advances in experimental and molecular medicine as they relate to understanding the pathogenesis of disease and the formulation of therapies. C. Fernandez-Hernando

PEDIATRICS

LMP 4085, 203.785.4638
https://medicine.yale.edu/pediatrics

Professors N. Ameen, W.A. Andiman (*Emeritus*), R.J. Antaya (*Dermatology*), R.S. Baltimore (*Emeritus*), C.R. Baum, M.J. Bizzarro, C.W. Bogue (*Chair*), M. Brueckner, L.M. Buckley (*Medicine*), M. Cappello, S. Caprio, T.O. Carpenter, M.G. Caty (*Surgery*), K. Chawarska (*Child Study Center*), E.R. Colson (*Emeritus*), J.A. Copel (*Obstetrics, Gynecology & Reproductive Sciences*), C.C. Duncan (*Neurosurgery*), M.E. Egan, S.H. Emre (*Surgery*), J.T. Fahey, B.W. Forsyth, A.H. Friedman, P.G. Gallagher, M. Genel (*Emeritus*), J.N. Grauer (*Orthopaedics & Rehabilitation*), I. Gross (*Emeritus*), J.R. Gruen, J.P. Hafler, W.E. Hellenbrand (*Emeritus*), A.L. Horwich (*Genetics*), D.M. Komp (*Emeritus*), G. Kupfer, J.F. Leckman (*Child Study Center*), J.M. Leventhal, G. Lister, L.C. Mayes (*Child Study Center*), P.L. McCarthy, L.R. Ment, M.R. Mercurio, G. Miller (*Emeritus*), I. Miller, P.K. Mistry (*Medicine*), S. Rooney (*Emeritus*), L. Rosenfeld (*Medicine*), K. Santucci, E.D. Shapiro, B.A. Shaywitz, S.E. Shaywitz, R.N. Shiffman, B.R. Smith (*Laboratory Medicine*), W.V. Tamborlane, F. Testa, A. Tufro, S. Vermund (*Public Health*), S. Weinzimer, C.C. Weitzman, J. Woolston (*Child Study Center*)

Associate Professors L.D. Arnold, P. Aronson, A.G. Asnes, J. Asnes, M. Auerbach, N. Bamford, A. Bazzy-Asaad, K.A. Bechtel, C. Bruno, E. Bruscia, M.F. Canarie, E. Cengiz, L. Chen, M.X. Cicero, K.G. Couloures, O. Couloures, M. Dias, B. Doolittle (*Medicine*), U.D. Ekong, A. El-Guindy, E. Faustino, A.M. Fenick, M. Flaherty-Hewitt, J.S. Giuliano Jr., J. Goodwin, M. Grossman, J. Hendrickson (*Laboratory Medicine*), M. Hommel, A.L. Hsiao, L.C. Johnston, N. Kadan-Lottick, M. Khokha, M. Langhan, J. Loyal, R.A. Martinello (*Medicine*), E. Michaelides (*Surgery*), R. Morotti (*Pathology*), E. Paintsil, J.M. Panisello, D.S. Pashankar, F.D. Pashankar, S.M. Peterec, A. Porto, A. Riera, M. Rosenthal, B. Sheares, J. Sherr, J. Talwalkar (*Medicine*), M. Vazquez, S.A. Walsh, P.G. Weiss

Assistant Professors O.O. Adekanye, A. Alper, P.J. Ananth, C. Anderson, R. Barrett, C.M. Beach, J. Beiner, V. Benitez, A. Berkwitt, S. Boulware, D.R. Camenga (*Emergency Medicine*), A. Cameron, C. Canapari, K. Cardinale, R. Carrasco Sanchez, E. Christison-Lagay (*Surgery*), K. Corbin, H. Dahlquist, E. Deniz, J.M. Dodington, M. Drago, R.W. Elder, B. Emerson, E. Faherty, D. Ferdman, I.D. Ferguson, A. Flagg, D. Frumberg (*Orthopaedics & Rehabilitation*), M. Goldman, Y.F. Gozzo, J. Greenberg, E. Gritz, A.R. Gupta, E. Hall, S. Hattangadi, D. Hersh, D. Hochreiter, M.S. Hogan, C. Ionita, E.K. James, A. Jastreboff (*Medicine*), S. Kandil, R. Karnik, B. Keeshan, V. Knight, A. Koral, D.A. Kuruvilla, S. Kwon, S.A. Lakhani, O. Levit, K.F. Liem, N. Makhani, A. Marks, S.A. Massaro, K.A. McVicar, A. Montgomery, E.A. Nozetz, D. Ozgediz (*Surgery*), A.D. Patel, L. Pavlovic, S.G. Pels, U. Phatak, R. Pierce, M. Posner, C. Robinson, A. Rodriguez, D.J. Rosen, N. Santoro, V. Shabanova, N. Shah, M. Sharifi, L. Siew, G. Soffer, G. Soma, M. Spencer-Manzon (*Genetics*), L. Sude, G.Y. Tiyyagura, P. Valentino, M. Van Name, A.V. Vash-Margita (*Obstetrics, Gynecology & Reproductive Sciences*), J.C. Vasquez, J.K. Warejko, H.Z. Zhang (*Genetics*)

Instructors K. Bjorkman, J. Catanzaro, F. Cheng, H. Davis, J.R. Gaither, M.C. Hooper, P. Houghteling, L. Jeffries, M. Lindeman, M. Lindeman, T. Maldonado, E. Myers, L. Nally, J. Rosenberg (*Medicine*), C.A. Rowan, S. Woolf

Research Scientists E. Drye, W. Ji, J.M. McGrath (*Genetics*)

Associate Research Scientists M. Ahsan, L. Balsamo, X. Chen, M. DeMille, C. Hansen, E. Legue, J. Li, M. Li, Q. Li, F. Liang, J. Malins, E. Marsillio, S. Matos daSilva Fertuzinhos, W. Ni, V. Schulz, K. Sheares, S. Siebel, E. Tarabra, D. Truong, T.M. Whitfill, J. Yao, K. Yu

Clinical Professor S. Levy

Associate Clinical Professors A.J. Avni-Singer, D.H. Dreyfus, M. Ellison, S.I. Escalera, R.S. Young

Assistant Clinical Professors C. Brown, C.L. Dorfman, L. Gray, L.M. Marks

Clinical Instructor J.C. Samuel

Lecturers L. Alonso, K.M. Baker, A. Beitel, N.B. Brown, A.J. Carlson, J. Chinchilla-Karolicki, A.V. Cohen, M. DeLucia, L. DiMauro, D. Flanagan, S. Frank, M.H. Gad, L. Glassman-Wisnewski, L.L. Gould, E. Herz, A. Hoefer, C. Keanna, C. Kennedy, K. Kinsella, S.E. Kuhn, S. Kurian, B. Liebler, S.P. Martinello, P. Murtagh, R. Nolfo, J. O'Connor, K. Pae, Z. Scates, R. Seligson, M. Sheehan, S. Slattery, C.M. Smillie, K. Vassell, K. Wallis

Clerkship

Women and Children's Health Clerkship This twelve-week integrated clerkship includes clinical components in obstetrics and gynecology and pediatrics. Students participate in six weeks of OB/Gyn and six weeks of pediatrics, with a mix of inpatient and ambulatory clinical experiences in both specialties. Throughout the clerkship students participate in integrated experiences that cover themes such as health and development, preventive care, sexual health, families and communities, health promotion and disease prevention, and perinatal care. All students attend an evening session with the gynecologic teaching associates. Directors: D.C. Hersh, S.R. Pathy; Associate Directors: S. Baxley, C. Boeras, U. Pathak

Electives

Pediatric Cardiology Elective Students are exposed to a broad array of congenital and acquired heart disease in pediatrics, ranging from fetal to adult congenital heart patients. Over the course of the elective, students develop a basic understanding of the physiology of normal circulation, as well as the pathophysiology, diagnostic tests, and management of common forms of congenital and acquired heart disease. Students are exposed to patients over a broad range of settings, from daily inpatient rounds to outpatient continuity clinics. Additionally, there may be opportunities to observe complex diagnostic and therapeutic management options, including advanced cardiac imaging, cardiac

catheterization, and surgical repair of pediatric heart defects. One student every four weeks. Director: R.W. Elder

Pediatric Critical Care Medicine Elective (PICU) Senior medical students participate as members of the pediatric intensive care unit team. Students are directly responsible for the care of assigned patients under the supervision of pediatric residents, critical care fellows, and attending intensivists. A core curriculum composed of interactive talks on the major pediatric critical care topics is presented two to three times a week, as well as daily radiology rounds and a monthly morbidity and mortality conference. Open to fourth- and fifth-year students only. One student every four weeks. Director: K.G. Couloures

Pediatric Emergency Medicine Elective Fourth- and fifth-year students have the opportunity to evaluate and manage a broad range of acute medical and surgical complaints while honing their clinical skills under direct attending supervision, including thirty-six clinical hours per week in the pediatric emergency department. Education during clinical shifts is augmented by pediatric emergency medicine fellow education conferences and one-on-one teaching sessions with the elective director. Participation in teaching conferences and mock codes is required. One student every four weeks; a tailored rotation is available. Prerequisites: pediatric rotation, EPIC inpatient training, and EPIC ED e-learning. Director: P.L. Aronson

Pediatric Endocrinology and Diabetes Elective This elective provides extensive exposure to various aspects of pediatric endocrinology, with an emphasis on disorders of growth and sexual development, thyroid function, diabetes (type 1 and type 2), obesity, and bone and mineral metabolism. The student participates primarily in the outpatient pediatric endocrinology and diabetes clinics, as well as the inpatient service. The rotation includes participation in weekly pediatric endocrinology conferences as well as conferences held jointly with the adult endocrinology service. One or two students every four weeks; a two-week tailored rotation is available. Director: A.D. Patel

Pediatric Hematology/Oncology Elective This elective provides broad experience in the diagnosis and management of pediatric malignancies and hematologic disorders of infancy and childhood. The student functions as part of the inpatient service team and participates in the outpatient clinic three to four mornings each week. Weekly conferences include the multidisciplinary pediatric tumor board, leukemia and lymphoma conference, section conference, and weekly pediatric hematology/oncology patient management rounds. One student every two or four weeks. Prerequisite: Pediatric clerkship. Director: S. Massaro

Pediatric Infectious Disease Elective Students participate in pediatric infectious disease rounds by presenting the case study of an inpatient whom they have examined to a group of faculty and fellows. Emphasis is placed on the correlation of the clinical problem and its practical management with principles of infectious epidemiology and clinical microbiology (bacteriology and virology). Consulting rounds are held daily. Teaching rounds in diagnostic microbiology are held four times a week. Weekly divisional rounds last approximately two hours. Students also attend the pediatric AIDS clinic. Prerequisite: Pediatric clerkship or permission of the instructor. Open to fourth- and fifth-year students only. One student every four weeks. Director: C. Hansen

Pediatric Neonatal-Perinatal Medicine Elective (NNICU) Students spend two weeks on the step-down service, followed by two weeks on the intensive care service. On each service students attend medical rounds and follow neonatal patients and write progress notes under close supervision. Students attend delivery room resuscitations and stabilizations, and prenatal consultations. On both services, students attend general and student-oriented educational conferences as well as radiology rounds. Students also pursue independent study on topics in neonatology and make brief presentations to the clinical team. Additional opportunities, such as attendance at outpatient developmental follow-up exams, are available to students based on interest. One student every four weeks; a two-week tailored rotation is available. Director: C. Bruno; Associate Director: S.M. Peterec

Pediatric Nephrology Elective Students participate in the evaluation and management of patients on the pediatric inpatient service, pediatric ICU, neonatal ICU, and pediatric specialty center. Patient problems encompass the full range of clinical renal disorders, including fluid and electrolyte disturbances, acute and chronic renal failure, various forms of glomerulonephritis and interstitial nephritis, nephrolithiasis, hypertension, intoxications, inherited renal diseases, and urinary tract abnormalities. A pediatric nephrology faculty member serves as attending physician at all times and conducts teaching rounds daily. These teaching sessions provide supervision and training in the practical aspects of patient management, as well as instruction in the basic scientific disciplines that underlie the clinical practice of nephrology. Students also participate in outpatient renal clinics under the supervision of the faculty, gaining experience in the work-up of common renal disorders not initially requiring hospitalization (e.g., proteinuria, hematuria, mild azotemia), the assessment and treatment of childhood hypertension, and the long-term follow-up of patients after discharge from the inpatient and transplant services. Students are expected to attend weekly teaching conferences, formal pediatric renal core curriculum, and pediatric renal rounds. Open to fourth-and fifth-year students only. One student every two or four weeks. Director: O. Couloures

Pediatric Neurology Elective This elective provides hands-on experience in pediatric neurology in both inpatient and outpatient clinical settings. Students attend rounds with supervising attending physicians as well as adult and pediatric neurology residents. Students are exposed to acute common as well as rare pediatric neurology disorders such as epilepsy, headaches, mental status changes, and weakness. The students obtain histories and perform neurological examinations on newly admitted patients or consult patients. Bedside discussions regarding diagnosis, work-up, and treatment are encouraged. Students have the opportunity to participate in the pediatric neurology consultation service or outpatient clinics. The consultation service exposes students to various emergencies in pediatric neurology such as seizures, status epilepticus, stroke, and other acute neurological issues. Both general pediatric neurology as well as subspecialty clinics (such as epilepsy, headache, movement disorders, multiple sclerosis, neuromuscular, EMG) are available. In addition, students are introduced to different procedures, including spinal tap, electroencephalogram, brain and spine imaging techniques, and electromyogram. One student every two or four weeks. C. Ionita

Pediatric Respiratory Pulmonary Elective This elective provides training and experience in the diagnosis and management of common respiratory and sleep disorders in children and adolescents. Students participate in the direct care and observation of patients on the inpatient service and in the ambulatory pulmonary clinics. They have the opportunity to go to the operating room to observe bronchoscopies. They review pulmonary function tests. The inpatient experience consists of daily bedside rounds and consultations on the wards with the attending physician and pulmonary fellow on service. The outpatient experience occurs with faculty during their office hours and fellows during their continuity clinic. Facilities include a dedicated pulmonary function laboratory for children, a pediatric exercise laboratory, an accredited sleep laboratory, and an accredited Cystic Fibrosis (CF) Center (one of only two in Connecticut, it offers a multidisciplinary team approach to providing comprehensive state-of-the-art care for children and adolescents with CF). Students are expected to attend pulmonary conferences and seminars. One student every four weeks. B. Sheares

Subinternships

Pediatric Surgery Subinternship This subinternship provides an in-depth exposure to the broad spectrum of pediatric surgical problems. Specific attention is given to identifying the pediatric patient in crisis, a relevant skill whether or not the student pursues a career in surgery. Objectives include understanding the correction of major congenital anomalies, management of trauma, care of the critically ill child, and management of solid tumors. Experience includes in-depth exposure to the pediatric operating room, training in neonatal and pediatric critical care, and experience in the pediatric surgical outpatient clinic. The student is an integral part of the pediatric surgical team. Prerequisite: completion of third-year clerkships. One student every four weeks. Director: E.R. Christison-Lagay

Pediatrics Subinternship A four-week inpatient rotation during which senior medical students are considered the equivalent of interns and are directly responsible for the care of assigned patients under the supervision of resident and attending physicians. Students are assigned to one of the three patient-care units at Yale New Haven Children's Hospital. The rotation offers an opportunity to develop organizational skills and experience the pace of internship in a supportive environment. Emphasis is placed on being an integrated team member, taking ownership of one's patients, and demonstrating improvement in intern skills (clinical reasoning, communication with patients/families, organization, prioritization, presentation, and efficiency) through incorporation of constructive feedback. Prerequisite: satisfactory completion of third-year Pediatric and Internal Medicine clerkships. Maximum of three students every four weeks. Director: H. Dahlquist

PHARMACOLOGY

SHM B208, 203.785.4393
https://medicine.yale.edu/pharm

Professors S. Akhtar (*Anesthesiology*), K.S. Anderson, A.M. Bennett, Y. Cheng, P.S. Dannies (*Emeritus*), B.E. Ehrlich, R.E. Handschumacher (*Emeritus*), R. Herbst (*Medicine*), J.R. Howe (*Emeritus*), L.K. Kaczmarek, N. Kaminski (*Medicine*), I. Lax, M.A. Lemmon, E. Lolis, A.C. Nairn (*Psychiatry*), M. Picciotto (*Psychiatry*), G. Rudnick, J. Schlessinger (*Chair*), W.C. Sessa, D. Wu

Associate Professors T.J. Boggon, D.A. Calderwood, J.N. Contessa (*Therapeutic Radiology*), M.P. DiGiovanna (*Medicine*), K.M. Ferguson, S. Ghosh (*Neurology*), Y. Ha, K.A. Martin (*Medicine*), E. Paintsil (*Pediatrics*), C.V. Rothlin (*Immunobiology*), B.E. Turk

Assistant Professors C. Alarcon, D. Klein, S. Lee, Y. Liu, B.P. Nelson (*Adjunct*), S. Nicoli (*Genetics*)

Senior Research Scientist S. Stayrook

Research Scientists A.B. Kiyatkin, S. Wu, Y. Zhang

Associate Research Scientists M. Ahmed, C. Calderwood, M. Chatterjee, Q. Cheng, K. Grabinska, F. Guan, B. Ha, Z. He, R. Hu, S.N. Kudalkar, W. Lam, A. Lawan, A. Li, W. Mi, K. Min, J.W. Murphy, G. Pantouris, E. Park, C. Ren, Y. Suzuki, W. Tang, Y. Tsutsui, M. Ung, A. Wyler, Q. Xiao, J. Yi

PHAR 501a/502b/C&MP 629a/630b/PATH 679a/680b, Seminar in Molecular Medicine, Pharmacology, and Physiology 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). S. Tomita

PHAR 504a, Molecular Mechanisms of Drug Actions 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. E. Lolis

PHAR 506a and b, Methods in Pharmacological Research (Rotations) Students work in laboratories of faculty of their choice. The schedule for each rotation is announced at the beginning of the fall term. E. Lolis

[**PHAR 521b/INP 521b, Neuroimaging in Neuropsychiatry II: Clinical Applications** 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.]

PHAR 528a, Principles of Signal Transduction 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. A.M. Bennett

PHAR 529b, Structural Biology and Drug Discovery 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. Y. Ha, T. Boggon

PHAR 530b, Targeted Use of Structural Biology in Drug Discovery This 0.5-credit course, the second half of PHAR 529b, 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. T. Boggon, Y. Ha

PHAR 531b, Concepts of Structural Pharmacology This 0.5-credit course, the first half of PHAR 529b, 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. T. Boggon, Y. Ha

PHAR 537b, Systems Pharmacology and Integrated Therapeutics The goal of this course is to provide an in-depth, "hands-on" experience in drug design, drug discovery, high-throughput screening, state-of-the-art proteomics, and target validation. K.M. Ferguson

PHAR 550a/C&MP 550a/ENAS 550a/MCDB 550a, Physiological Systems 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. W.M. Saltzman, S. Campbell

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

PHAR 580b/C&MP 650b/PATH 660b, The Responsible Conduct of Research Organized to foster discussion, the course is taught by faculty in the Pharmacology, Pathology, and Physiology departments and two or three senior graduate students. Each session is based on case studies from primary literature, reviews, and two texts: Francis Macrina's *Scientific Integrity* and Kathy Barker's *At the Bench*. Each week, students are required to submit a reaction paper discussing the reading assignment. Students take turns leading the class discussion; a final short paper on a hot topic in bioethics is required. Staff

PSYCHIATRY

300 George Street, Suite 901, 203.785.2117
https://medicine.yale.edu/psychiatry

Professors G.K. Aghajanian (*Emeritus*), A.T. Arnsten (*Neuroscience*), S.A. Ball, M. Baranoski, M.D. Bell (*Emeritus*), H. Blumberg, A. Buchanan, B.S. Bunney (*Emeritus*), K.M. Carroll, J.M. Cedarbaum (*Adjunct*), Z. Cooper (*Adjunct*), D.C. D'Souza, L. Davidson, R.J. DiLeone, R.S. Duman, M.H. Ebert, J.E. Gelernter, D.C. Glahn (*Adjunct*), L.S. Godleski, E.H. Griffith (*Emeritus*), C.M. Grilo, K.A. Hawkins, G. Heninger (*Emeritus*), J. Hirsch, R.A. Hoff, M.A. Hoge, S.C. Jacobs (*Emeritus*), R.D. Kerns, S. Krishnan-Sarin, J.H. Krystal (*Chair*), D. Lee (*Neuroscience*), C. Li, P.J. Lombroso (*Child Study Center*), R.T. Malison, A.S. Martin (*Child Study Center*), S. Martino, G.F. Mason (*Radiology & Biomedical Imaging*), C. Mazure, T.H. McGlashan (*Emeritus*), S. McKee, T.J. McMahon, A.C. Nairn, M.A. Norko, S.S. O'Malley, G.D. Pearlson, I.L. Petrakis, M. Picciotto, M.N. Potenza, S.M. Powsner, D.M. Quinlan (*Emeritus*), R.M. Rohrbaugh, M.I. Rosen, R. Rosenheck, R.H. Roth, M. Rowe, G. Sanacora, M.J. Sernyak, N. Sestan (*Neuroscience*), R. Sinha, W.H. Sledge (*Emeritus*), D. Small, D.L. Snow (*Emeritus*), M. Sofuoglu, S.M. Southwick (*Emeritus*), J.S. Strauss (*Emeritus*), J.R. Taylor, J.K. Tebes, A.N. Van den Pol (*Neurosurgery*), C.H. Van Dyck, B.E. Wexler (*Emeritus*), S.W. Woods, K.A. Yonkers, H.V. Zonana

Associate Professors C. Abdallah, N. Addy, M. Alreja, H. Altalib (*Neurology*), M. Altemus, L. Anez, A. Annamalai, A. Anticevic, S.R. Axelrod, D. Barry, R. Belitsky, C.D. Bellamy, M. Bonarrigo, M. Chawarski, C. Connell (*Adjunct*), J.M. Cook, N.L. Cooney, P.R. Corlett, K.P. Cosgrove, C. Crusto, M.E. Delphin (*Adjunct*), J.C. Deviva, E. Diaz, C.C. Dike, E. Edens, J.A. Encandela, I. Esterlis, D.C. Fehon, J.M. Fiszdon, A. Forray, L. Fucito, M. Goldenberg, D.M. Gordon, M. Hampson (*Radiology & Biomedical Imaging*), I. Harpaz-Rotem, A.A. Heapy, T. Iheanacho, R. Kapoor, J.S. Kaufman, B. Kiluk, P.D. Kirwin (*Adjunct*), H. Kober, D.M. LaPaglia, P. Morgan, M. Paris, R.H. Pietrzak, C. Pittenger, A.N. Ponce, M. Prabhu, M. Ranganathan, S.G. Resnick, D. Ross, C.E. Sartor, P.D. Skosnik, M. Smith, V.H. Srihari, J.L. Steiner, T.H. Styron, N.E. Suchman, T.P. Sullivan, G. Tamagnan (*Adjunct*), C. Tek, J. Tondora, L.A. Trevisan, J. Tsai, F. Wang (*Adjunct*), N. Ward, M.A. White (*Public Health*), K. Wilkins, K. Xu, P. Zimbrean

Assistant Professors T. Adams, K. Ahn, S. Allsop (*Adjunct*), P. Amble, B. Arnaout, A. Bassir Nia, J.E. Beauvais, N. Beck, R.D. Beech, E. Berger, K. Budde, J. Cahill, N. Capurso, E.R. Carr, D.A. Cavallo, J. Check, A. Chekroud (*Adjunct*), L.G. Chepenik, A. Childs, Y. Chung (*Adjunct*), E.H. Connors, M. Conroy, E.B. Cooney, G. Coppola (*Child Study Center*), A.D. Dager, M. Davis, S. Decker, P.H. Desan, G. Dragoi, L.M. Edwards, Y. Feng, T.V. Fernandez, F. Fortunati, D. Foster, B. Fuehrlein, M. Garcia Vassallo, K.A. Garrison, P.Y. Geha, S. Gold, D. Greenfeld, P. Gruner, A. Gupta, S. Gupta, E.D. Hermes, G. Hermes, A. Hillmer, P. Ho, X. Hu (*Adjunct*), M.G. Hunt, V. Ivezaj, M. Jadi, A. Jordan, L.K. Kachadourian, R. Katz, A.S. Klee, K. Klingensmith, G. Kong, K.J. Koslosky, S. Kruger, J.F. Kulas, C. Kwan, J. Landau, L. Li, J. Lydecker, R. MacLean, W. Mathis, T.E. Matos Santana, D. Matuskey (*Radiology & Biomedical*

Imaging), A. Mecca, S. Meshberg-Cohen, H. Millard, R.A. Miller, K. Mohamed, J. Montalvo-Ortiz, D. Moore, J. Murray, S. Muvvala, M. Nakic, L. Oberleitner, C. Oleskey, C.L. Olezeski, S. Parida, S. Parke, H. Paxton, P.J. Petersen-Crair, D. Pilkey, R. Polimanti, J.M. Pollard, A. Powers, K. Preller (*Adjunct*), T. Rhee (*Adjunct*), S. Rumschik, K.A. Sabet (*Adjunct*), C.J. Schmidt, T. Schmutte, L. Schneeberg, D. Sebastian, J.J. Sellinger, D. Seo, H. Seo, R. Shenouda, M.A. Silva, L. Sippel (*Adjunct*), M. Stacy, H.R. Steinberg, M. Steinfeld, M.J. Strambler, T.S. Surti, T.C. VanDeusen, D. Vojvoda, T.D. Wasser, A. Westphal, I. Wiechers, S. Wilkinson, P.D. Worhunsky, S. Yip, G. Yoon, S. Zhang, Z. Zimolo

Instructors A. Allen, S. Brown, M. Comas, M. Desai, A. Fesharaki-Zadeh, A. Harper, B.M. Kitay, R. Radhakrishnan, M. Sherif

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Research Scientists N.R. Driesen, E. Flanagan, J.K. Johannesen, A. Kaffman, Y.S. Mineur, B.A. Moore, E. Ralevski, E. Stefanovics, B. Yang

Associate Research Scientists G. Angarita-Africano, L. Averill, R.D. Barnes, K. Bold, F.D. Buono, G.M. Chowdhury, J. Cortes-Briones, M. Costa, K.S. DeMartini, M. Demirtas, E.E. DeVito, A. DiFeliceantonio, M. Driscoll, C.H. Duman, S.N. Edmond, S.K. Fineberg, S. Groman, W. Han, M.G. Hatungil, S.E. Holmes, J.S. Ide, A. Imal, J.S. Jane, K.P. Jensen, W.J. Kasprow, B. Kelmendi, B. Lee, R. Liu, X. Luo, V. Milivojevic, K. Morie, B. Muppala, J. Noah, E.J. Nunes, E.E. O'Brien, A. Pavlo, G. Portnoy, H. Pushkarskaya, M. Raza, M. Seay, D. Sells, P. Simon, M. Staeheli, J. Trinko, T. Verplaetse, W. Wang, M. Wu, J. Xu, X. Zhang, S. Zhornitsky, H. Zhou, W. Zhou

Clinical Professors D.N. Berg, J. Phillips, L.W. Reiser

Associate Clinical Professors D. Fried, M. Mandelkern, M. Rubenstein

Assistant Clinical Professors S.L. Amen, E. Becker-Dunn, S.E. Bender, D. Bond, I. Burgos-Chapman, K. Croce, D. David, C. DeMaio, J.M. Doran, D. Epelbaum, S. Finkelstein, D.A. Fisk, T. Glinberg, A. Gonzales-Harsha, H. Gouta, N. Hamlett, M. Jean-Baptiste, A. Kaffman, S. Khan, B. Klink, J. Kremer, B. Lee, R.A. Litwin, H. Lizcano, G. Maloney, C.A. Markle, S.J. Migdole, R.M. Milstein, P.V. Mulinski, M. Niculete, Z. Qayyum, E. Rathbun, S. Ravven, A. Resnick, J. Scott, R. Sidaros, S. Silverstein, N. Smith, T. Straun, D.C. Tate, N.D. Thai, M. Whitson, K.M. Wrocklage

Clinical Instructors M. Bailey, V. Dubose, M. Ervin, C. Grazia, M.C. Grenough, C.M. Hunnicutt, R.L. Kieran, H. Kim, R. Lekwauwa, I. Moses, J.N. Rascati, J. Serra

Lecturers C. Atkins, J. Ballestas, C.M. Barber, J.L. Barron, N. Beesley, R.H. Berger, D. Berv, I. Bhalla, E. Brett, M. Campbell, C. Conrad, H.F. Crabbe, M. Cruza-Guet, G.H. Davis, A.R. Demac, C.E. Desmond, P.J. Dileo, P. Dillon, B. Earl, M. Emmanuel, S. Feuerstein, K.E. Gersick, J. Giard, S. Goodson, J.B. Gordon, G. Greenberg,

C. Gulrajani, H. Hamer, J. Hannan, K. Hathaway, K. Hefner, B. Hopkins, S.J. Houlding, D. Howe, R. Juaneza, M.A. Kalacznik, A. Kalafa, J.P. Kimmel, A. Kingston, B.C. Klein, J. Klugman, A. Koleszar, K.K. Krusong, A.L. Labruzza, L. Lager, L.M. Lothstein, J.J. Magnavita, R.B. Makover, A. Manhapra, K. Marcus, A. Massa, A.W. Meisler, D. Mender, J. Meyer, J. Meyers, M. Mitchell, N.V. Mohatt, D.C. Moore, M. Moscarelli, L. Nathan, E. Neeley, K.F. Nuro, M. O'Malley, M. Oliva, M.J. Orlosky, A. Otzel, J.M. Palumbo, A. Papsun, E. Peters, J.M. Pisciotta, P. Rehmer, W. Reich, E. Renaud, J. Reynolds-Kaye, E.B. Rubin, D. Sakheim, S.L. Satel, R. Scherman, A.J. Sholomskas, R. Sirken, H. Smith, S.I. Tarbox-Berry, P.F. Thomas, G. Valentine, P.J. Whang, C. Yang, H. Yarosh, A. Yusim, R. Zhong, J.R. Zigun

Clerkship

Biopsychosocial Approach to the Patient Clerkship This twelve-week integrated clerkship comprises a six-week rotation in primary care and a six-week rotation in psychiatry. During the six-week primary care component, students spend 5–6 half-days each week working in a practice for adult primary care (i.e., general internal medicine, family medicine, or combined medicine/pediatrics) and 2–3 half-days each week working in a practice for general pediatrics. The psychiatry component of the clerkship includes three weeks of inpatient psychiatry, three weeks of consultation-liaison or emergency psychiatry, and six half-day sessions in a longitudinal outpatient psychiatry or integrated primary care–psychiatry clinic. Primary care and psychiatry each have distinct classroom exercises. However, an integrated classroom curriculum brings students together each Thursday afternoon to explore the many topics that overlap primary care and psychiatry, including mood disorders, anxiety disorders, substance abuse, somatic symptom disorder, and pain. Directors: P. Ellis, K.M. Wilkins; Associate Directors: A.M. Fenick, M. Goldenberg

Electives

Addiction Psychiatry Elective An elective clinical training experience in addiction psychiatry for third- and fourth-year students. The primary training site is the Detoxification and Addiction Stabilization Service at the VA Connecticut Healthcare System in West Haven. Students learn about performing detailed initial evaluations; treating alcohol, opioid, and benzodiazepine withdrawal; initiating medication-assisted treatment; providing opioid overdose education and naloxone distribution, providing smoking cessation treatment, utilizing psychosocial interventions and mutual help, as well as the principles of harm reduction; and addressing psychiatric and medical comorbidities. The rotation includes a discussion of relevant readings. Prerequisite: required Psychiatry clerkship. One student every four weeks. Director: R.M. Rohrbaugh

Adolescent Psychiatry Elective The purpose of this elective is to provide fourth-year medical students interested in child and adolescent psychiatry and/or adolescent medicine an experience in working with adolescents presenting with acute psychiatric illness. The elective is based on the adolescent inpatient unit at Yale New Haven Psychiatric Hospital, a short-term fifteen-bed unit serving patients aged 12–18. Students gain exposure to a diverse patient population with severe mood, psychotic, behavioral, and/or

substance use disorders, as well as begin to understand the intricacies of working with families and systems providing care for adolescents with significant emotional and/or behavioral disturbances. Teaching activities include daily rounds and weekly case conferences. Prerequisite: required Psychiatry clerkship. One student every four weeks. Director: R.M. Rohrbaugh

Child Study Center Clinical Research Elective This elective entails etiology, clinical manifestations, and treatment of adolescent psychopathology, including eating disorders, depression, suicide, psychosis, delinquency, and the impact of physical and mental disabilities on adolescent development. Reading is supplemented with live and taped clinical material. One student every four weeks. Director: A.S. Martin

Child Study Center Elective The aim of this elective is to provide the student with an intensive experience in infant, child, and adolescent psychiatry. The curriculum includes assessments of normal development and psychopathology in childhood, treatment methods, and research in major disorders of childhood. Students are active team members of the Children's Psychiatric Inpatient Service (CPIS) and the consultation service to the pediatric wards of Yale New Haven Hospital and can take advantage of the wide range of ongoing seminars, conferences, and clinical services in place at the Child Study Center. Teaching methods include seminars, conferences, field observations, ward rounds, and practicals selected by the student following consultation with the director of medical studies and the Child Study Center. One student every four weeks. Director: R.M. Rohrbaugh

Clinical Neuroscience Research Unit Elective This elective offers senior medical students the opportunity to work closely with a variety of patients who are hospitalized during their participation and treatment in research protocols. The Clinical Neuroscience Research Unit (CNRU) is a thirteen-bed inpatient ward with associated outpatient clinics and basic science laboratories on the third floor of the Connecticut Mental Health Center (CMHC). Supervised implementation of novel psychopharmacology, exposure to multiple aspects of clinical and basic science research, and in-depth experience with individual and group psychotherapies are educational aspects of this elective. Patients' diagnostic categories include depression, obsessive-compulsive disorder, schizophrenia, cocaine abuse, substance abuse, and psychiatric genetics. Prerequisite: required Psychiatry clerkship. Open to fourth-year students only. One student every four weeks. Director: R.M. Rohrbaugh

Early Psychosis Elective (STEP Clinic) STEP (Specialized Treatment Early in Psychosis) is a multidisciplinary team-based treatment for individuals presenting early in the course of a psychotic illness. This clinic offers unique opportunities in the assessment and treatment of a population that is difficult to access in other clinical settings. Students have the opportunity to observe structured research assessments and interpretation of these scales in light of careful clinical follow-up. Given the diagnostic and prognostic heterogeneity of illnesses presenting with psychosis, this experience provides the opportunity to develop clinical expertise in diagnosis and management of a range of mental health issues. The enriched treatment includes cognitive-behavioral group therapy, family psycho-education groups, and cognitive remediation in addition to vocational support

with a focus on rapidly reintegrating patients back to age-appropriate social, educational, and employment goals. Students have the opportunity to observe or participate in any of these treatments. The multidisciplinary and pluralistic nature of the intervention presents a rich opportunity to participate in collaborative care with other mental health disciplines. Students can also participate in regular seminars sponsored by the STEP and PRIME (Prevention through Risk Identification, Management, and Education) clinics. The latter is a research clinic focused on prodromal psychosis. STEP is designed as a service delivery model with a built-in observational cohort and experimental pragmatic randomized controlled trial. Students are invited to take an active role in the various domains of scholarship including community and clinician education efforts, publication, and learning about clinical research design. This experience *must* be paired with a main placement at one of the available elective inpatient services. Prerequisite: required Psychiatry clerkship. Open to fourth-year students only. One student every four weeks. Director: R.M. Rohrbaugh

Forensic Inpatient Psychiatry Elective This elective at Whiting Forensic Hospital exposes students to a variety of elements of mental health and medical care for forensically hospitalized individuals with severe mental illness and substance use disorders. Students learn about and actively participate in the longitudinal inpatient care for individuals in Connecticut who are found not guilty by reason of insanity (NGRI) and not competent to stand trial, in both high-security and enhanced (medium) security psychiatric treatment environments. Students also have the chance to observe hearings for individuals found NGRI before the state's Psychiatric Security Review Board. Students with a particular interest in the medical care of forensic populations also have an opportunity to work with the hospital's internists to provide the patient's primary medical care. Students with an interest in administration and leadership in health care also have an opportunity to work with the hospital medical director to better understand the elements of leadership, policy development, and hospital management inherent in overseeing the operations of a large, state-operated forensic psychiatric hospital. Four-week rotation. Director: T.D. Wasser

Law and Psychiatry Elective This elective affords opportunities for third- and fourth-year students to observe and participate in "competency to stand trial" evaluations with a clinical team that makes these assessments at the New Haven Correctional Center. In addition, they may attend Law School classes with students who represent psychiatric patients, observe civil commitment procedures, and attend probate court hearings as well as the criminal proceedings in local New Haven Superior Courts. Students attend work seminars where case evaluations and write-ups are discussed and prepared, and read appropriate legal cases and psychiatric literature. Students may be able to participate in parts of evaluations of insanity defense, custody determination, and other forensic issues. They attend the Law and Psychiatry seminar during their rotation. Prerequisite: required Psychiatry clerkship. One student every four weeks. Director: R.M. Rohrbaugh

Mood Disorders and Neuromodulation Elective (ECT and TMS) This elective offers senior medical students the opportunity to learn about neuromodulation techniques in the treatment of mood disorders, more specifically, by using electroconvulsive therapy

(ECT) and repetitive transcranial stimulation (TMS). Students learn the theoretical basis for the use of ECT and TMS, among other neuromodulation techniques, in the treatment of mood disorders. They learn indications and contraindications to treatment, the process of evaluation of patients prior to and during treatment (including use of standardized depression rating scales), how to monitor for complications and side effects to treatment, and the latest research in the field. Students work closely with psychiatry attending physicians and residents at the VA in the evaluation of patients referred for ECT and TMS, and have the opportunity for supervised participation in the performance of these treatments. Patient population includes veterans of all ages with a variety of psychiatric conditions, including mood disorders with comorbid anxiety and substance use disorders. Prerequisite: required Psychiatry clerkship. One student every four weeks. Director: R.M. Rohrbaugh

Psychiatric Care at Hispanic Clinic of CMHC This elective is focused on the provision of outpatient mental health services for monolingual Latino communities in the United States and covers three main themes: (1) clinical assessment and conceptualization: culturally specific and linguistically appropriate clinical skills including interviewing, diagnosis, and formulation of a recovery-oriented treatment plan that includes psychopharmacology and psychotherapy; (2) systems-based practice: understanding the impact of community-academic partnerships and the characteristics of a culturally responsive behavioral health system of care for Hispanics; and (3) recovery-oriented care: culturally sensitive approaches to recovery from mental illness. Clinical interviewing techniques are reviewed with an emphasis on the Latino culture, and students have opportunities to practice these skills. Students initially observe crisis consultations and eventually perform supervised evaluations followed by presentations in weekly clinical rounds. Students become familiar with the Connecticut State Department of Mental Health Recovery Initiative and attend meetings of the Connecticut Latino Behavioral Health System to learn about the expansion of local culturally sensitive behavioral health services, and about progress, challenges, and outcomes. Students review and present summaries of assigned readings of mental health services, the challenges facing minority communities, and the best practices to address them. Stigma, implicit bias, health disparities, the social determinants of mental health, recovery from mental illness, and advocacy are the main subjects for review. Prerequisite: required Psychiatry clerkship. One student every four weeks. Director: R.M. Rohrbaugh

Psychiatric Emergency Room Elective, VA Connecticut Healthcare System This two-week elective experience exposes students to the management of complex and high-risk veterans who present to the psychiatric emergency room (PER). Students learn basic skills in obtaining a thorough history, including the difficult topics of suicidality, homicidality, substance use, and homelessness. Students learn basic skills in crisis management, acute substance intoxication and withdrawal, and comprehensive risk assessments. Students function within the larger team of professionals and learn the importance of a team-based approach to patient care. Prerequisite: completion of the preclinical medical school curriculum and the core clinical clerkships. One student every two weeks. Director: R.M. Rohrbaugh

Psychiatry Inpatient Elective (CMHC) This elective includes intensive work with inpatients who suffer from major psychiatric disorders with or without substance abuse. Emphasis is on assessment, acute treatment, and arrangement of continuing care in the community. The student functions as an integral member of a multidisciplinary treatment team. Clinical research participation is encouraged. Opportunities are available to explore special areas of interest (e.g., forensics, psychopharmacology, administration) with CMHC faculty. Prerequisite: required Psychiatry clerkship. Open to fourth-year students only. One student every four weeks. Director: R.M. Rohrbaugh

Psychiatry Inpatient Elective (YNHH/YPH) This elective includes intensive work with patients who suffer from major psychiatric disorders and range in age from college students to middle age. Emphasis is on assessment, acute treatment, and arrangement of post-discharge follow-up care in the community. The student is an advanced clerk functioning as a member of the multidisciplinary treatment team, taking on primary clinician and psychiatric/medical responsibilities for patients under the supervision of senior clinicians. The elective is given on the inpatient service at the Yale New Haven Psychiatric Hospital; clinical research and outpatient involvement may be options. Prerequisite: required Psychiatry clerkship. Open to fourth-year students only. One student every four weeks. Director: R.M. Rohrbaugh

Psychological Medicine Elective In this elective, post-clerkship students are exposed to a variety of patients with psychiatric symptoms who are hospitalized in the general hospital and/or present to outpatient medical clinics. The students are assigned to either the Behavioral Intervention Team (BIT), a multidisciplinary team that works proactively providing timely, appropriate, and effective patient care in the internal medicine floors, or the Psychiatric Consultation/Liaison Service, which provides psychiatric consultation in the different specialty sites including ICU, surgery, OBGYN, and neurology. Students also spend time in an outpatient experience in the Nathan Smith Clinic, where their clinical learning focuses on HIV psychiatry and addictive disorders. During this clinical elective, students enhance their interview skills, learn the process of consultation/liaison in the different treatment settings, and enhance their core psychiatric knowledge and skills with a focus on content at the interface of medicine and psychiatry. They participate in teaching sessions provided by the attendings and fellows and are expected to attend the service's clinical conferences and to present cases in morning rounds. Prerequisite: required Psychiatry clerkship. One student every four weeks. Director: T. Matos Santana

Subinternships

Clinical Neuroscience Research Unit Subinternship (CNRU) The Clinical Neuroscience Research Unit (CNRU) is a specialized service dedicated to the diagnosis, treatment, and research of neuropsychiatric disorders. The unit consists of an inpatient service, as well as outpatient specialty clinics for addictive, depressive, obsessive-compulsive, psychotic, and women's behavioral health disorders. Most patients voluntarily participate in clinical research studies designed to determine the neurobiological mechanism underlying these disorders. Pharmacotherapy, individual psychotherapy, group therapy, and behavior therapy are provided as clinically indicated and are free of charge to patients. Students function as high-level clinical care providers and are an integral part of the

treatment team. The subinternship occurs on the CNRU of the Connecticut Mental Health Center. Prerequisite: required Psychiatry clerkship. Open to fourth- and fifth-year students only. One student every four weeks. Director: R.M. Rohrbaugh

Psychiatric Emergency Room Subintership (VACHS) Students build skills and have an increasing level of responsibility for direct patient care. Students take a primary role in caring for patients, with direct supervision from chief residents and attending physicians; and they act as role models and mentors for MS3 students who will be rotating simultaneously. By the end of the rotation, students should be confident with supervised but independent management of complex psychiatric patients. Prerequisite: completion of the preclinical medical school curriculum and the core clinical clerkships. One student every four weeks. Director: R.M. Rohrbaugh

Psychiatry Inpatient Subinternship (CMHC) Intensive work with inpatients who suffer from major psychiatric disorders with or without substance abuse and who have significant social challenges often including lack of access to stable housing, work, and health care insurance. Emphasis is on assessment, acute treatment, and arrangement of continuing care in the community. The student functions as an integral member of a multidisciplinary treatment team and serves as the primary clinician for four to five patients. The subinternship occurs on the inpatient service (4th floor) of the Connecticut Mental Health Center (CMHC). Prerequisite: required Psychiatry clerkship. Open to fourth- and fifth-year students only. One student every four weeks, May through October only. Director: R.M. Rohrbaugh

Psychiatry Inpatient Subinternship (YNHH, WS-2) Intensive work with patients who suffer from major psychiatric disorders and range in age from college students to middle age. Most patients have access to health care insurance or have Medicare and/or Title XIX. Emphasis is on assessment, acute treatment, and arrangement of post-discharge follow-up care in the community. The student is an advanced clerk functioning as a member of the multidisciplinary treatment team, taking on primary clinician and psychiatric/medical responsibilities for patients under the supervision of senior clinicians. The subinternship occurs on the general adult inpatient service at the Yale New Haven Psychiatric Hospital. Prerequisite: required Psychiatry clerkship. Open to fourth- and fifth-year students only. One student every four weeks, May through October only. Director: R.M. Rohrbaugh

PUBLIC HEALTH

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Professors S. Aksoy, H.G. Allore (*Medicine*), F. Altice (*Medicine*), P. Anastas, M. Armstrong (*Emeritus*), R.S. Baltimore (*Pediatrics*), S.L. Bernstein (*Emergency Medicine*), M.S. Bogucki (*Emergency Medicine*), M.B. Bracken (*Emeritus*), C.A. Brandt (*Emergency Medicine*), R. Bucala (*Medicine*), S.H. Busch, M. Cappello (*Pediatrics*), E.B. Claus, P.D. Cleary, L. Curry, L. Dembry (*Medicine*), V.T. DeVita (*Medicine*), A.B. Du Bois (*Emeritus*), R.D. Dubrow, J. Dziura (*Emergency Medicine*), D.A. Fiellin (*Medicine*), E. Fikrig (*Medicine*), D. Fish (*Emeritus*), H.P. Forman (*Radiology & Biomedical Imaging*), M. Friesen (*Adjunct*), C.S. Fuchs (*Medicine*), A.P. Galvani, T.M. Gill (*Medicine*), P. Glazer (*Therapeutic Radiology*), C.P. Gross (*Medicine*), R. Hecht, R. Heimer, T.R. Holford, S.M. Horwitz (*Emerita*), J.R. Ickovics, S. Inayat-Hussain (*Adjunct*), M.L. Irwin, J.F. Jekel (*Emeritus*), A.C. Justice (*Medicine*), T. Kershaw, A.I. Ko, H.M. Krumholz (*Medicine*), B.P. Leaderer, L.S. Levin (*Emeritus*), B.R. Levy, J.H. Lichtman, E.D. Louis (*Neurology*), S.Ma, X. Ma, R.W. Makuch, L.E. Marks (*Emeritus*), D. McMahon-Pratt (*Emeritus*), I.G. Miller (*Pediatrics*), L.M. Niccolai, A.D. Paltiel, C.L. Patton (*Emeritus*), P.N. Peduzzi, R. Perez-Escamilla, M.M. Pettigrew, C. Redlich (*Medicine*), H.A. Risch, L.S. Robertson (*Adjunct*), R. Rosenheck (*Psychiatry*), N.H. Ruddle (*Emerita*), M.B. Russi (*Medicine*), M.J. Schlesinger, E.D. Shapiro (*Pediatrics*), J.L. Sindelar, A.N. Sofair (*Medicine*), D. Spiegelman, J. Stitt (*Emeritus*), J.A. Stolwijk (*Emeritus*), J. Sweasy (*Therapeutic Radiology*), J.K. Tebes (*Psychiatry*), G.H. Tignor (*Emeritus*), M.E. Tinetti (*Medicine*), J.P. Townsend, C. Tschudi, P. Varkey (*Medicine*), V. Vasiliou, S.H. Vermund (*Dean*), E. Weiderpass (*Adjunct*), K.A. Yonkers (*Psychiatry*), D. Zelterman, H. Zhang, H. Zhao

Associate Professors M.M. Ciarleglio, T. Cohen, Z.N. Cooper, F.W. Crawford, J.L. Davis, M.M. Desai, A.T. Dewan, E. Edelman (*Medicine*), D.A. Esserman, J.J. Hoh, M. Juthani-Mehta (*Medicine*), K. Khoshnood, N. Kleinstreuer (*Adjunct*), H. Lin, J.E. Monin, R.R. Montgomery (*Medicine*), T.E. Murphy (*Medicine*), J.E. Pachankis, E. Paintsil (*Pediatrics*), S. Parikh, R.H. Pietrzak (*Psychiatry*), V. Pitzer, J.S. Ross (*Medicine*), J. Sherman (*Anesthesiology*), M. Smith (*Medicine*), M.V. Smith (*Psychiatry*), S. Wang, Z. Wang, D.M. Weinberger, M.A. White, Y. Zhang (*Surgery*), Y. Zhu

Assistant Professors A. Bei, X. Chen, J. Chu (*Medicine*), N.C. Deziel, E. Donroe (*Medicine*), L. Ferrucci, D. Foster (*Psychiatry*), A.S. Friedman, S. Geballe, G. Gonsalves, N. Grubaugh, N.L. Hawley, C. Johnson, A.M. Jukic (*Adjunct*), M. Kane, D.E. Keene, M. Levine (*Pathology*), Z. Liew, A.M. Miller, C.D. Ndumele, K. Pollitt, Y. Ransome, J.L. Schwartz, V. Shabanova (*Pediatrics*), F.M. Shebl (*Adjunct*), J. Wallace, J.D. Wallach, P. Wang, J.L. Warren, S.D. Whirledge (*Obstetrics, Gynecology & Reproductive Sciences*), R. Yaesoubi, X. Yan (*Medicine*), C. Yeckel, X. Zhou

Instructors D.L. Humphries, W. Wei

Senior Research Scientists M. Bracken, B. Cartmel, A.J. Davidoff, G.H. Friedland (*Medicine*), J.F. Gent, R. Gueorguieva, P.J. Krause, L.E. Munstermann

Research Scientists L. Calvocoressi, Y. Chen, S. Cunningham, F. Dai, L.E. Grau, H. Huang, B. Jones, N.G. Kolev, Y. Kong, E. Leifheit, L. Lu, H. Qian, N. Sun, R. Wang, B.L. Weiss

Associate Research Scientists J. Alfaro-Murillo, M. Armstrong-Hough, R.C. Barbour, M. Brault, G. Buccini, C. Burton, E. Buta, G. Charkoftaki, K. Duffany, S. Gaffney, J. Golla, E. Greene, K.L. Harding, R. Hernandez Ramirez, A.J. Hromi-Fiedler, M. Islam, T. Kyriakides, L. Liu, A. Nkouawa, A. Pandey, G. Peng, A. Pomer, S. Suttiratana, A. Vigneron, Z. Wang, E. Wunder, C. Yang

Clinical Professor J.F. Anderson

Associate Clinical Professor D. Shenson

Assistant Clinical Professors Y. Tuakli-Wosomu, M. Wininger

Lecturers C. Austin, D. Aye, D. Banach, A. Boissevain, M. Borgstrom, E. Bortnichak, M. Callaway, P. Canny, B. Cartmel, J. Childs, K. Conlon, R. D'Aquila, M. Dale, A.S. Darefsky, H. Dove, K. Duffany, J. Hamblin, I. Herz Kaminski, B. Jones, P. Krause, S. Kumar, M. Lee, J. Mantopoulos, Z. McNatt, M.A. Pascucilla, C. Petit, C. Roser-Renouf, J. Scheeren, M. Slade (*Medicine*), J.P. Smith, R.S. Stahl (*Surgery*), J. Stolwijk, M.H. Stowe (*Medicine*), K. Timm, P.H. Van Ness (*Medicine*), B.L. Weiss, Y. Wong, E. Wunder

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RADIOLOGY AND BIOMEDICAL IMAGING

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Professors J.J. Abrahams (*Emeritus*), H. Blumberg (*Psychiatry*), S. Bokhari, R.A. Bronen, M.I. Burrell, R.E. Carson, R.T. Constable, A.M. Curtis (*Emeritus*), R. de Graaf, J.S. Duncan, H.P. Forman, M.G. Glickman (*Emeritus*), T.R. Goodman (*Chair*), A.H. Haims, Y.H. Huang, D. Hyder, G.M. Israel, M.H. Johnson, L.D. Katz, E. Kier (*Emeritus*), H. Kim, J.P. Lawson (*Emeritus*), G.F. Mason, S.M. McCarthy (*Emeritus*), B.L. McClennan (*Emeritus*), E.D. Morris, X. Papademetris, L.E. Philpotts, J. Pollak, A.T. Rosenfield (*Emeritus*), D.L. Rothman, L.M. Scoutt, C. Shaw (*Emeritus*), L.H. Staib, G. Sze, H.D. Tagare, I. Tocino, F.J. Wackers (*Emeritus*), J.C. Weinreb, R.I. White (*Emeritus*)

Associate Professors M. Chen, M.A. Choma (*Adjunct*), I. Cortopassi, K.P. Cosgrove (*Psychiatry*), R.K. Fulbright, G. Galiana, G. Gunabushanam, M. Hampson, R.J. Hooley, K.M. Johnson, C. Liu, A. Malhotra, C.C. Matouk (*Neurosurgery*), C.R. Miller, E.J. Miller (*Medicine*), H.R. Mojibian, A. Mustafa, J.A. Obando, J.K. Pahade, D.C. Peters, D. Pucar, A.N. Rubinowitz, C.J. Silva, C.R. Taylor

Assistant Professors L. Andrejeva, M.H. Arici, R.R. Ayyagari, A. Bader, L.A. Baldassarre (*Medicine*), A. Boustani, B. Branson, J. Brown (*Adjunct*), R. Butler, Z. Cai, T. Carroll, P.A. Cedeno, D. Coman, M. Conti, F. Czeyda-Pommersheim, M. Davis, H. De Feyter, P. DiDomenico, B.J. Dillon, J. Donahue, M.A. Durand, M. Dvornek, L. Ehrlich, M. Etesami, M. Ferrante, S. Finnema (*Adjunct*), C. Gange, J. Geisel, R. Gil (*Adjunct*), A. Hillmer, L.J. Horvath, M. Hovnanian, S. Huber, I. Ikuta, K. Kaliannan, R.H. Kent, J. Killam, J.D. Kirsch, M. Kulon, I. Latich, J. Lee, P.H. Levesque, A.W. Lischuk, A. Mahajan, S. Mahalingam, A.G. Marino, S. Marlatt, B. Marquez-Nostra, M. Mathur, D. Matuskey, R.D. Messina, J. Mezrich, F.J. Minja, S. Payabvash, J.L. Perez Lozada, N.H. Petersen (*Neurology*), M. Raghu, B. Rao, M.V. Revzin, E. Rowe, L.A. Saperstein, D. Scheinost, T. Schlachter, L.S. Sheiman, D.D. Silin, M. Spektor, P. Varma, A. Wang, V.M. Zohrabian, W.B. Zucconi

Instructors P. Aiello, C. Colton, P. Himelfarb, G. Riccio, G. Russo

Research Scientists F. D'Errico, N. Nabulsi

Associate Research Scientists J. Bini, F. Bonnet, D. Casetti, J. Chapiro, J. Gallezot, B. Ganganna, P. Herman, L. Jiang, Y. Koush, D.C. Labaree, S. Li, K. Lim, Y. Lu, M. Naganawa, J. Onofrey, M. Qiu, M. Rance, J.R. Ropchan, X. Shen, T. Toyonaga, B. Wu, J. Wu, Y. Ye, M. Zheng

Clinical Professor M.S. Shin

Associate Clinical Professor T.R. McCauley

Assistant Clinical Professor M. Rolen

Instructors G.J. Conlogue, M.E. Zawalich

Electives

Diagnostic Radiology Clinical Elective This elective introduces students to the basic principles of radiologic imaging and interpretation necessary for clinical management. Students rotate through one-week blocks on the Chest, Musculoskeletal (MSK), and GI/GU services as well as the radiology section of the Emergency Department (ED), with the goal of learning the fundamentals of interpreting plain films. The emphasis on the Chest service is the interpretation of plain films seen in the ICU and imaging related to acute and chronic chest pathology. On the MSK service, emphasis is on interpretation of fractures, plain film findings of bone disease, and postoperative imaging. On the GI/GU service, students observe and participate in fluoroscopic gastrointestinal studies and their interpretation. The ED rotation exposes students to the wide array of imaging performed through the ED including trauma. Students are also exposed to more advanced imaging modalities (CT, ultrasound, and MRI). Students are paired with a dedicated resident on their weekly rotations and also participate in readouts with attending radiologists. Students are taught relevant radiologic anatomy and the appropriateness of ordering various studies in the diagnosis of disease; they are also exposed to what the performance of various studies entails. Students may tailor the rotations to specific interests within radiology (e.g., ultrasound, mammography, interventional radiology, neuroradiology, nuclear medicine). Students attend the twice daily departmental resident lectures and weekly medical student radiologic lectures, as well as at least two core introductory lectures in each subspecialty. Self-teaching material is available online, and students are expected to review this during each of their weeks. There are no call responsibilities, although students have the option of participating in evening shifts in the ED to gain more experience and broader exposure to this busy service. At the conclusion of the elective, each student gives a short presentation of an interesting case with discussion of relevant imaging. Maximum of six students every four weeks. Director: J.D. Kirsch; Associate Director: J. Killam

Diagnostic Radiology Clinical Elective (VA) Students work with an attending physician in general or cross-sectional radiology and develop skills in basic plain film interpretation, ultrasound, computed tomography, and GI/GU radiology. In addition, students build basic skills in identifying abdominal anatomic structures using ultrasound, and basic ultrasound scanning techniques. Rotations include body CT, body MRI, MSK, neuroradiology, and nuclear medicine (which will include PET CT). During assignments to chest radiology and body CT/MRI rotations, students learn basic CT anatomy of the thorax, abdomen, and pelvis. Students are encouraged to begin independent study of topics in the core curriculum using recommended reading materials. One student every two weeks. C.R. Taylor

Neuroradiology Elective This rotation is designed as an introduction to neuroradiology. The student becomes an integral part of the neuroradiology team, which consists of the resident, fellow, and attending physician. This elective is somewhat different from others in that there is less "hands-on" activity and more observation, and it tends to be more self-motivated and self-directed. Students are encouraged and expected to interact during readouts by asking questions and being involved. They are also encouraged to

review cases on their own prior to readout. By the end of the elective, students should be familiar with the normal radiographic anatomy of the brain, spine, and head and neck, and they should have developed a systematic approach to interpreting CTs and MRIs of this region as well as recognizing basic pathology. Students are also exposed to the various subsections of neuroradiology including brain, spine, head and neck, pediatrics, etc. Upon request, those interested may also be exposed to special procedures including image-guided biopsies, myelography, angiography, and neurointerventional procedures. An interactive PowerPoint program covering neuroradiology is provided, and there are also teaching aids on the neuroradiology website. A number of teaching conferences are offered. One or two students every two or four weeks. Director: A. Malhotra

Pediatric Imaging Clinical Elective This elective serves as an introduction to the clinical management of infants, children, and adolescents through the use of integrated diagnostic imaging. Students participate through a review of imaging studies with residents and attending physicians; observation of fluoroscopic, ultrasound, and computed tomography (CT) procedures; and attendance at daily clinical conferences. Students are encouraged to present interesting cases or to participate in research projects during the elective. One or two students every two or four weeks. Director: L. Ehrlich

Vascular and Interventional Radiology Elective This two-week elective is an introduction to vascular and interventional radiology: the use of radiological imaging to guide procedures in various organ systems of the body and the evaluation and management of patients who are candidates for these. In the vascular system, this includes arterial and venous angiography, angioplasty, stenting, embolization for bleeding, tumors (such as uterine fibroids), vascular malformations, venous reflux management, inferior vena cava filter placement, hemodialysis access management, and placement of a variety of venous access devices. Nonvascular experience includes percutaneous approaches to biliary and urinary track pathology, drainage of abscesses and other fluid collections, and tumor ablation. Students participate in the interventional radiology clinic and admitting service. One student every two weeks; a tailored rotation is available. Director: I. Latich

Subinternship

Interventional Radiology Subinternship This subinternship is designed for students interested in pursuing a career in interventional radiology, but also for those interested in diagnostic radiology, surgical specialties, and other fields that interact intimately with interventional radiology such as urology, transplant surgery, oncology, and hepatology, among many others. Students participate in a wide spectrum of interventional procedures, which include body systems spanning human anatomy from head to toe. In the vascular system, these include arterial and venous angiography, angioplasty, thrombolysis, and stenting; embolization for bleeding; tumor treatments (chemoembolizations, radioembolizations); vascular malformation and venous reflux management; inferior vena cava filter placement and retrieval; management of portal hypertension (TIPS, BRTO); and hemodialysis access management and placement of a variety of venous access devices, such as ports, hemodialysis, and medication infusion catheters. Nonvascular procedures include image-guided biopsy and tumor ablation; percutaneous

approaches to gastric, biliary, and urinary track pathology; and drainage of abscesses and other fluid collections. In addition to engaging actively in procedures, students participate in the pre- and postprocedural evaluation of patients in the clinic setting, engage in the postprocedural care of admitted patients, and rotate on the interventional radiology consult service, at times carrying the IR consult pager. Educational components include weekly IR lectures, weekly peripheral vascular multidisciplinary conferences, and weekly liver tumor board meetings. Students are expected to take approximately one weeknight call per week and one weekend call during the rotation. Prerequisite: completion of all required clerkships. One or two students every four weeks. Director: I. Latich

SURGERY

FMB 102, 203.785.6763
https://medicine.yale.edu/surgery

Professors N. Ahuja (*Chair*), S. Ariyan (*Emeritus*), L.M. Bartoshuk (*Emeritus*), D.J. Boffa, S. Bokhari (*Radiology & Biomedical Imaging*), M.G. Caty, A.B. Chagpar, A. Dardik, K.A. Davis, F.C. Detterbeck, S.J. Dudrick (*Emeritus*), C.C. Duncan (*Neurosurgery*), J.A. Elefteriades, S.H. Emre, R.N. Formica (*Medicine*), J.P. Geibel, B.G. Green, R.J. Gusberg (*Emeritus*), B. Kinder (*Emeritus*), G.S. Kopf, D.R. Lannin, D.J. Leffell (*Dermatology*), W.E. Longo, L.M. Manuelidis, D.C. Mulligan, J.A. Persing, L. Rizzolo, S.H. Rosenbaum (*Anesthesiology*), R.A. Rosenthal, R.R. Salem, J. Santos-Sacchi, C.T. Sasaki, B. Sumpio, G. Tellides, J.G. Thomson, R.J. Touloukian (*Emeritus*), R. Udelsman (*Emeritus*)

Associate Professors P.N. Bonde, G.G. Callender, T. Carling, C.H. Cha, O. Colegio (*Dermatology*), R.A. Cowles, A. Duffy, A. Geirsson, H. Hsia, B. Judson, B. Killelea, S. Kulkarni, A. Liapakis (*Medicine*), F.Y. Lui, L.L. Maerz, R. Manes, A.A. Mangi, A. Maung, E. Michaelides, M.F. Perkal, K.E. Roberts, M. Schilsky (*Medicine*), K. Schuster, D.M. Steinbacher, W.B. Stewart, P. Yoo, Y. Zhang

Assistant Professors A. Ali, M. Alperovich, T. Avraham, R. Batra, R. Becher, D.M. Bertoni, B. Bhattacharya, M.S. Bianchi, J. Blasberg, L.M. Bow, J. Cardella, E. Christison-Lagay, J. Clune, U. Darr, M.L. Dewar, H. Einarsdottir, S. Ghiassi, C. Gibson, D. Haakinson, D.M. Hildrew, N. Horowitz, D.C. Johnson, S.A. Khan, Y. Lee, M. Malinis (*Medicine*), V. Mase, S. Mehra, G. Nadzam, C. Ochoa Chaar, K. Olino, K. Oliveira, H. Osborn, D. Ozgediz, T.S. Park, M. Pronovost, A. Prsic, R. Rahmati, V. Reddy, M. Sion, D. Solomon, D.H. Stitelman, G. Tietjen, E. Waldman, N. Young, P. Zimbrean (*Psychiatry*)

Instructors K. Bruckman, C.A. Dinauer, J.L. Earles, G. Klimovich, E. Lane, J.F. Passarelli, Y. Polyatskaya, G. Yavorek

Senior Research Scientist R. Korah

Research Scientist L. Qin

Associate Research Scientists B.C. Dash, N. Hasan, G. Li, T. Lysyy, K. Nalamada, S. Ono, A.A. Surguchev, R. Taniguchi, D.P. Vangeli, B. Yatsula, B. Ziganshin

Clinical Professors J.E. Fenn, R.S. Stahl

Assistant Clinical Professor M.K. O'Brien

Lecturers L. Acton, B.C. Fichandler, N.M. Hewitt, J. Hopper, L. Lazarus, J. Mendes, S.B. Michaelides, M. Narron, H.L. Warner, X. Yao

Clerkship

Surgical Approach to the Patient Clerkship This twelve-week integrated clerkship includes surgery (six weeks, general; three weeks, specialties) and emergency medicine (three weeks) clinical components. Throughout the clerkship students participate in integrated experiences that address themes of the OR experience such as perioperative care, emergency/trauma management, procedures, medical error and patient safety, and anesthesiology. Students also participate in a twelve-week mentoring program during the clerkship. Directors: J. Bod, F. Liu; Associate Directors: C. Gibson, D. Stitelman

Electives

Burn Surgery Elective (Bridgeport Hospital) This rotation provides intensive exposure to the care of the acutely burned patient: surgical and nonsurgical care, critical care, and outpatient wound care. Large burn injuries evoke the most severe critical illness known to medicine. Patients with such injuries are unstable for prolonged periods of time and require responsive and attentive critical care. The student participates in this care, including procedures performed in the burn intensive care unit. Assessment of burn depth and the prognosis for wound healing are often far from straightforward, and the student participates in this assessment process with the rest of the team, learning to gauge depth and prognosis via examination of multiple patients. Operative therapy for burns includes excisional debridement and often split-thickness skin grafting, but there are multiple choices to be made in providing optimal care to a particular patient. The student learns the rudiments of this decision-making process and is an active participant in all operations performed by the burn team. One student every four weeks. Director: A. Savetamal

Cardiac Transplantation/Cardiac Assist Device Elective Intensive exposure to laboratory and clinical aspects of cardiac transplantation. Special emphasis is placed on the relationship between ongoing laboratory studies and clinical practice in this field. Students are involved in the preoperative assessment of prospective transplant candidates, donor procurement, intraoperative management, and postoperative immunosuppression. Open to fourth- and fifth-year students only. One student every four weeks. Director: A. Ali; Associate Director: P. Bonde

Congenital Heart Surgery Elective Students actively participate in the diagnosis, treatment, and operative and postoperative management of patients with congenital heart disease. Daily rounds on adult and pediatric cardiothoracic patients. Students receive a large exposure to pediatric and adult surgical cardiac ICU care. One or two students every four weeks. T.-Y. Hsia

General Surgery Elective (YNHH/SRC) Students become an integral part of the resident team, supervised by the chief resident and attending physicians on the general surgery service. Students participate in the management of general surgical inpatients, preoperative evaluations, and outpatient clinics. Students are expected to participate in all teaching conferences, Grand Rounds, and clinics, and to attend the core curriculum conference each week. The goal is to provide an educational experience that will be of value to students' eventual practice, regardless of which specialty they enter. Open to fourth-year students only. One or two students every four weeks. Director: J. Passarelli

Otolaryngology Elective This clinical elective includes experience in the operating room, wards, outpatient clinics, conferences, didactics, and tumor board; the experience is similar to the Otalaryngology Subinternship but allows students more flexibility in choosing to participate in operations and clinics of special interest to them. The rotation is divided into one-week blocks, including the head and neck service (H&N cancer/reconstructive surgery, laryngology) and the ENT specialty service (neurotology, pediatrics, sinus/skull base, facial plastics, general). Students improve their suturing skills and become comfortable performing a thorough but efficient head and neck examination and interpreting diagnostic tests and procedures that can be useful in all medical and surgical subspecialties. At the end of the rotation, students may (but are not required) to give a seven-minute presentation on a topic of their choice at the ENT grand rounds. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One or two students every two weeks; a four-week tailored rotation is available. Director: S. Mehra

Surgical Critical Care Elective (YNHH) The surgical intensive care unit exposes the senior medical student to the day-to-day and minute-to-minute management of the critically ill surgical patient. The breadth of surgical disease, spanning all aspects of surgery, allows the student to understand the management of respiratory, cardiovascular, gastrointestinal, and renal failure. Advanced techniques in ventilatory management and state-of-the-art sepsis management are used. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One student every four weeks. Director: L.L. Maerz

Subinternships

Bariatric Surgery Subinternship (SRC) Students learn about the multidisciplinary approach to bariatric surgery, its indications, types of bariatric surgery, postoperative care of patients, and evaluation and management of complications. Assisting in the care of patients in the hospital ward, emergency room, operating room, and clinic, students gain familiarity with the anatomy and pathophysiology of conditions addressed by and related to bariatric surgery; are exposed to nonbariatric cases, with minimally invasive foregut surgeries and hernia repairs; and learn the principles and applications of laparoscopy. Many cases include upper endoscopy. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One student every four weeks. Directors: J. Passarelli, K.E. Roberts

Cardiac Surgery Subinternship Intensive exposure to preoperative and postoperative management of adult and pediatric cardiac surgical patients and to intraoperative conduct of surgical procedures, with active participation in the operating room and in regular conferences. Students attend regular seminars covering major areas of cardiac surgery with members of the faculty and may be required to present a seminar on a subject in cardiac surgery to faculty and resident staff. Prerequisite: completion of third-year clerkships. Maximum of four students every four weeks. Director: J.A. Elefteriades

Colorectal Surgery Subinternship Students learn about the surgical care of colon and anorectal diseases, including infectious, inflammatory, neoplastic, and mechanical pathologic processes. Students assist in the evaluation, management, and care of patients

with colorectal and anorectal disease in the hospital ward, emergency room, operating room, and clinic. There is routine use of endoscopy and laparoscopy. Students may also participate in a precepted experience, with increased responsibility for patient care on the hospital ward, acting as the intern for select weekends. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One student every four weeks. Director: H. Einarsdottir

Endocrine Surgery Subinternship This elective exposes the student to in-depth clinical and surgical aspects of endocrine surgery. Special emphasis is placed on the multidisciplinary approach to the endocrine patient, understanding the laboratory and radiologic studies, cytopathology, biochemical analysis, preoperative stabilization of patients, intraoperative decision-making, and postoperative follow-up and outpatient evaluation of patients. Technical skills are emphasized as well for students interested in improving their surgical hands. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One or two students every four weeks. Director: G. Callender

Otolaryngology Subinternship This clinical experience is independent of the Otolaryngology rotation and takes place on an individual basis. It includes experience in the operating room, ward, outpatient clinics, conferences, didactics, and tumor board. The rotation is divided into two-week blocks, including the head and neck service (H&N cancer/reconstructive surgery, laryngology) and the ENT specialty service (neurotology, pediatrics, sinus/skull base, facial plastics, general). Students improve their suturing skills and become comfortable performing a thorough but efficient head and neck examination and interpreting diagnostic tests and procedures that can be useful in all medical and surgical subspecialties. At the end of the rotation, students are expected to give a seven-minute presentation on a topic of their choice at ENT grand rounds. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One or two students every four weeks. Director: S. Mehra

Pediatric Surgery Subinternship This subinternship provides an in-depth exposure to the broad spectrum of pediatric surgical problems. Specific attention is given to identifying the pediatric patient in crisis, a relevant skill whether or not the student pursues a career in surgery. Objectives include understanding the correction of major congenital anomalies, management of trauma, care of the critically ill child, and management of solid tumors. Experience includes in-depth exposure to the pediatric operating room, training in neonatal and pediatric critical care, and experience in the pediatric surgical outpatient clinic. The student is an integral part of the pediatric surgical team. Prerequisite: completion of third-year clerkships. One student every four weeks. Director: E.R. Christison-Lagay

Plastic and Reconstructive Surgery Subinternship Students participate in the evaluation and reconstructive surgery of deformities of congenital, traumatic, and neoplastic origin. Students are exposed to patients in inpatient and outpatient settings as well as operating room experiences, supplemented by regular conferences. Prerequisite: completion of third-year clerkships. One or two students every four weeks. Director: M. Alperovich

Surgical Critical Care Subinternship (VAMC/SICU) Students are assigned advanced clinical duties in the field of surgical critical care. Students spend time in the surgical intensive care unit (SICU), where they participate in the management of critically ill surgical patients, including general surgical, vascular, urologic, cardiothoracic, and neurosurgical patients. Topics covered include cardiopulmonary resuscitation, airway and ventilator management, fluid management, nutritional support, and the management of sepsis. Students can participate in all invasive procedures in the SICU, including bedside tracheostomy, percutaneous gastrostomy placement, bronchoscopy, and arterial and central venous catheter placement. Under the supervision of the intensive care attending physician, students are directly responsible for one to two critical care patients. Students present on rounds each day and assist in providing family and primary service communication. Prerequisite: completion of third-year surgery and medicine clerkships. Open to fourth- and fifth-year students only. One student every four weeks. Director: M.F. Perkal

Surgical Oncology Subinternship Intensive exposure to surgical aspects of the treatment of cancer in the clinic, hospital, and operating room. The interaction among surgery, medical oncology, and radiation therapy is experienced by following patients receiving multiple forms of therapy. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. Maximum of four students every four weeks. Director: A.B. Chagpar

Thoracic Surgery Subinternship The student is expected to be a valuable contributing team member during daily rounds, in the operating room, in the outpatient clinics, and at conferences. The majority of patients under the care of the thoracic surgery service include those with lung, esophageal, and mediastinal malignancies and infections, and many present both diagnostic and therapeutic challenges. Students have the opportunity to understand the multidisciplinary approach toward the management of these complex patients. Interested students can also pursue clinical research projects and papers. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One or two students every four weeks. Director: J. Blasberg

Transplantation Surgery Subinternship This intensive clinical experience emphasizes the preoperative assessment, intraoperative care, and postoperative management of patients suffering end-stage organ system failure who are cared for by transplantation. Emphasis on the management of immunosuppressive medication regimens and the care of post-transplant problems. Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One student every four weeks. Director: S.H. Emre

Trauma and Emergency General Surgery Subintership A four-week exposure to the urgent surgical care of the critically ill and injured patient including those with penetrating and blunt injuries, surgical emergencies including mesenteric ischemia, bowel perforation, abdominal sepsis, necrotizing soft-tissue infections, and other urgent surgical conditions. Students are exposed to the evaluation, medical, and surgical management of patients with traumatic and surgical emergencies in the emergency department, surgical floors, operating rooms, and outpatient clinics; and they assume supervised primary responsibility for these patients throughout their pre-, intra- and postoperative courses. Options for involvement in clinical research projects are also available. Prerequisite:

completion of third-year clerkships. Open to fourth- and fifth-year students only. One or two students every four weeks. Director: F.Y. Lui

Urology Subinternship Flexible program designed to provide in-depth exposure to urology specialty areas, including uro-oncology, minimally invasive (laparoscopic) urology, endo-urology, neuro-urology, female urology, and pediatric urology. Students are part of the urologic team and participate actively in the clinic, the operating room, and on rounds. Prerequisite: at least six months of prior clinical training. One or two students every four weeks. Director: A. Arlen

Vascular Surgery Subinternship A practical experience in the diagnosis and management of vascular disease, including pre- and postoperative care. The scope of the experience includes orientation to the noninvasive vascular diagnostic laboratory, outpatient care in the Yale Vascular Center, and inpatient management (including patients in the operating room, ICU, and the vascular surgery unit). Prerequisite: completion of third-year clerkships. Open to fourth- and fifth-year students only. One student every four weeks. Director: C. Ochoa Chaar

THERAPEUTIC RADIOLOGY

HRT 140, 203.785.2956
https://medicine.yale.edu/therapeuticradiology

Professors S.J. Baserga (*Molecular Biophysics & Biochemistry*), Z. Chen, V.L. Chiang (*Neurosurgery*), R.H. Decker, J. Deng, D.C. DiMaio (*Genetics*), P.M. Glazer (*Chair*), S.A. Higgins, M.S. Moran, R. Nath, R.E. Peschel (*Emeritus*), K.B. Roberts, S. Rockwell (*Emeritus*), W. Rupp (*Emeritus*), R.J. Schulz (*Emeritus*), Y.H. Son (*Emeritus*), J.B. Sweasy, L.D. Wilson

Associate Professors R.S. Bindra, J.G. Cardinale, J.N. Contessa, S. Damast, S.B. Evans, J.E. Hansen, R.B. Jensen, A.A. Patel, F.A. Rogers, J.B. Yu, Z. Yun

Assistant Professors Y. An, J.Y. Chung, N. Dainiak (*Adjunct*), F. Guo, N. Housri, K. Johung, S. Kamath, C.A. Knowlton, W. Liu, B. McGibbon, H. Park, M. Young

Senior Research Scientist D.E. Brash

Associate Research Scientists A. Gupta, J. Jimenez Sainz, H. Lee, Q. Lin, Y. Lu, A. Narayan, M. Palmatier

Clinical Professor D.E. Brash

Assistant Clinical Professor C. Tien

Lecturer H.M. Lincoln

Clerkship

Clinical Clerkship in Radiation Therapy A flexible program designed to introduce the medical student to radiation therapy. The biological and physical bases of radiation therapy, together with clinical practice and ongoing research. Clinical exposure to patients with malignant disease, with between ninety and one hundred ten treated daily in the department. The student takes part in departmental conferences, clinics, lectures, and individual teaching sessions. Limited to two students at any time. R.H. Decker and staff

Electives

Clinical Radiobiology This course is designed to provide residents in radiation oncology with a comprehensive review of clinical radiobiology as it applies to the practice of radiation therapy. The course is open to residents and fellows in other disciplines interested in radiobiology as it applies to clinical oncology. The course participant attends approximately twenty lectures in clinical radiobiology, which are delivered throughout the academic year between September and June. Scheduling by arrangement with Radiobiology staff

Laboratory Projects in Radiation Dosimetry Students are given problems that relate to and supplement long-term, ongoing radiation dosimetry projects within the department. Prerequisite: Principles and Methods of Radiation Dosimetry or its equivalent. Scheduling by arrangement with instructor.

Principles and Methods of Radiation Dosimetry A graduate-level course for physics students or medical students with a strong physics background who want to learn about radiation dosimetry as it applies to medical practice. Topics include X-ray spectra, ionization chambers, X-ray exposure and the roentgen, mass energy-absorption coefficients, the Bragg-Gray principle, stopping power and linear energy transfer, chemical dosimeters, instrumentation, and physical aspects of radiology. Approximately twenty hours of tutorial sessions. Scheduling by arrangement with instructor.

Radiation Oncology Elective A flexible program designed to introduce the student to radiation oncology. Students become familiar with the biological and physical basis of radiation oncology, together with clinical practice and ongoing research. This elective offers clinical exposure to patients with malignant disease, with between seventy-five and one hundred patients treated daily in the department. The student takes part in departmental conferences, clinics, lectures, and individual training sessions. Maximum of three students every four weeks. Director: H. Park

A Survey of Radiobiology A review of the interaction of radiation on living organisms, progressing from DNA damage to complex mammalian systems. Modern concepts in molecular biology and cell kinetics are emphasized in understanding the sequelae of this interaction and the mechanism by which the organism responds to the injury produced. Fourteen sessions. By arrangement with Radiobiology staff

UROLOGY

FMP 316, 203.785.4755
https://medicine.yale.edu/urology

Professors T.C. Chai, J.W. Colberg, H.E. Foster, I. Franco, S.C. Honig, B. Lytton (*Emeritus*), D. Petrylak (*Medicine*), P. Schulam (*Chair*), R.M. Weiss

Associate Professors A.B. Hittelman, C.R. Loose (*Adjunct*), L.M. Rickey, B. Schuch (*Adjunct*), P. Sprenkle

Assistant Professors A. Arlen, R. Ayyagari (*Radiology & Biomedical Imaging*), R.S. Bercik (*Obstetrics, Gynecology & Reproductive Sciences*), J. Brito, T. Buckley, R. Devito, D.G. Hesse, D. Kellner, P.A. Kenney, S. Lambert, M. Leapman, M. Maher, T. Martin, P. Motamedinia, M. Passarelli, J.S. Rosoff, D. Singh, T.Y. Tran

Instructor M. Goland-Van Ryn

Research Scientist D.T. Martin

Associate Research Scientists L. Boyd, M. Cartiera, K. Ghabili Amirkhiz, M. Lu

Assistant Clinical Professor R.F. Stroup

Urology electives are listed under the Department of Surgery.

Yale Cancer Center

WWW 205, 203.785.4095
Director: C.S. Fuchs
http://yalecancercenter.org

MEMBERSHIP

Professors N. Ahuja (*Surgery*), K.S. Anderson (*Pharmacology*), S. Ariyan (*Emeritus; Surgery*), P.W. Askenase (*Internal Medicine*), M. Azodi (*Obstetrics, Gynecology & Reproductive Sciences*), J.M. Baehring (*Neurology; Neurosurgery*), A.E. Bale (*Genetics*), L.M. Bartoshuk (*Emeritus; Surgery*), S. Baserga (*Molecular Biophysics & Biochemistry*), J.R. Bender (*Internal Medicine*), A.M. Bennett (*Pharmacology*), S.L. Bernstein (*Emergency Medicine*), D.J. Boffa (*Surgery*), J.L. Bolognia (*Dermatology*), M.W. Bosenberg (*Dermatology*), A.L.M. Bothwell (*Immunobiology*), R.R. Breaker (*Molecular, Cellular & Developmental Biology*), R. Bucala (*Internal Medicine*), B. Burtness (*Internal Medicine*), N. Carrasco (*Cellular & Molecular Physiology*), R.E. Carson (*Radiology & Biomedical Imaging; Biomedical Engineering*), A.B. Chagpar (*Surgery*), T.C. Chai (*Urology*), S. Chang (*Laboratory Medicine*), L. Chen (*Immunobiology*), Z. Chen (*Therapeutic Radiology*), Y.-C. Cheng (*Pharmacology*), V.L. Chiang (*Neurosurgery*), K.A. Choate (*Dermatology*), E.B. Claus (*Public Health*), J.W. Colberg (*Urology*), L. Cooley (*Genetics; Cell Biology; Molecular, Cellular & Developmental Biology*), J. Costa (*Emeritus; Pathology*), J. Craft (*Internal Medicine*), P. Cresswell (*Immunobiology*), C.M. Crews (*Molecular, Cellular & Developmental Biology*), R.H. Decker (*Therapeutic Radiology; Surgery*), J. Deng (*Therapeutic Radiology*), G.V. Desir (*Internal Medicine*), F. Detterbeck (*Surgery*), V.T. DeVita, Jr. (*Internal Medicine*), D.C. DiMaio (*Genetics*), J.S. Duncan (*Radiology & Biomedical Imaging*), R.L. Edelson (*Dermatology*), J.P. Eder (*Internal Medicine*), B.E. Ehrlich (*Pharmacology*), J.A. Ellman (*Chemistry*), D. Engelman (*Molecular Biophysics & Biochemistry*), J.J. Farrell (*Internal Medicine*), R.A. Flavell (*Immunobiology*), F. Foss (*Dermatology*), C.S. Fuchs (*Cancer Center*), J.E. Galán (*Microbial Pathogenesis*), J. Geibel (*Surgery*), M.B. Gerstein (*Molecular Biophysics & Biochemistry*), A.J. Giraldez (*Genetics*), M. Girardi (*Dermatology*), P.M. Glazer (*Therapeutic Radiology*), E.J. Glusac (*Pathology*), S. Gore (*Internal Medicine*), V. Greco (*Genetics*), C.P. Gross (*Internal Medicine*), M. Gunel (*Neurosurgery; Neuroscience*), D. Hafler (*Neurology; Immunobiology*), R. Herbst (*Medical Oncology*), K. Herold (*Immunobiology*), S. Herzon (*Chemistry*), H. Hetherington (*Adjunct; Neurosurgery*), S.A. Higgins (*Therapeutic Radiology*), M.W. Hochstrasser (*Molecular Biophysics & Biochemistry*), T.R. Holford (*Public Health*), S.D. Hudnall (*Pathology; Laboratory Medicine*), J. Hwa (*Internal Medicine*), D.F. Hyder (*Radiology & Biomedical Imaging*), K.L. Insogna (*Internal Medicine*), M.L. Irwin (*Public Health*), A. Iwasaki (*Immunobiology; Molecular, Cellular & Developmental Biology*), D. Jain (*Pathology*), W.L. Jorgensen (*Chemistry*), A.C. Justice (*General Medicine; Public Health*), P.B. Kavathas (*Laboratory Medicine*), K.K. Kidd (*Emeritus; Genetics*), K. Kim (*Radiology & Biomedical Imaging*), H.M. Kluger (*Medical Oncology*), Y. Kluger (*Pathology*), M.T. Knobf (*School of Nursing*), A.J. Koleske (*Molecular Biophysics & Biochemistry*), W.H. Konigsberg (*Molecular Biophysics & Biochemistry*), M. Kozal (*Internal Medicine*), D.S. Krause (*Laboratory Medicine*), S. Krishnan-Sarin (*Psychiatry*), G. Kupfer (*Pediatrics*), J. Lacy

(*Internal Medicine*), D.R. Lannin (*Surgery*), F.Y. Lee (*Orthopaedics & Rehabilitation*), P.J. Lee (*Internal Medicine*), D.J. Leffell (*Dermatology*), M.A. Lemmon (*Pharmacology*), P. Lengyel (*Emeritus; Molecular Biophysics & Biochemistry*), A. Levchenko (*Engineering & Applied Science*), R.C. Lilenbaum (*Medical Oncology*), H. Lin (*Cell Biology*), X. Llor (*Internal Medicine*), E. Lolis (*Pharmacology*), J.A. Longtine (*Pathology*), P. LoRusso (*Medical Oncology*), S. Ma (*Public Health*), X. Ma (*Public Health*), M.J. Mamula (*Internal Medicine*), S.M. Mane (*Genetics*), R. McCorkle (*Emerita; School of Nursing*), S. McKee (*Psychiatry*), J.M. McNiff (*Dermatology*), R. Medzhitov (*Immunobiology*), I.G. Miller (*Pediatrics*), S.J. Miller (*Chemistry*), W. Min (*Pathology*), M.S. Moran (*Therapeutic Radiology*), E.D. Morris (*Radiology & Biomedical Imaging; Biomedical Engineering; Psychiatry*), J.S. Morrow (*Pathology*), W. Mothes (*Microbial Pathogenesis*), R. Nath (*Therapeutic Radiology*), M.H. Nathanson (*Internal Medicine*), K. Neugebauer (*Molecular Biophysics & Biochemistry*), L.M. Niccolai (*Epidemiology*), S. O'Malley (*Psychiatry*), A. Omuro (*Neuro-Oncology*), P. Patrizio (*Obstetrics, Gynecology & Reproductive Sciences*), P. Peduzzi (*Public Health*), D. Petrylak (*Medical Onocology*), J.M. Piepmeier (*Neurosurgery*), J.S. Pober (*Immunobiology; Pathology; Dermatology*), M. Prasad (*Pathology*), L. Pusztai (*Medical Oncology*), A.M. Pyle (*Molecular Biophysics & Biochemistry*), D.L. Rimm (*Pathology*), H.A. Risch (*Public Health*), J.D. Roberts (*Internal Medicine*), K.B. Roberts (*Therapeutic Radiology*), J.K. Rose (*Emeritus; Pathology*), M.G. Rose (*Medical Oncology*), N.H. Ruddle (*Emerita; Public Health*), P. Salovey (*Psychology*), W.M. Saltzman (*Biomedical Engineering*), A. Santin (*Obstetrics, Gynecology & Reproductive Sciences*), C.T. Sasaki (*Surgery*), D.G. Schatz (*Immunobiology*), A. Schepartz (*Chemistry; Molecular, Cellular & Developmental Biology*), J. Schlessinger (*Pharmacology*), P.G. Schulam (*Urology*), M.A. Schwartz (*Internal Medicine*), P.E. Schwartz (*Obstetrics, Gynecology & Reproductive Sciences*), E.U. Seli (*Obstetrics, Gynecology & Reproductive Sciences*), W.C. Sessa (*Pharmacology*), J. Sklar (*Pathology*), B.R. Smith (*Laboratory Medicine*), E.L. Snyder (*Laboratory Medicine*), M. Sofuoglu (*Psychiatry*), D.A. Spiegel (*Chemistry*), D. Spiegelman (*Public Health*), J.A. Steitz (*Molecular Biophysics & Biochemistry*), D.F. Stern (*Pathology*), M. Strazzabosco (*Internal Medicine*), R. Sutton (*Internal Medicine*), J.B. Sweasy (*Therapeutic Radiology*), M. Sznol (*Medical Oncology*), P.J. Tattersall (*Laboratory Medicine*), H.S. Taylor (*Obstetrics, Gynecology & Reproductive Sciences*), R.E. Tigelaar (*Emeritus; Dermatology*), D.K. Toomre (*Cell Biology*), J. Townsend (*Public Health*), A.N. Van den Pol (*Neurosurgery*), V. Vasiliou (*Public Health*), S.H. Vermund (*Public Health*), R. Weiss (*Urology*), S.M. Weissman (*Genetics*), K.R. Williams (*Adjunct; Molecular Biophysics & Biochemistry*), L.D. Wilson (*Therapeutic Radiology*), D. Wu (*Pharmacology*), J.J. Wysolmerski (*Internal Medicine*), T. Xu (*Adjunct; Genetics*), D. Zelterman (*Public Health*), H. Zhao (*Public Health*)

Associate Professors K.B. Adelson (*Internal Medicine*), K.M. Akgun (*Internal Medicine*), R.S. Bindra (*Therapeutic Radiology*), T. Boggon (*Pharmacology*), D. Braddock (*Pathology*), D.A. Calderwood (*Pharmacology*), T. Carling (*Surgery*), C. Cha (*Surgery*), H.H. Chao (*Medical Oncology*), A. Chiang (*Medical Oncology*), J.N. Contessa (*Therapeutic Radiology*), J.M. Crawford (*Chemistry*), S. Damast (*Therapeutic Radiology*), H.A. Deshpande (*Medical Oncology*), A.T. Dewan (*Public Health*), M.P. DiGiovanna (*Medical Oncology*), A.S. El-Guindy (*Pediatrics/Infectious Disease*), S.B. Evans (*Therapeutic Radiology*), T. Fahmy (*Biomedical Engineering*), R. Fan (*Biomedical*

Engineering), K.M. Ferguson (*Pharmacology*), C. Fernandez-Hernando (*Comparative Medicine*), L. Fucito (*Psychiatry*), G. Galiana (*Radiology & Biomedical Imaging*), S.N. Gettinger (*Medical Oncology*), S. Ghosh (*Neurology*), A. Goodman (*Microbial Pathogenesis*), Y. Ha (*Pharmacology*), A. Haberman (*Immunobiology*), S. Halene (*Hematology*), J.E. Hansen (*Therapeutic Radiology*), E.W. Hofstatter (*Medical Oncology*), V. Horsley (*Molecular, Cellular & Developmental Biology*), G. Huang (*Obstetrics, Gynecology & Reproductive Sciences*), S. Jakab (*Internal Medicine*), R.B. Jensen (*Therapeutic Radiology*), B. Judson (*Surgery/Otolaryngology*), M. Juthani-Mehta (*Internal Medicine*), N.S. Kadan-Lottick (*Pediatrics*), J. Kapo (*Internal Medicine*), S. Katz (*Pathology*), R.G. Kibbey (*Endocrinology*), B. Killelea (*Surgery*), M.C. King (*Cell Biology*), S.H. Kleinstein (*Pathology*), J.P. Koo (*Medical Oncology*), M. Krauthammer (*Pathology*), P. Kumar (*Internal Medicine*), J.M. Lazenby (*School of Nursing*), P. Li (*Genetics*), H. Lin (*Public Health*), B. Lindenbach (*Microbial Pathogenesis*), D.M. Lindskog (*Orthopaedics & Rehabilitation*), J. Liu (*Microbial Pathogenesis*), J. Lu (*Genetics*), E.R. Meffre (*Immunobiology*), K. Miller-Jensen (*Biomedical Engineering; Molecular, Cellular & Developmental Biology*), D. Nguyen (*Pathology*), J.P. Noonan (*Genetics*), M. Nuñez-Smith (*Internal Medicine*), E. Paintsil (*Pediatrics*), Z. Pan (*Pathology*), F. Pashankar (*Pediatrics*), A.A. Patel (*Therapeutic Radiology*), J.P. Pereira (*Immunobiology*), M. Pillai (*Hematology*), K. Politi (*Pathology*), T.G. Prebet (*Internal Medicine*), J.T. Puchalski (*Internal Medicine*), E. Ratner (*Obstetrics, Gynecology & Reproductive Sciences*), J. Rinehart (*Cellular & Molecular Physiology*), F.A. Rogers (*Therapeutic Radiology*), C.V. Rothlin (*Immunobiology*), T. Sanft (*Medical Oncology*), C. Schlieker (*Molecular Biophysics & Biochemistry*), D.J. Schulman-Green (*School of Nursing*), S. Seropian (*Internal Medicine*), A.L. Silber (*Medical Oncology*), Y. Suarez (*Comparative Medicine*), T.H. Taddei (*Digestive Diseases*), S. Takyar (*Internal Medicine*), M.M. Tomayko (*Dermatology*), B. Turk (*Pharmacology*), S. Wang (*Epidemiology*), A. Xiao (*Genetics*), C. Xiao (*School of Nursing*), Y. Xiong (*Molecular Biophysics & Biochemistry*), M.L. Xu (*Pathology; Laboratory Medicine*), Q. Yan (*Pathology*), X. Yang (*Comparative Medicine; Cellular & Molecular Physiology*), J.B. Yu (*Therapeutic Radiology*), Z. Yun (*Therapeutic Radiology*), Y. Zhang (*Public Health*), J. Zhou (*Neurosurgery; Biomedical Engineering*), Y. Zhu (*Public Health*)

Assistant Professors C.R. Alarcon (*Pharmacology*), P. Ananth (*Pediatrics*), K.P. Becker (*Neurology*), A.K. Bhatia (*Medical Oncology*), J. Blasberg (*Surgery*), D.S. Brandt (*Medical Oncology*), D. Breslow (*Molecular, Cellular & Developmental Biology*), Z. Cai (*Radiology & Biomedical Imaging*), M. Cecchini (*Medical Oncology*), S. Chen (*Genetics*), H. De Feyter (*Radiology & Biomedical Imaging*), N.C. Deziel (*Public Health*), N. Dimitrova (*Molecular, Cellular & Developmental Biology*), B. Emu (*Internal Medicine*), L.M. Ferrucci (*Epidemiology/Chronic Diseases*), C.A. Flannery (*Obstetrics, Gynecology & Reproductive Sciences*), E. Foxman (*Laboratory Medicine*), S.B. Goldberg (*Internal Medicine*), L. Gowda (*Internal Medicine*), F. Guo (*Therapeutic Radiology*), S. Guo (*Cell Biology*), N. Hafez (*Medical Oncology*), S. Hattangadi (*Hematology*), S. Hatzios (*Biological & Biomedical Sciences*), Y.-C. Ho (*Microbial Pathogenesis*), N.R. Horowitz (*Surgery*), S. Huntington (*Hematology*), M. Hurwitz (*Medical Oncology*), I. Isufi (*Hematology*), A. Jastreboff (*Internal Medicine*), L.B. Jilaveanu (*Medical Oncology*), C. Johnson (*Public Health*), N. Joshi (*Immunobiology*), P.A. Kenney (*Urology*), S. Khan (*Surgery*), J.W. Kim (*Medical Oncology*), D.E. Klein (*Pharmacology*),

M.A. Kriegel (*Adjunct; Immunobiology*), S. Krishnaswamy (*Genetics*), M.S. Leapman (*Urology*), B. Lesch (*Genetics*), M. Levine (*Pathology*), R. Lim (*Ophthalmology & Visual Science*), Y. Liu (*Pharmacology*), C.L. Lucas (*Immunobiology*), M. Mak (*Biomedical Engineering*), A.M. Marks (*Pediatrics*), B. Marquez-Nostra (*Radiology & Biomedical Imaging*), J. Moliterno-Gunel (*Neurosurgery*), S.S. Mougalian (*Internal Medicine*), R.M. Munoz Xicola (*Internal Medicine*), M.D. Muzumdar (*Genetics*), P. Myung (*Dermatology*), B. Nelson (*Pharmacology*), N. Neparidze (*Internal Medicine*), K. Olino (*Surgery*), H. Osborne (*Surgery*), N. Palm (*Immunobiology*), T.S. Park (*Oncology/ General Surgery*), T.L. Parker (*Internal Medicine*), R. Perry (*Internal Medicine*), N.A. Podoltsev (*Hematology*), E. Reisenbichler (*Pathology*), I. Richman (*Internal Medicine*), A. Ring (*Immunobiology*), K. Schalper (*Pathology*), S.S. Sheth (*Obstetrics, Gynecology & Reproductive Sciences*), P. Sprenkle (*Urology*), S. Stein (*Medical Oncology*), X. Su (*Cell Biology*), C. Tien (*Therapeutic Radiology*), A. Vash-Margita (*Obstetrics, Gynecology & Reproductive Sciences*), J. Vasquez (*Pediatrics*), S. Weiss (*Medical Oncology*), C. Wilen (*Laboratory Medicine*), F. Wilson (*Genetics*), A. Zeidan (*Hematology*)

Associate Director R.L. Mehta (*Cancer Center, Rapid Case Ascertainment Shared Resource*)

Senior Research Scientists D.E. Brash (*Therapeutic Radiology*), B. Cartmel (*Public Health*), A. Davidoff (*Public Health*), R. Halaban (*Dermatology*)

Research Scientists F. D'Errico (*Radiology & Biomedical Imaging*), N. Ivanova (*Genetics*), B.A. Jones (*Public Health*), T.T. Lam (*Molecular Biophysics & Biochemistry*), J. Lu (*Public Health*), L. Lu (*Epidemiology/Chronic Diseases*), D.T. Martin (*Urology*), J.M. McGrath (*Comparative Medicine*), S.D. Weatherbee (*Genetics*)

Associate Research Scientists A. Arnal Estape (*Pathology*), J. Cao (*Pathology*), G. Chen (*Immunobiology*), D.J. Hanlon (*Dermatology*), C.E. Hansen (*Pediatrics*), J. Hens (*Internal Medicine*), D. Sells (*Psychiatry*), S. Suttiratana (*Public Health*), V. Wali (*Medical Oncology*), J. Wang (*Immunobiology*), T. Zhang (*Immunobiology*)

Assistant Clinical Professor C. Tien (*Therapeutic Radiology*)

Instructors S. Aneja (*Therapeutic Radiology*), B. Bade (*Internal Medicine*), T.K. Kim (*Hematology*)

The center supports a $95.6 million research base to promote translational research through collaborations between and within seven basic, epidemiological, and clinical research programs. Basic research programs in Signal Transduction; Genomics, Genetics, and Epigenetics; Virus and Other Infection-associated Cancers; and Developmental Therapeutics are integrated with clinical research programs in Cancer Immunology and in Radiobiology and Radiotherapy, and with one epidemiological program, Cancer Prevention and Control. The center also supports eight shared facilities that are available for oncological research: Flow Cytometry, Cesium-137 Irradiator, Rapid Case Ascertainment, Biostatistics and Bioinformatics, Clinical Research Services, Yale Center for Genome Analysis, Yale Pathology Tissue Services, and Yale Center for Molecular Discovery. Information regarding patient care, research, and cancer prevention and control may be obtained by telephoning 203.785.4095.

School of Nursing

The following course in the School of Nursing is open to interested medical students. For more information, contact faculty of record.

NURS 610a, Advanced Concepts and Principles of Diabetes Care Seminar 2 credit hours. This seminar focuses on the concepts and principles of diabetes managed care based on the annually updated American Diabetes Association Standards of Care. It includes principles of primary care (screening, early detection, intervention, and patient education), secondary care principles related to diabetes management (various treatment modalities, patient education, and self-care), and tertiary care related to complications. These concepts and principles of care are presented relative to type of diabetes (type 1, type 2, gestational, diabetes in pregnancy, and secondary), age, developmental stage, duration of disease, and ethnicity. A multidisciplinary approach to care issues is emphasized, incorporating the contributions of other disciplines in the collaborative management of diabetes. Important aspects of living with a chronic illness such as psychological, social, occupational, and economic are also emphasized. Two hours per week. E. Doyle

Postgraduate Study

Graduate medical education in clinical departments is based upon the residency training programs of the Yale-New Haven Medical Center. Initial appointments are offered in Anesthesiology, Combined Child and Adult Psychiatry, Dermatology, Diagnostic Imaging, Emergency Medicine, Internal Medicine Primary Care, Internal Medicine, Internal Medicine–Pediatrics, Interventional Radiology, Neurology, Child Neurology, Neurosurgery, Obstetrics and Gynecology, Ophthalmology, Orthopaedics and Rehabilitation, Otolaryngology, Pathology, Pediatrics, Plastic Surgery, Psychiatry, Surgery, Therapeutic Radiology, Thoracic Surgery, Urology, and Vascular Surgery; appointments are made through the National Resident Matching Program or the appropriate specialty matching program (Ophthalmology and Urology). Residencies are also offered in Dentistry, Pediatric Dentistry, Oral Maxillofacial Surgery, and Podiatry. Subspecialty residency programs are offered in the following specialties:

Anesthesiology
Cardiothoracic Surgery
Child Psychiatry
Dermatology
Diagnostic Radiology
Emergency Medicine
Internal Medicine
Medical Genetics
Neurology
Neurosurgery
Obstetrics and Gynecology
Ophthalmology
Orthopaedic Surgery
Pathology and Laboratory Medicine (AP/CP)
Pediatrics
Plastic Surgery
Psychiatry
Surgery
Urology

The School of Medicine and Yale New Haven Hospital are joined in the establishment and management of an Office of Graduate Medical Education of Yale-New Haven Medical Center. Residents at the Yale New Haven Hospital and the VA Connecticut Healthcare System, West Haven, are enrolled as postgraduate students in the School of Medicine in addition to their hospital appointments. In most of the clinical departments, a number of fellowships for research or clinical training are also available.

Detailed information concerning residency programs may be obtained from the chair of the appropriate department. Applicants must be graduates of an approved medical school in the United States or Canada or have successfully completed the requirements of the ECFMG and have a valid ECFMG certificate. General information may be obtained by visiting the Yale-New Haven Medical Center Graduate Medical Education website (www.ynhh.org/gme/welcome-to-ynhhgme.aspx) or the Yale School of Medicine site (http://medicine.yale.edu/ysm/departments) and visiting the appropriate department.

Continuing Medical Education

The mission of the Yale School of Medicine's Center for Continuing Medical Education is to advocate and support the continuing professional development of health care professionals. Through its Center for Continuing Medical Education, the School of Medicine offers a full range of evidence-based educational programs that enhance the practitioner's knowledge base, provide updates and review, and expand professional skills.

Yale School of Medicine is accredited with commendation by the Accreditation Council for Continuing Medical Education as a provider of continuing medical education (CME). Under the auspices of Yale Medicine, the educational programs sponsored by Yale CME include primary care, specialty, and subspecialty topics in the field of medicine. The scope of these activities involves the body of knowledge and skills generally recognized and accepted by the profession as within the basic medical sciences, the discipline of clinical medicine, and the provision of health care to the public.

Yale CME provides content and material tailored to complement the participant's needs and schedule through the following educational activities: conferences and workshops; enduring materials; and distance education by personal computer and other innovative formats. The offerings are intended to enhance physician and other health professionals' professional development and influence their behavior for the purpose of improving health outcomes and patient care.

Courses offered include (a) review courses and symposia designed to present advances in the diagnosis and management of selected disorders of general interest; (b) courses of interest to physicians in a particular specialty; and (c) courses dealing with matters of public health and its administration, developed by the faculty of the Department of Epidemiology and Public Health.

Most regularly scheduled Yale educational conferences (Grand Rounds) are also open to all physicians for CME credit. Also available for physicians and certain other health care workers is the Online Learning Program, live conference webcasts, Connecticut Mandated Courses, and *The Diabetes Newsletter*.

The Yale CME website contains the most timely and detailed listing of all these events; see http://cme.yale.edu. Inquiries should be addressed to the Center for Continuing Medical Education, SHM CE-3, PO Box 208052, New Haven CT 06520-8052; telephone, 203.785.4578; e-mail, cme@yale.edu.

Doctors of Medicine

CLASS OF 2019

Pending completion of all requirements

Nidharshan Subra Anandasivam, B.S., Massachusetts Institute of Technology; M.B.A., Yale University. *Demographics, Mechanism of Injury, Injury Severity, and Associated Injury Profiles of Patients with Femoral and Tibial Shaft Fractures: A Study of the National Trauma Databank*. Orthopaedic Surgery: University of Texas at Austin Dell Medical School Program, Austin, Tex.

Prince Antwi, A.B., Harvard University; M.H.S., Yale University. *High-Fidelity Simulated Driving Paradigm for Predicting Driving Impairment in Generalized Epilepsy*. Neurosurgery: Duke University Medical Center, Durham, N.C.

Paul McCracken Bourdillon, B.A., Northwestern University; Certificate in Global Medicine, Yale University. *The Department of Justice Investigation into Implantable Cardioverter Defibrillators*. Internal Medicine: University of Washington Affiliated Hospitals, Seattle, Wash.

Patawut Bovonratwet, B.S., Johns Hopkins University. *Using Big Data to Study the Safety of New Surgical Pathways and Technologies in Orthopaedic Surgery*. Orthopaedic Surgery: Hospital for Special Surgery, New York, N.Y.

Michael Jarvis Boyle, B.S., Yale University. *Searching for Phenotypes of Sepsis: An Application of Machine Learning to Electronic Health Records*. Emergency Medicine: University of California–San Francisco, San Francisco, Calif.

Raysa Gabriela Cabrejo, B.A., Amherst College; M.H.S., Yale University. *The Neurological Development of Sagittal Craniosynostosis Patients Treated with Whole Vault Cranioplasty*. Surgery-Preliminary: Yale New Haven Medical Center Program, New Haven, Conn.

Herbert Castillo Valladares, A.B., Harvard University; M.H.S., Yale University. *Generalized Morphea: Autoimmune Patterns, Association with Lichen Sclerosus, and Treatment Regimens*. Medicine-Preliminary: Yale New Haven Medical Center (Waterbury) Program, Waterbury, Conn.; Dermatology: University of California–San Francisco, San Francisco, Calif.

Lawrence Chan, A.B., Harvard University. *Multimodal Imaging and Asymmetry of Disease Progression in Rhodopsin-Associated Autosomal Dominant Retinitis Pigmentosa*. Surgery-Preliminary: University of California–San Francisco, San Francisco, Calif.; Ophthalmology: University of California–San Francisco, San Francisco, Calif.

Tafadzwa Lawrence Chaunzwa, B.S., Duke University; M.H.S., Yale University. *On Technology and Innovations in Cancer Imaging and Image-Guided Therapy*. Medicine-Preliminary: Mount Auburn Hospital Program, Cambridge, Mass.; Radiation Oncology: Massachusetts General Hospital/Brigham & Women's Hospital/Harvard, Boston, Mass.

Nicholas Rabih Chedid, B.S., Tulane University. *Medically Applied Artificial Intelligence: From Bench to Bedside*. Internal Medicine: Brigham & Women's Hospital, Boston, Mass.

Eun Sook Choi, B.S., Johns Hopkins University. *The Care of the Sexual Assault Patient*. Obstetrics and Gynecology: Yale New Haven Medical Center Program, New Haven, Conn.

Shang-Lin Chung, B.S., M.H.S., Yale University. *The Role of Renalase and Its Potential Serum Binding Proteins in Pancreatitis*. Internal Medicine: Duke University Medical Center, Durham, N.C.

Sophie Haeun Chung, B.S., Massachusetts Institute of Technology. *Use of Posterior Colpotomy to Minimize Abdominal Incisions during Benign Gynecologic Surgery*. Surgery-Preliminary: Brigham & Women's Hospital, Boston, Mass.

Emily Lacy Coleman, B.A., Swarthmore College. *Inflammatory Eruptions from Immune Checkpoint Inhibitors: Stratification by Toxicity and Implications for Management*. Medicine-Preliminary: Yale New Haven Medical Center (Waterbury) Program, Waterbury, Conn.; Dermatology: Boston University Medical Center, Boston, Mass.

Jeremiah Joseph Cross, A.B., Harvard University; M.S.Ed., Johns Hopkins University. *Neighborhood Walking Tours for Physicians-in-Training*. Emergency Medicine: Alameda Health System-Highland Hospital Program, Oakland, Calif.

Di Deng, B.S., Massachusetts Institute of Technology; M.B.A., Yale University. *Magnetic Resonance-Guided Laser Thermal Ablation for Brain Metastases after Radiosurgical Failure*. Consultant: Boston Consulting Group, Boston, Mass.

Stephen Graham DeVries, B.S., United States Naval Academy; M.Phil., University of Cambridge. *Insulin and Non-insulin Dependent GLUT4 Trafficking: Regulation by the TUG Protein*. Emergency Medicine: Massachusetts General Hospital/Brigham & Women's Hospital/Harvard, Boston, Mass.

Matthew John Erlendson, B.A., University of California–Santa Cruz. *Femoral and Lateral Femoral Cutaneous Nerve Block in Elderly Hip Fracture—A Pilot Study*. Anesthesiology: Stanford University Programs, Stanford, Calif.

Maxwell Gerard Farina, B.A., B.S., Emory University; M.B.A., Yale University. *Localized Hippocampal Glutamine Synthetase Knockout: A Novel Model of Mesial Temporal Lobe Epilepsy*. Associate, Healthcare Investment Banking: Goldman Sachs & Co., New York, N.Y.

Rebecca Louisa Fine, B.A., Williams College. *Gut Commensal Translocation and Lymphocyte Migration to Internal Organs in Autoimmunity*. Internal Medicine: Yale New Haven Medical Center Program, New Haven, Conn.

Samara Danielle Fox, B.A., Yale University; M.P.H., Harvard School of Public Health; J.D., Harvard Law School. *Social Integration and the Mental Health Needs of LGBTQ Asylum Seekers in North America*. Psychiatry: Beth Israel Deaconess Medical Center, Boston, Mass.

Whitney Fu, B.A., Dartmouth College. *Ischemia-Reperfusion Injury-Mediated Complement Activation of Endothelial Cells Leads to Expansion of Peripheral T Helper Cells and Production of Donor Specific Antibodies*. General Surgery: University of Michigan Health System Program, Ann Arbor, Mich.

Jonathan Read Gaillard, B.S., University of Virginia; M.H.S., Yale University. *The Genetics of Vein of Galen Malformation and Assessment of Candidate Genes in Xenopus tropicalis*. Child Neurology: University of Michigan Health System Program, Ann Arbor, Mich.

Mekka Rae Garcia, B.S., University of Missouri. *Ossification of the Phalanges of the Foot and Its Relationship to Peak Height Velocity and the Calcaneal System*. Child Neurology: New York University School of Medicine, New York, N.Y.

Mansur Abdul Ghani, B.S., Yale University. *Identifying Quantitative Enhancement-Based Imaging Biomarkers in Patients with Colorectal Cancer Liver Metastases Undergoing Loco-Regional Tumor Therapy*. Medicine-Preliminary: Yale New Haven Medical Center Program, New Haven, Conn.; Interventional Radiology (Integrated)/Research: University of California–San Diego, San Diego, Calif.

Mohammed Imran Riaz Ghare, B.S., University of Arizona. *Outcomes among Patients with Chronic Critical Limb Ischemia with No Revascularization Option and Deep Vein Arterialization as a Novel Revascularization Approach: A Systematic Review and Meta-Analysis*. Internal Medicine: Brigham & Women's Hospital, Boston, Mass.

Amandine Florence Ghislaine Godier-Furnemont, B.S., M.S., Ph.D., Columbia University. *Development of High Fidelity Cardiac Tissue Engineering Platforms by Biophysical Signaling: In Vitro Models and In Vivo Repair*. General Surgery: University of California–San Francisco, San Francisco, Calif.

Michael Vincent Gilligan Gormally, B.A., Pomona College; Ph.D., University of Cambridge. *Drugging the Cancer Cell at the DNA Interface*. Internal Medicine (Physician Scientist): Yale New Haven Medical Center Program, New Haven, Conn.

Tyler Greenway, B.A., University of California–Berkeley. *Parent and Provider Perceptions of Suboptimal Communication in a Pediatric Intensive Care Unit: A Qualitative Investigation*. Pediatrics/Anesthesiology: Stanford University Programs, Stanford, Calif.

Zachary Daniel Grunwald, B.A., University of California–Berkeley. *Perihematomal Edema Expansion Rates and Patient Outcomes in Deep and Lobar Intracerebral Hemorrhage*. Emergency Medicine: Temple University Hospital Program, Philadelphia, Pa.

Aaron Hakim, B.S., M.S., Yale University. *A Genomic Approach to Idiopathic Liver Disease in Adults*. Internal Medicine: Beth Israel Deaconess Medical Center, Boston, Mass.

Peter Theodore Hetzler III, B.A., Middlebury College; M.H.S., Yale University. *A Report of U.S. Physicians' Beliefs about Physician-Assisted Suicide and a Bioethical Analysis of the Practice*. Plastic Surgery (Integrated): MedStar Health/Georgetown University Hospital Program, Washington, D.C.

Emily Claire Allewelt Hoff, B.A., Middlebury College. *The Reproductive Health Needs of Women at Risk of HIV Infection in Connecticut*. Internal Medicine: University of Texas Southwestern Medical School Program, Dallas, Tex.

Florence Hsiao, B.A., Princeton University. *Controlling Pregnancy: Fred Lyman Adair and the Influence of Eugenics on the Development of Prenatal Care*. Family Medicine: Christ Hospital/University of Cincinnati College of Medicine, Cincinnati, Ohio

Yejoo Jeon, B.S., Cornell University. *Macrotrabecular Massive, a Novel Hepatocellular Carcinoma Histological Subtype: Analysis of Post-Resection and Transplant Recurrence*. Internal Medicine: UCLA Medical Center Program, Los Angeles, Calif.

Christina Brady Johns, B.A., University of Pennsylvania. *The Worsening Trajectory of Social Impairment in Preterm-Born Young Adults and Its Association with Altered Amygdalar Functional Connectivity*. Internal Medicine/Pediatrics: Yale New Haven Medical Center Program, New Haven, Conn.

Shihan Naeem Khan, B.S., University of Michigan–Ann Arbor; Ph.D., Yale University. *Characterization of the Biophysical Parameters Governing Nanoparticle-Based Drug Delivery to B Cells*. Internal Medicine: University of Michigan Health System Program, Ann Arbor, Mich.

Sa Rang Kim, B.S., University of Toronto. *BET Inhibitors and Its Potentiation with BCL2 or HDAC Inhibitors as Targeted Therapies for Cutaneous T-Cell Lymphoma*. Medicine-Preliminary: Yale New Haven Medical Center Program, New Haven, Conn.; Dermatology: Yale New Haven Medical Center Program, New Haven, Conn.

Lovemore Simbarashe Kuzomunhu, B.A., M.S., University of Pennsylvania. *Career Interests and Mentorship Experiences of International and Underrepresented Minority Medical Students in the United States*. General Surgery: University of Washington Affiliated Hospitals, Seattle, Wash.

Alison Kyung-Hwa Lee, B.A., Wellesley College; M.H.S., Yale University. *Biodegradable Bioadhesive Nanoparticle Delivery of Chemotherapy to Treat Non-Melanoma Skin Cancer*. Medicine-Preliminary: Zucker School of Medicine at Hofstra/Northwell Program, Great Neck, N.Y.; Dermatology: University of Michigan Health System Program, Ann Arbor, Mich.

Nicholas Chien-Juei Lee, B.S., University of Virginia. *De-Intensification Treatment of Human Pappilomavirus-Associated Oropharyngeal Carcinoma*. Internal Medicine/Pediatrics: University of Texas Southwestern Medical School Program, Dallas, Tex.

Jonathan L.B. Levinsohn, B.A., Williams College; Ph.D., Yale University. *Functional Genetics of Epidermal Mosaic Disease*. Pediatrics: Children's Hospital of Philadelphia, Philadelphia, Pa.

Hong Li, B.A., Dartmouth College. *Outcomes of Human Papillomavirus-Associated Head and Neck Cancers*. Medicine-Preliminary: New York Presbyterian Brooklyn Methodist Hospital, Brooklyn, N.Y.; Diagnostic Radiology: Jacobi Medical Center/Albert Einstein College of Medicine, The Bronx, N.Y.

Xiang Li, B.A., Bowdoin College. *Activation and Trafficking of CSF Lymphocytes and Monocytes during Primary HIV Infection*. Internal Medicine: University of Michigan Health System Program, Ann Arbor, Mich.

Rebecca Liu, B.S., Duke University; Ph.D., Yale University. *Immunological Functions of Human Microvascular Pericytes*. Internal Medicine: Massachusetts General Hospital, Boston, Mass.

Kelsey Burk Loeliger, B.S., University of Maryland, Baltimore County; Ph.D., Yale University. *The Impact of Incarceration and Release from a Correctional Facility on HIV Treatment Outcomes and All-Cause Mortality among People Living with HIV*. Obstetrics and Gynecology: Hospital of the University of Pennsylvania, Philadelphia, Pa.

Amanda Jane Lu, A.B., Harvard University. *Role of Multiparametric MRI and MRI-US Fusion to Diagnosis Clinically Significant Prostate Cancer*. Transitional: Eastern Connecticut Health Network, Manchester, Conn.; Ophthalmology: UCLA Medical Center Program, Los Angeles, Calif.

Renee Muyoka Maina, B.A., Columbia University; M.H.S., Yale University. *Scaffold-Free Three-Dimensional Bioprints Repair Small Intestine Injuries and Integrate into Native Intestine*. Surgery-Preliminary: Yale New Haven Medical Center Program, New Haven, Conn.

Patrick McGillivray, B.S., McGill University; M.H.S., Yale University. *Annotation and Variant Impact Analysis of Whole Genomes in Cancer*. Internal Medicine: Johns Hopkins Hospital, Baltimore, Md.

Kavita Mistry, B.A., Ph.D., Yale University. *Explorations in Autosomal Dominant Polycystic Kidney Disease: Novel Effectors of Polycystin-1 Function*. Internal Medicine: Brigham & Women's Hospital, Boston, Mass.

Elliot Coleman Morse, B.S., M.H.S., Yale University. *Industry Payments and Conflicts of Interest in Otolaryngology*. Otolaryngology: New York Presbyterian Hospital–Columbia & Cornell, New York, N.Y.

Sifon Udeme Ndon, A.B., Harvard University. *The Role of the Skin Microbiome in Wound Healing*. Otolaryngology: University of California–San Francisco, San Francisco, Calif.

Adam Carl Nolte, B.S., Duke University. *Renal Cell Carcinoma in End Stage Renal Disease Patients: An Institutional Review*. Urology: Mount Sinai Medical Center of Florida Program, Miami Beach, Fla.

Sudhakar Venkata Nuti, B.A., Yale University. *Health Disparities between Medicare Beneficiaries in the United States Territories and the Fifty States and District of Columbia*. Internal Medicine/Primary Care: Massachusetts General Hospital, Boston, Mass.

Derek Ou, B.A., Princeton University. *An Examination of Functions and Users of the Healing Garden and Its Precursors from a Historical Perspective*. Psychiatry: Zucker School of Medicine at Hofstra/Northwell at Zucker Hillside Hospital, Glen Oaks, N.Y.

Cassie Ja-ann Pan, B.S., Yale University. *Improving Therapeutics of Head and Neck Cancer through Novel Research Models and Prognostic Biomarkers*. Otolaryngology. University of Washington Affiliated Hospitals, Seattle, Wash.

Laura West Pappalardo, D.Pharm., University of Texas at Austin; Ph.D., Yale University. *Functional Role of Voltage-Gated Sodium Channel Nav1.5*. Neurology: Hospital of the University of Pennsylvania, Philadelphia, Pa.

Jea Young Park, B.S., Franklin W. Olin College of Engineering. *In-Situ Cross-linking Hydrogel as a Vehicle for Retinal Progenitor Cell Transplantation in Rodent Retina*. Medicine-Preliminary: Griffin Hospital Program, Derby, Conn.

Taha Najam Qarni, B.H.Sc., McMaster University. *Preliminary Validation of a Common Benign Clinical Cognitive Impairment Syndrome—Introducing Hyperarousal Amnestic Dysexecutive Syndrome*. Medicine-Preliminary: Zucker School of Medicine at Hofstra/Northwell at Staten Island University Hospital, Staten Island, N.Y.; Neurology: Hospital of the University of Pennsylvania, Philadelphia, Pa.

Anusha Raja, B.S., M.B.A., Yale University. *Spatiotemporal Analysis of Neuronoal Activity during the First Second of Visual Conscious Perception*. Internal Medicine: Yale New Haven Medical Center Program, New Haven, Conn

Andrea Elizabeth Roberts, B.A., Barnard College. *The Prevalence of and Factors Associated with Burnout in First-Year Health Professional Students*. Internal Medicine: Yale New Haven Medical Center Program, New Haven, Conn.

Kelly Michelle Rogers, B.S., University of Pennsylvania. *Investigating the Association of Brain Metabotropic Glutamate Receptor Subtype 5 with Age Using PET and [18F]FPEB*. Medicine-Preliminary: Yale New Haven Medical Center Program, New Haven, Conn.; Neurology: Brigham & Women's Hospital/Massachusetts General Hospital, Boston, Mass.

Aliya Cecilia Roginiel, B.S., Fairfield University; M.P.H., Yale University. *Evidence Supporting FDA Approval and CMS National Coverage Determinations for Novel Medical Products, 2005 through 2016: A Cross-Sectional Study*. Medicine-Preliminary: Bridgeport Hospital/Yale University Program, Bridgeport, Conn.; Ophthalmology: Zucker School of Medicine at Hofstra/Northwell Program, Great Neck, N.Y.

Rahil Amyn Rojiani, B.A., Brown University. *Drumming to Communicate Emotion: Dual-Brain Imaging Informs an Intervention in a Carceral Setting*. Psychiatry: Cambridge Health Alliance Program, Cambridge, Mass.

Amitte Gail Rosenfeld, B.S., Brown University. *Home Visits in Internal Medicine Graduate Medical Education*. Internal Medicine/Pediatrics: Johns Hopkins Hospital, Baltimore, Md.

Praneeth Reddy Sadda, B.A., Johns Hopkins University. *Methods for the Visualization of Placental Vasculature in Fetoscopic Surgery*. Internal Medicine: Tulane University Program, New Orleans, La.

Tejas Sudarshan Sathe, B.A., Princeton University; M.H.S., Yale University. *The Role of TRAF3 and CYLD Mutation in the Etiology of Human Papillomavirus-Driven Head and Neck Cancers*. General Surgery: New York Presbyterian Hospital–Columbia, New York, N.Y.

Amy Elizabeth Schettino, B.S., Johns Hopkins University. *A Single-Institution Database Analysis of Operative Technique in the Surgical Treatment of Otosclerosis*. Otolaryngology: Hospital of the University of Pennsylvania, Philadelphia, Pa.

Cortlandt Mercy Sellers, B.S., Brigham Young University. *Inflammatory Markers as Predictors in Primary Liver Cancers with Emphasis on Chronic Viral Hepatitis*. Transitional: Riverside Regional Medical Center Program, Newport News, Va.; Diagnostic Radiology: Baylor College of Medicine Program, Houston, Tex.

Sophia Elana Shimer, B.S., Yale University. *Patient Versus Physician Perceptions of Prognosis and End-of-Life Outcomes in Acute Leukemia*. Internal Medicine: Massachusetts General Hospital, Boston, Mass.

Joongyu Daniel Song, B.A., Princeton University. *Metabolic Inflexibility Revisited: Muscle Substrate Oxidation Is Mechanistically Dissociated from Muscle Insulin Resistance in Rats*. Internal Medicine/Pediatrics: University of Cincinnati Medical Center/College of Medicine Program, Cincinnati, Ohio

Goldie Beth Stands-Over-Bull, B.A., Yale University. *Characterization and Review of Pre-Hospital Pain Management Strategies at Yale New Haven Hospital*. Family Medicine: University of Washington Affiliated Hospitals, Seattle, Wash.

Matthew Stephen Swallow, B.A., Columbia University. *Factors in PI-RADS 3 and 4 Prostate Lesions That Predict the Risk of Clinically Significant Cancer*. Urology: University of Utah School of Medicine, Salt Lake City, Utah

Sara Tannenbaum, A.B., Harvard University. *Early Experiences with Journal Data Sharing Policies: A Survey of Clinical Trial Investigators*. Obstetrics and Gynecology: Brigham & Women's Hospital/Massachusetts General Hospital, Boston, Mass.

Alexandra Moran Thomas, B.A., Princeton University. *The Medial Prefrontal Cortex to Dorsal Raphe Circuit in the Antidepressant Action of Ketamine*. Psychiatry/Research: University of Illinois College of Medicine at Chicago Program, Chicago, Ill.

Noel Arthur Joseph Turner, B.A., Johns Hopkins University; M.H.S., Yale University. *Evaluation of the Mechanisms of Anti-Cancer Immune Responses*. Medicine-Preliminary: Yale New Haven Medical Center Program, New Haven, Conn.; Dermatology: Yale New Haven Medical Center Program, New Haven, Conn.

Evgeniya Tyrtova, B.S., M.P.H., Fairleigh Dickinson University; M.H.S., Yale University. *Meningiomas with Multiple Drivers: Genomic Landscape and Clinical Correlations*. Neurosurgery: University of Washington Affiliated Hospitals, Seattle, Wash.

Nicholas Son Wilcox, B.A., B.S., University of Pennsylvania; M.H.S., Yale University. *Distinct Hypoxia-induced Translational Profiles of Embryonic and Adult-derived Macrophages*. Internal Medicine: Hospital of the University of Pennsylvania, Philadelphia, Pa.

Robin Tiffany Wu, B.S., The College of New Jersey. *Neurodevelopmental Risks of Non-Syndromic Craniosynostosis*. Plastic Surgery (Integrated): Stanford University Programs, Stanford, Calif.

Alina Y. Yang, B.A., Princeton University. *Corneal Sensation after Glaucoma Laser Therapy and Anti-VEGF Intravitreal Injection*. Medicine-Preliminary: Kaiser Permanente Northern California Program, Santa Clara, Calif.; Ophthalmology: Wills Eye Residency Program at Jefferson, Philadelphia, Pa.

Laura Jeannette Yockey, B.A., Washington University in St. Louis; Ph.D., Yale University. *Innate Immune Responses in Zika Virus Control and Pathogenesis*. Research Fellow: Massachusetts General Hospital, Boston, Mass.

Jin Woo Yoo, A.B., Harvard University. *Development of Pancreatic Cancer Organoid Model for Studying Immune Response in Pancreatic Cancer*. Internal Medicine: Yale New Haven Medical Center Program, New Haven, Conn.

Mark William Youngblood, B.S., Georgia Institute of Technology; Ph.D., Yale University. *Genomic Characterization of Meningiomas*. Neurosurgery: McGaw Medical Center of Northwestern University Program, Chicago, Ill.

Alp Yurter, B.S., Johns Hopkins University. *The Application of Extracorporeal Photochemotherapy to Head and Neck Squamous Cell Carcinoma*. Medicine-Preliminary: St. Vincent's Medical Center Program, Bridgeport, Conn.; Physical Medicine and Rehabilitation: Spaulding Rehabilitation Hospital/Harvard Medical School Program, Charlestown, Mass.

Theodore Daniel Zaki, B.S., University of California–Irvine. Recent *Advances in Understanding Inherited Disorders of Keratinization*. Medicine-Preliminary: St. Mary's Hospital (Waterbury) Program, Waterbury, Conn.; Dermatology: Yale New Haven Medical Center Program, New Haven, Conn.

Ke Zhang, B.S., Massachusetts Institute of Technology; Ph.D., Yale University. *The Abl2 Non-Receptor Tyrosine Kinase and Cortactin Form Actin Waves That Promote Lamellipodia Formation*. Interventional Radiology (Integrated): Brigham & Women's Hospital, Boston, Mass.

Chloe Olivia Zimmerman, B.A., Dartmouth College. *Iatrogenic Complications of Diabetes Mellitus: An Examination of Hospital-Acquired Diabetic Ketoacidosis and Severe Outpatient Hypoglycemia*. Internal Medicine/Pediatrics: Yale New Haven Medical Center Program, New Haven, Conn.

Constance Xuanyi Zou, B.A., Columbia University; B.S., China Agricultural University; M.A., New York University. *Impact of FDAAA on Registration, Results Reporting, and Publication of Clinical Trials Evaluating New Neuropsychiatric Drugs Approved between 2005 and 2014*. Psychiatry: Medical University of South Carolina Program, Charleston, S.C.

STUDENTS RECEIVING THE M.D. AND PH.D. DEGREES

Shihan Naeem Khan
Jonathan L.B. Levinsohn
Rebecca Liu
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Kavita Mistry
Laura West Pappalardo
Laura Jeannette Yockey
Mark William Youngblood
Ke Zhang

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Raysa Gabriela Cabrejo
Herbert Castillo Valladares
Tafadzwa Lawrence Chaunzwa
Shang-Lin Chung
Jonathan Read Gaillard
Peter Theodore Hetzler III
Alison Kyung-Hwa Lee
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Patrick McGillivray
Elliot Coleman Morse
Tejas Sudarshan Sathe
Noel Arthur Joseph Turner
Evgeniya Tyrtova
Nicholas Son Wilcox

STUDENTS RECEIVING THE M.D. AND M.B.A. DEGREES

Nidharshan Subra Anandasivam
Di Deng
Maxwell Gerard Farina
Anusha Raja

STUDENT RECEIVING THE M.D. DEGREE AND THE CERTIFICATE IN GLOBAL MEDICINE

Paul McCracken Bourdillon

Enrollment for 2018–2019

POSTGRADUATE STUDENTS

Members of the resident staff at Yale New Haven Hospital and the VA Connecticut Healthcare System's West Haven campus are enrolled as postgraduate students in the School of Medicine. Information on postgraduate students is available from the Office of Postgraduate Medical Education.

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Yifan Chang
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Tafadzwa Lawrence Chaunzwa
Nicholas Rabih Chedid

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Rohil Malpani
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Kavita Mistry
Alyssa Mitson-Salazar
Danielle Miyagishima
Alaa Mohamedali
Muneeb Mohideen
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Micha Sam Raredon
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Praneeth Reddy Sadda
Nadia Saeed
Adam Sahlstrom
Ya Haddy Sallah
Aminah Sallam
Keyuree Satam
Tejas Sudarshan Sathe
Neil Savalia
Christopher Schenck
Alexander Scherer
Amy Elizabeth Schettino
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Lorenzo Sewanan
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Tayyab Shah
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Tyler Shelby
Liangbo Shen
Amar Sheth
Sophia Elana Shimer
Blake Shultz
Mayfong Shum
Cosmas Sibindi
Erin Silva
Julio Silva
Andrew Silverman
Anusha Singh
Katelyn Singh
Muriel Solberg
Michael Solotke
Diane Somlo
Samuel Sondalle

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Joongyu Daniel Song
Anuoluwapo Sopeyin
Goldie Stands-Over-Bull
Benjamin Steren
Lauren Stone
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Shobana Subramanian
Qisi Sun
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Minh Than
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Amy Thomas
Isaiah Thomas
Melissa Thomas
Sina Torabi
Tara Torabi
Gwendolyn Towers
Amelia Trant
Rebecca Treger
Stephanie Tu
Noel Arthur Joseph Turner
Evgeniya Tyrtova
Nelson Ugwu
Kelechi Umoga
Akhil Upneja
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Kristin Yu
Sang Won Yun
Alp Yurter
Ramsey Yusuf
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Ce Zhang
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Ke Zhang
Yapei Zhang

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Anna Zhao
Jack Zhao
Weige Zhao
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Cheryl Zogg
Constance Xuanyi Zou

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Alexandra Albert
Matthew Alsaloum
Emmanuella Asabor
Nathaniel Bachtel
Daniel Barson
Hannah Batchelor
Shivani Bhatt
Sean Bickerton
Gregory Breuer
Jessica Cerdena
Nashid Chaudhury
Jennifer Chen
Adriana Cherskov
Ryan Chow
Shanin Chowdhury
William Culligan
Stefano Daniele
Andrew Daniels
Pasha Davoudian
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Katharine Ellis
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Justin Goodwin
Michael Gormally
Sydney Green
Abigail Greene
Casey Grun
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William Hancock-Cerutti
Rachel Hennein
Grant Higerd
Corey Horien
Laura Hoyt
Brandon Hubbard
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Jillian Jaycox
Amanda Jeng
Tyler Jensen
Ruoyi Jiang
Justin Johnson
Jessica Johnston
Alanna Kaplan
Shihan Khan
Ramak Khosravi
Daniel Kim
Jonathan Klein
Zachary Kloos
Valentyna Kostiuk
Sahana Kribakaran
Irina Krykbaeva
Angela Lee
Katherine Leiby

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Jonathan Levinsohn
Alice Li
Dan Li
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Jonathan Liang
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Kingson Lin
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Jacob Lister
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Kelsey Loeliger
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Jonathan Marquez
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Elias Quijano
Micha Sam Raredon
Erin Reed
Adele Ricciardi
Neil Savalia
Alexander Scherer
Lorenzo Sewanan
Tyler Shelby
Julio Silva
Samuel Sondalle
Hoyeon Song
Alexandra Suberi
Alexander Svoronos
Taylor Takasugi
Ronan Talty
Durga Thakral
Minh Than
Alexandra Thomas
Rebecca Treger
Jordan Valdez
John Walsh
Elizabeth Woo
Madeleine Wood
Anchi Wu
Catherine Xie
Diana Yanez
Jessica Ye
Lee Ying
Laura Yockey
Mark Youngblood
Sang Won Yun
Seyedeh Zekavat
Ce Zhang
Ke Zhang
Amy Zhao
Sijin Zheng
Cheryl Zogg

Total, 134

REGISTERED FOR THE COMBINED M.D./M.H.S. DEGREE

Sarah Amalraj
Nientara Anderson
Prince Antwi
Zachary Avigan
Raysa Cabrejo
Herbert Castillo Valladares
Tafadzwa Chaunzwa
Shang-Lin Chung
Arash Fereydooni
Jonathan Gaillard
Peter Hetzler
Bryan Kaps

Maria Korah
Alison Lee
Renee Maina
Patrick McGillivray
Elliot Morse
Rachel Nelson
Tess O'Meara
Tejas Sathe
Andrew Silverman
Anusha Singh
Noel Turner
Evgeniya Tyrtova
Mike Wang
Nicholas Wilcox

Total, 26

REGISTERED FOR THE COMBINED M.D./M.B.A. DEGREE

Nidharshan Anandasivam
Eric Chen
Di Deng
Keval Desai
Maxwell Farina
Lin Mu
Anusha Raja
Jack Zhao

Total, 8

REGISTERED FOR THE COMBINED M.D./J.D. DEGREE

Blake Shultz

Total, 1

REGISTERED FOR THE PHYSICIAN ASSOCIATE PROGRAM

Victoria Ahrens
Mara Anderson
Kai Ando
Jose Arciniega
Rebecca Arko
Ben Artin
Corrie Asseo
Jessica Bahr
James Barbosa
Courtney Batchelor
Kara Becker
Tess Boeker
Tracy Buechele
Meghan Burns
Julie Butera
Tinley Chen
Naiska Cheung
Giavanna Chirico
Mahra Colvin
Amanda Connell
Andrew Cook
Lauren Culy
Susan Davis
Rachel Dayan
Taylor Dempsey
Caroline deSaussure
Indumathi Dhakshinamurthy
Lia DiMartino
Matthew Drause
Nicholas Drews
Taylor Edwards
Hannah Eldred
Katherine Farnsworth
Jennifer Farren

Nina Fiellin
Sarah Fittro
Kaitlin Fitzgerald
Timothy Fong
Scott Freeberg
Katherine Furland
Julie Gedalecia
Melissa Giblin
Zachary Gibson
Nusheen Goshtasbi
Shikha Goyal
Mallory Grosso
Katherine Gruppo
Matthew Gueble
Olivia Hayward
Jessica Hockla
Christina Jacobson
Kamran Javadi
Alexander Jewett
Emily Jimenez
Jessica Jones
Vincenzo Julian
Yeon Sun Kim
Jessica Kohler
Amy Kole
Madeline Kratz
Claire Lai
Eric Lau
Jonathan Lee
Melissa Ling
Danielle Lockwood
Jessie Mangs
Molly Marsh
Sean McCarthy
John McCarty
Rebecca McCurdy
Joseph Miller
Elisabeth Mirenda
Stephanie Mock
Lana Monashkin
Corinne Morrison
Jeannette Mutch
Lauren O'Brien
Lawrence Olala
Victor Ortiz
David Oshiro
Paige Ourada
Elizabeth Philbrick
Angela Preda
Sabrina Puvalowski
Rachel Rose
Sarah Savoia
Margaret Schultheiss
Clayton Schutz
Dennis Shea
Rachel Singley
Libby Slosburg
Jason Sotomayor
Meghan Sowers
Emily Speck
Paxton Stein
Faye Steiner
Elena Sullivan
Yukari Suzuki
Randall Swyers
Jonah Tanguay-Colucci
Mark Tatera
Emily To
Nicole Torchia
Madeline Tropp-Bluestone
Victoria Viveen
Alan Vlieg
Madison Walsh
Emily Walwood
Mia Wigley
Samantha Wright
Anton Yanker
Christopher Yegge
Alexandra Zhakov
Jessica Zheng
Drew Zimmerman
Connie Zuo

Total, 116

REGISTERED FOR THE PHYSICIAN ASSISTANT ONLINE PROGRAM

Second Year

Ayesha Ahmed
Joshua Amano
Amanda Amster
Nilofar Ariasaif
Macy Baig
Julie Ballard
Mary Bradley
Julia Burke
Marissa Clark
Danae Davis
Rebecca Dronet
Andrew Galbraith
Mary Garrison
Kelly Green Boesen
Kelly Greenville
Shiva Kasravi
Sarah Kelly
Rose Knight
Christina Kvistad
Micaela Kwochka
Sandra Lyman
Rachel Marcus
Steven Montague
Jordan Morris
Deborah Noghreyan
Rebecca Preston
Caraline Risinger
Yermiahu Sarne
Bianca Sayegh
Melissa Smith
Tammy St. Louis
Dustin Vuong
Joshua Wageman
Eugenie Weaver
Phillip Weaver
Angela Wei
Jeniece Wert
Jennifer Wood
Sheila Yack
Sean Yarbrough
David Yeh

Total, 41

First Year

Mallory Ballard
Jason Barnett
Alexandra Binder
Jessica Butts
Annette Carlsen
Shannon Carres
Krista Celestin
Laura Christensen
Alexia Clark
Daniel Coronado
Luke Counterman
Stacy Deibert
Alyssa Diver
Anne Dixon
Rebecca Dronet
Abigail Dumont
William Eisenhart
Mary Elliott
Alexander Fein
Samantha Fernandes
Jeffrey Goldman
Lila Guarco
Katie Harris
Casey Hill
Woyan Huang
Jinelle Jagoda
Natalie Jain
Sherin John
Kelly Karr
Adelaide Kier
Jeena Kinney
Catherine Kistler
Shqiponja Kuka
Carly Landry
Sara Levy
Kenneth Lowry
Jessica Lynch
Jeff Magbitang
Tamera Martin
Fasiha Memon
Melva Navarro
Linda Nguyen

Skye Nicholls
Kristin Perry
Melissa Regan
Joshua Riepe
Lauren Rosso
Joshua Rust
Jonathon Rutt
Alejandra Salinas
Travis Shields
Bobbie Simms
Kristi Sterry
Gary Strosser
Anne Wei
Kendra Yakobson
Amanda Yazzie
Betty Yu

Total, 58

REGISTERED FOR THE COMBINED M.M.SC./M.P.H DEGREE

Ben Artin
Kamal Javadi

Total, 2

The Work of Yale University

The work of Yale University is carried on in the following schools:

Yale College Est. 1701. Courses in humanities, social sciences, natural sciences, mathematical and computer sciences, and engineering. Bachelor of Arts (B.A.), Bachelor of Science (B.S.).

For additional information, please visit https://admissions.yale.edu, 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 https://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 https://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 https://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 https://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 https://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 https://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 https://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 https://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 https://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 and postprofessional degree: Master of Architecture (M.Arch.); nonprofessional degree: Master of Environmental Design (M.E.D.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences.

For additional information, please visit https://architecture.yale.edu, 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 https://nursing.yale.edu or call 203.785.2389. Postal correspondence should be directed to Yale School of Nursing, Yale University West Campus, PO Box 27399, West Haven CT 06516-0974.

School of Drama Est. 1925. Courses for college graduates and certificate students. Master of Fine Arts (M.F.A.), Certificate in Drama, Doctor of Fine Arts (D.F.A.).

For additional information, please visit https://drama.yale.edu, 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 https://som.yale.edu. Postal correspondence should be directed to Yale School of Management, PO Box 208200, New Haven CT 06520-8200.

Travel Directions

See also http://medicine.yale.edu/maps/index.aspx. Additional parking is available at the Amistad, Howard Avenue, and Temple garages, and at Yale New Haven Hospital's Emergency Department and Children's Hospital.

BY AIR

Tweed–New Haven Airport is the closest airport and is approximately four miles from the Yale campus. It is serviced by American Airlines. Local taxi service, Metro Cab (203.777.7777), is available at the airport. Connecticut Limousine Service (800.472.5466) to New Haven services Kennedy International Airport (New York), La Guardia Airport (New York), Newark International Airport (Newark, New Jersey), and Bradley International Airport (Windsor Locks, Connecticut, near Hartford).

BY TRAIN

There is hourly Metro-North (800.638.7646) service to New Haven from Grand Central Station in New York every day of the week. Amtrak (800.872.7245) service is scheduled daily from Boston, Washington, D.C., or New York (Penn Station).

BY CAR

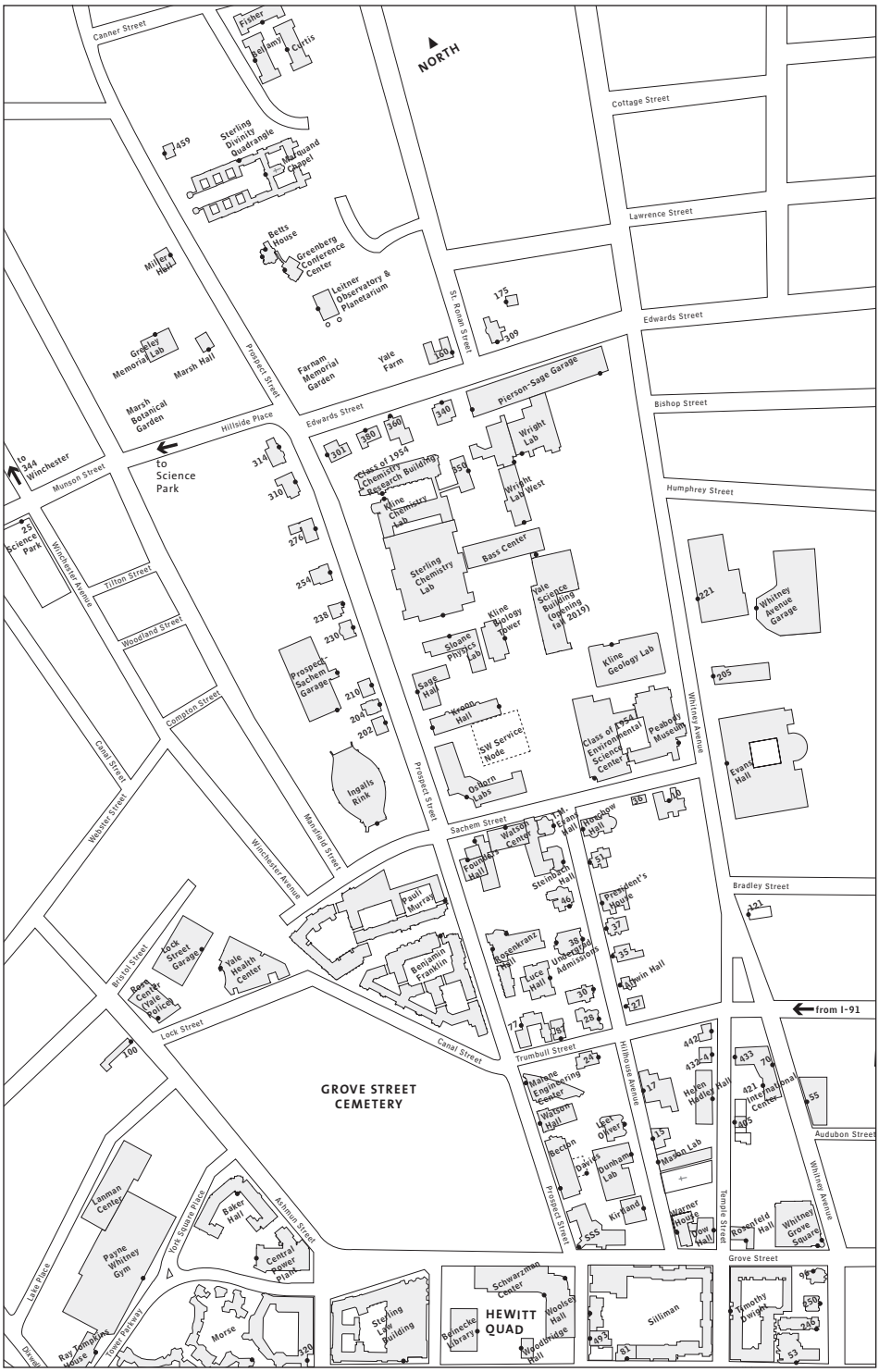
From I-95 North or South Take Exit 47 (Route 34) to Exit 1. Visitor parking is available in the Air Rights Garage, which can be entered from North or South Frontage Roads, or from York Street.

From I-91 South Take Exit 1 (Route 34) to Exit 1. Continue to the Air Rights Garage, as above.

From Merritt Parkway (Rte. 15) North Take Exit 57 to Route 34 East into New Haven. Turn right onto Ella T. Grasso Boulevard (Rte. 10) and then left onto South Frontage Road (Legion Avenue). Follow Yale New Haven Hospital and Rte. 34 signs. Continue to the Air Rights Garage, as above.

From Wilbur Cross Parkway (Rte. 15) South Take Exit 59 immediately after the tunnel. Go right at end of ramp. Merge left onto Whalley Avenue at light. Stay on Whalley until you see signs for Yale New Haven Hospital at Park Street. Follow hospital signs, then make a left turn onto South Frontage Road. Continue to the Air Rights Garage, as above.

YALE UNIVERSITY CAMPUS NORTH



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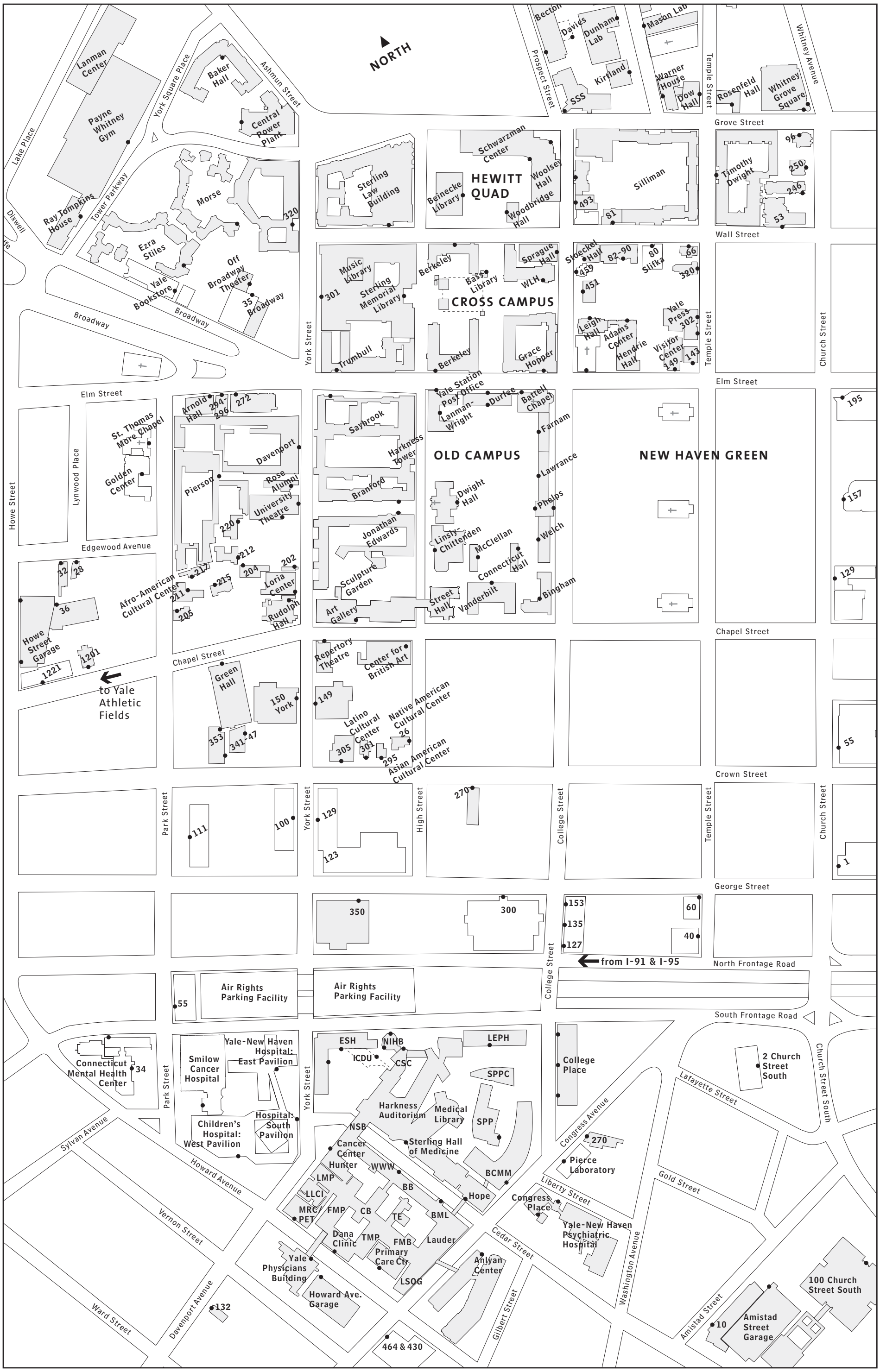
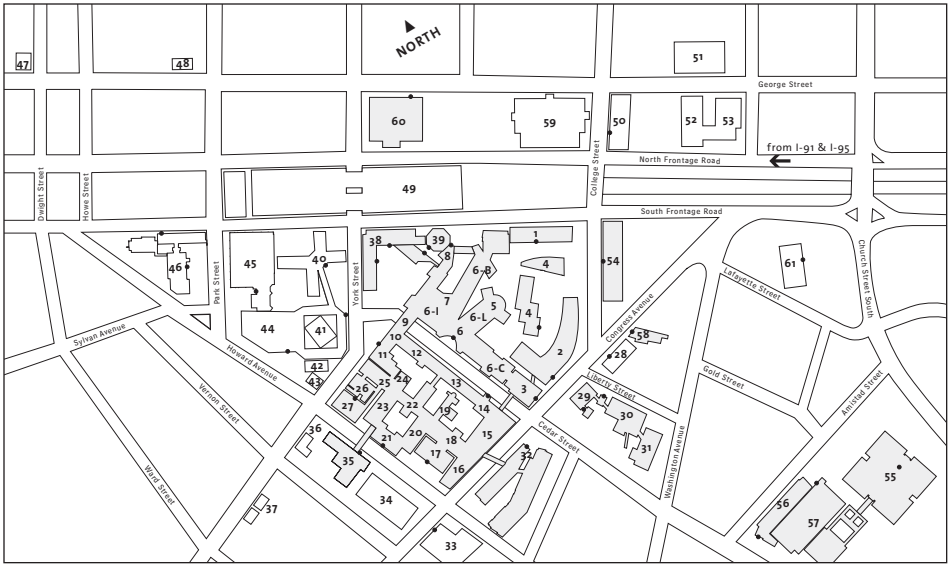
YALE UNIVERSITY CAMPUS SOUTH & YALE MEDICAL CENTER



YALE MEDICAL CENTER BUILDINGS AND ADDRESSES



1. Laboratory of Epidemiology and Public Health, 60 College St.
2. Boyer Center for Molecular Medicine
3. Jane Ellen Hope Building
4. Sterling Power Plant and Sterling Power Plant Co-Gen
5. Harvey Cushing/John Hay Whitney Medical Library
6. Sterling Hall of Medicine, 333 Cedar St.
   Wings: B, C, I & L
7. Mary S. Harkness Memorial Auditorium
8. Child Study Center
9. Nathan Smith Building (Bridge)
10. Yale Cancer Center
11. Hunter Building, 15 York St.
12. William Wirt Winchester Building
13. Boardman Building, 330 Cedar St.
14. Brady Memorial Laboratory, 310 Cedar St.
15. Lauder Hall
16. Laboratory for Surgery, Obstetrics and Gynecology
17. Primary Care Center
18. Farnam Memorial Building
19. Tompkins East
20. Tompkins Memorial Pavilion
21. Charles A. Dana Building, 789 Howard Ave.
22. Clinic Building
23. Fitkin Memorial Pavilion
24. Fitkin Amphitheater
25. Laboratory for Medicine and Pediatrics
26. Lippard Laboratory of Clinical Investigation
27. P.E.T. Center
28. John B. Pierce Laboratory, 290 Congress Ave.
29. Congress Place, 301 Cedar St.
30. Yale-New Haven Psychiatric Hospital 2, 184 Liberty St.
31. Yale-New Haven Psychiatric Hospital 3, 184 Liberty St.
32. Anlyan Center for Medical Research and Education, 300 Cedar St.
33. 430 and 464 Congress Ave. and 726 Howard Ave.
34. **Howard Ave. Garage**
35. Yale Physicians Building, 800 Howard Ave.
36. 110 Davenport Ave. (YNHH Day Care Center)
37. 132–138 Davenport Ave.
38. Edward S. Harkness Memorial Hall A and D, 367 Cedar St.
39. Neison and Irving Harris Building, Child Study Center, 230 S. Frontage Rd.
40. East Pavilion, 20 York St.
    (Yale New Haven Hospital Main Entrance)
41. South Pavilion, 20 York St.
42. **Emergency Services Parking**
43. **Children's Hospital Parking Garage**
44. Children's Hospital (West Pavilion)
45. Smilow Cancer Hospital, 35 Park St.
46. Connecticut Mental Health Center
47. Ronald McDonald House, 501 George St.
48. 425 George St.
49. **Air Rights Parking Garage**
50. 127, 135, and 153 College St.
51. New Haven Hotel, 229 George St.
52. **Temple Garage**
53. Temple Medical Center, 40–60 Temple St.
54. College Place, 47 College St.
55. Medical Center South, 100 Church St. South
56. 10 Amistad St.
57. **Amistad Garage**
58. 270 Congress Ave.
59. 300 George St.
60. 350 George St.
61. 2 Church St. South

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 https://equalopportunity.yale.edu.

Title IX of the Education Amendments of 1972 protects people from sex discrimination in educational programs and activities at institutions that receive federal financial assistance. Questions regarding Title IX may be referred to the University's Title IX Coordinator, Stephanie Spangler, at 203.432.4446 or at titleix@yale.edu, or to the U.S. Department of Education, Office for Civil Rights, 8th Floor, 5 Post Office Square, Boston MA 02109-3921; tel. 617.289.0111, fax 617.289.0150, TDD 800.877.8339, or ocr.boston@ed.gov.

In accordance with federal and state law, the University maintains information on security policies and procedures and prepares an annual campus security and fire safety report containing three years' worth of campus crime statistics and security policy statements, fire safety information, and a description of where students, faculty, and staff should go to report crimes. The fire safety section of the annual report contains information on current fire safety practices and any fires that occurred within on-campus student housing facilities. Upon request to the 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.

For all other matters related to admission to the School of Medicine, please telephone the Office of Admissions, 203.785.2696.

BULLETIN OF YALE UNIVERSITY
New Haven CT 06520-8227

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