

# Keck School of Medicine of USC

Founded in 1885, the Keck School of Medicine of USC is part of Keck Medicine of USC, a major center of medical research, education and patient care with more than 1,500 full-time faculty members and a voluntary faculty of more than 4,000 physicians. Faculty includes national leaders in each of its 25 clinical and basic science departments. Located on the university's 30.8-acre Health Sciences Campus three miles northeast of downtown Los Angeles, the Keck School is adjacent to the Los Angeles County+USC Medical Center, one of the largest teaching hospitals in the United States.

The Keck School's faculty, students and residents serve more than one million patients each year through the Los Angeles County+USC Medical Center, the USC Norris Cancer Hospital, the Keck Hospital of USC, Children's Hospital Los Angeles, USC Verdugo Hills and a network of USC-affiliated hospitals throughout Southern California. More than 500 faculty physicians care for patients with complex medical needs as well as provide primary care.

The new Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research of USC, which opened in the fall of 2010, joins the Harlyne J. Norris Cancer Research Tower and USC Zilkha Neurogenetic Institute in providing state-of-the-art facilities for important scientific discovery. With more than \$248 million in total federal research support, the Keck School ranks among the top U.S. medical schools in federal funding.

The Keck School of Medicine of USC is at the forefront of medical education and was among the first medical schools to adopt Introduction to Clinical Medicine courses for first-year students, providing direct experience in patient care from the start.

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Peggy Farnham, Ph.D., *Associate Dean, Graduate Affairs (Ph.D. Programs)*

Inderbir Gill, M.D., *Associate Dean, Clinical Innovation*

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Elahe Nezami, Ph.D., *Associate Dean, Graduate Affairs (Undergraduate, Master's and Professional Degree Programs)*

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Darcy Spicer, M.D., *Assistant Dean, Clinical Research Studies*

Sajjad Yacoub, M.D., *Assistant Dean, Student Affairs*

## Admissions

### Doctor of Medicine

**Keith Administration Building 100B**  
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Los Angeles, CA 90089-9021  
(323) 442-2552  
FAX: (323) 442-2433

*Associate Dean, Admissions:* Raquel D. Arias, M.D.

The Keck School of Medicine of USC Committee on Admissions is responsible for selecting members of the entering class. The committee comprises both faculty and students. The committee reviews candidates whose academic achievement, commitment to service and personal qualities distinguish them from the many thousands of applicants who apply.

The applicant's undergraduate major may be in any subject area from an accredited college or university. Although sound preparation in the basic sciences is essential, a background in the humanities, and depth and breadth of personal experience are also important.

### General Admissions Information

The Keck School of Medicine of USC participates in the centralized American Medical College Application Service (AMCAS) and also requires the submission of the Keck School of Medicine supplemental application. Approximately 7,500 applications are received per year and 750 applicants receive interview invitations. Interviews begin in mid-September and end in early March. Students receive acceptance letters beginning in October.

### Requirements

All applicants to the Keck School of Medicine of USC M.D. program must have completed a baccalaureate degree, or its equivalent, from an accredited college or university prior to matriculation. The school has no specific course requirements. Strong applicants will have distinguished themselves in their chosen field of study and have demonstrated competency in the sciences at the time of their application. The Medical School Admission Requirement (MSAR) guide may be referenced for recommended course work. The MCAT is required, and scores must be from within the previous three years of the date of matriculation.

International applicants must hold a degree considered equivalent to a U.S. bachelor's degree as evaluated by the USC Office of Graduate and International Admissions.

Individuals who have discontinued studies in medical school for academic reasons are not eligible to apply to the Keck School of Medicine of USC.

### Medical College Admission Test (MCAT)

The MCAT is required of all applicants. Applicants to the entering class are required to take the MCAT within the previous three years of the date of matriculation and no later than August in the year that the application becomes available. Scores from administrations of the examination taken outside of this time period will not be accepted.

### Applications

The Keck School of Medicine of USC participates in the American Medical College Application Service (AMCAS). AMCAS reproduces and distributes an application and standardized academic record to participating medical schools designated by the student. Applications may be obtained from its Website ([aamc.org](http://aamc.org)).

Applications are available after June 1 for the class entering in August of the following year. Applications to USC must be returned to AMCAS before November 3, but earlier application is encouraged. The Keck School of Medicine of USC participates in the Early Decision Program. Interested applicants apply between June 1 and July 31 and are notified of the Admissions Committee's decision by September 1.

The Committee on Admissions reviews all information submitted on the AMCAS application as well as the school's supplemental application. The nonrefundable supplemental application fee is \$100.

### Personal Interviews

Personal interviews are a required aspect of the application process. Interviews are conducted at the Keck

School of Medicine on the Health Sciences Campus of the University of Southern California.

### Notice of Acceptance

Notices of acceptance will be sent to successful candidates beginning in October until the class is filled. Since Keck uses a rolling admissions process, it is highly recommended to submit a completed application early in the cycle. If not chosen for an interview, candidates are usually notified by March of the application year.

Candidates must reply to an offer of admission and agree to the Essential Characteristics and Abilities Required for the Completion of the MD Degree within 10 business days of receiving the offer of admission. A letter of withdrawal, via email or post mail, is required if students wish to relinquish their place in the class; release is granted automatically when the letter is received.

### M.D./Ph.D. Program

The Keck School of Medicine has developed an M.D./Ph.D. program designed for individuals who aspire to a career in academic medicine or a leadership role within the biomedical industry. Students are expected to acquire the modern skills that are required for physician competence. Additionally, the M.D./Ph.D. program provides an opportunity for the development of research expertise and academic excellence while fulfilling the requirements for a Ph.D. degree.

A joint program between the Keck School of Medicine and the California Institute of Technology (Caltech) was established in fall 1997 for the granting of the M.D./Ph.D. degree. Ph.D. studies may be carried out at Caltech or through collaboration between two laboratories at both institutions. The M.D. will be awarded from the Keck School of Medicine and the Ph.D. will be awarded from Caltech.

The M.D./Ph.D. executive committee is responsible for selecting students for the M.D./Ph.D. program. Members of the committee review the qualifications of each applicant, including MCAT scores, academic performance, letters of recommendation and research experience. The committee interviews candidates and then selects students for admission to the program. All applicants to the joint program interview at Keck School of Medicine and the California Institute of Technology.

### General Information

The M.D./Ph.D. program enrolls four students annually. Students have the option of doing the Ph.D. at USC or Caltech. Each student accepted to the program must also be accepted to the Keck School of Medicine. All positions are fully funded.

### Requirements

Admission requirements for the M.D./Ph.D. program are those of one of the graduate programs at Caltech, the Keck School of Medicine and USC. Students select the program of their choice during the first two years of the medical curriculum; descriptions of these programs are available from each department or program and Caltech.

### Graduate Record Examinations (GRE)

To assist the M.D./Ph.D. Committee in its evaluation of candidates, applicants to the M.D./Ph.D. program are encouraged to provide recent GRE scores. The committee does not, however, require GRE scores in order to consider an application.

### Applications

Applicants to the Keck School of Medicine are advised to request information about the M.D./Ph.D. program at the time of application. In addition to completing the medical school application, applicants should indicate their interest in the M.D./Ph.D. program.

Students who are currently pursuing the medical curriculum at the Keck School of Medicine may apply to the M.D./Ph.D. program by contacting: M.D./Ph.D. Program, Keck School of Medicine, 1975 Zonal Avenue (KAM 200), Los Angeles, CA 90089-9023; (323) 442-2965, FAX: (323) 442-2318.

### Personal Interviews

All applicants are screened by members of the M.D./Ph.D. Executive Committee; candidates who meet the basic criteria of the program are then invited to be interviewed by members of the committee and faculty at USC and Caltech.

### Notice of Acceptance

Students selected for acceptance to the M.D./Ph.D. program are notified between January and May of each year. Students begin their program in the fall semester and register for courses in the medical curriculum at that time.

Further information about the M.D./Ph.D. program at the Keck School of Medicine may be obtained by contacting: M.D./Ph.D. Program, Keck School of Medicine, 1975 Zonal Avenue (KAM 200), Los Angeles, CA 90089-9023; (323) 442-2965, FAX: (323) 442-2318; email: [mdphdpgm@usc.edu](mailto:mdphdpgm@usc.edu).

### Graduate Degree Programs

Admission standards for these curricula are established jointly by the Keck School of Medicine, its participating programs and the Graduate School.

Applicants to graduate degree programs offered at the Keck School of Medicine must meet the general criteria for acceptance to the Graduate School. Each participating program may have additional requirements for application. The programmatic requirements for the Keck School of Medicine's graduate programs are detailed in the Graduate Degree Programs section.

Further information about graduate degree programs at the Keck School of Medicine may be obtained by contacting: Office of the Associate Dean for Graduate Studies, Keck School of Medicine, 1975 Zonal Avenue (KAM 409), Los Angeles, CA 90089-9023; (323) 442-1607, FAX: (323) 442-1199.

### Tuition and Fees

The tuition and fees listed below are estimated for fall semester, 2013. All fees are subject to change without notice by action of the University of Southern California Board of Trustees. The university reserves the right to assess new fees or charges. Tuition is not refundable; late registration fees are mandatory and cannot be waived.

Tuition for each semester of the medical school curriculum is due and payable at the beginning of the semester. Registration is not permitted after the third week of instruction. Late payment of tuition is subject to a mandatory late fee. Average budgets for medical students will vary according to their year in the curriculum. Sample budgets for Year I, Year II, and the Junior/Senior Continuum may be requested from the Office of Financial

Aid. Tuition, mandatory fees and parking are the same for all years.

Tuition for courses of the graduate curriculum is based upon the number of units assigned to each course. The Graduate Degree Programs section provides a department-by-department list of graduate course titles; the number following each title indicates the number of units for which tuition is charged. Late payment of tuition is subject to a mandatory late fee.

### Required Fees (Estimated)

Academic Year Tuition (two semesters)	\$54,662
Graduate Tuition (per unit)	1,602
Student Health Service Fee (annual)	545
Student Programming Fee (graduate)	80
Student Services Fee	20
Norman Topping Scholarship Fee	16
Health Insurance	1,712
Annual Dental Rate	136
Malpractice Insurance	25 (per academic year)
Disability Insurance	51 (per academic year)

### Optional Fees

Parking fee, per semester (see Tuition and Fees).

## Grading and Evaluation

The Keck School of Medicine employs a system of evaluation and grading designed to encourage student self-reliance, to stimulate the student's independent quest for knowledge and to promote excellence in academic achievement.

For courses of the medical curriculum, the Keck School of Medicine does not award numerical or letter grades. The evaluation process leading to a pass or fail grade is based on performance of the student in relation to announced course criteria. Throughout medical school, students will be evaluated on their fund of knowledge, problem-solving ability, professional behavior, relevant personality traits and clinical and interpersonal skills. Additional information on grading and evaluation is contained in the handbook provided to every enrolled medical student.

Faculty instructors are responsible for establishing evaluation criteria appropriate to the objectives of each course, discipline and clerkship, and for specifying the manner in which evaluative information is to be gathered. Instructor comments on student performance form an integral part of a student's total evaluation. For each evaluation, descriptive comments based on the student's overall performance in relation to course criteria are submitted for permanent file to the office of the associate dean for student affairs, together with performance reports.

The student's permanent file is used to prepare a letter from the senior associate dean of Student Affairs and Educational Affairs of the Keck School of Medicine, which accompanies student applications for internships and residencies. These records are maintained by the Office of

Student Affairs; students may review their records during regular office hours by scheduling an appointment. During the lifetime of the physician, the permanent student record may be consulted as evidence of completion of the required curriculum and as certification for licensure.

Grading and evaluation policies for graduate degree programs and for joint M.D./Ph.D. degrees are established in conjunction with the Graduate School. In general, courses taken in partial fulfillment of graduate degree requirements receive letter grades that are recorded by the university.

## Degrees and Requirements

The Keck School of Medicine and its departments offer types of curricula leading to award of: the Doctor of Medicine; joint M.D./Ph.D.; joint M.D./MBA; joint M.D./MPH; M.D./M.S., Global Medicine; a Master of Academic Medicine, MAM; Global Medicine, M.S.; Pharm.D./M.S., Global Medicine; Global Health, B.S.; Health Promotion and Disease Prevention Studies, B.S.; graduate degrees in conjunction with the Graduate School in Applied Biostatistics/Epidemiology, M.S.; Biochemistry and Molecular Biology, M.S.; Biostatistics, M.S., Ph.D.; Cancer Biology and Genomics, Ph.D.; Cell and Neurobiology, M.S.; Clinical, Biomedical and Translational Investigations, M.S.; Development, Stem Cells, and Regenerative Medicine, Ph.D.; Epidemiology, Ph.D.; Experimental and Molecular Pathology, M.S.; Medical Biology, Ph.D.; Molecular Epidemiology, M.S., Ph.D.; Molecular Microbiology and Immunology, M.S.; Molecular Structure and Signaling, Ph.D.; Nurse Anesthesia, M.S.; Physiology and Biophysics, M.S.; Psychology and Public Health, Ph.D./MPH; Stem Cell Biology and Regenerative Medicine, M.S.; Integrative Biology of Disease, Ph.D.

The Department of Family Medicine has one academic division: the Division of Physician Assistant Studies, which offers the Master of Physician Assistant Practice.

The Department of Preventive Medicine has two academic divisions: the Health Behavior Research Division, which offers a B.S., Global Health; B.S., Health Promotion and Disease Prevention Studies; B.S., Global Health/Master of Public Health; B.S., Health Promotion and Disease Prevention Studies/Master of Public Health; Master of Public Health; Pharm.D./Master of Public Health; Ph.D., Physical Therapy/Master of Public Health; Ph.D., Preventive Medicine (Health Behavior Research); and the Biostatistics Division, which offers M.S. programs in Biostatistics, Molecular Epidemiology, and Applied and Biostatistics/Epidemiology. The division also offers Ph.D. programs in Biostatistics, Epidemiology, and Molecular Epidemiology.

In addition, departments of the school have certificate programs in certain medical specialties.

The Medical Education Committee (MEC) is responsible for overall planning of the medical school curriculum. Separate curriculum committees plan and supervise the instructional programs for each year of medical school. Each of the committees includes student representatives and faculty members from the departments involved in each year's teaching program.

The curriculum of medical education at USC continues to emphasize preparation of the student to give optimal patient care. Students are progressively involved in patient care beginning with their first semester. The curriculum is patient-oriented, and students are expected to assume increasing responsibility for patient care as they acquire sufficient knowledge and skills. During the clinical experiences of the Junior/Senior Continuum students eventually attain a level equivalent to that of an intern.

At the same time, the school recognizes that the explosion of knowledge and techniques brought about by the current "biotechnology revolution" is rapidly altering the practice of medicine. During the four years of medical school, students cannot be taught all that will be needed for the practice of medicine – either now or in the years ahead. To a far greater degree than in the past, the present curriculum encourages students to acquire skills and habits of self-education and self-instruction that will prepare them for lifelong learning.

The faculty of the school recognize that while most students will eventually practice medicine, some will choose an academic research career. The plan of medical education fosters the development of individuals whose careers may be directed along this path. Faculty are available to counsel and encourage research participation by students during their medical school training.

The curricula of the Keck School of Medicine and its departments acknowledge the crucial place of basic medical science in the advance of modern clinical practice. Both basic and clinical science are taught throughout the four years of the undergraduate medical curriculum. Basic science is taught both as pure basic science and in correlation with clinical science. In addition, a number of the school's departments cooperate with the USC Graduate School to offer degree courses leading to the award of the Master of Science and Doctor of Philosophy. Most of these graduate courses may also be taken as part of the school's joint M.D./Ph.D. program.

## Doctor of Medicine

The Keck School of Medicine awards the Doctor of Medicine to enrolled students who have satisfactorily completed the four-year curriculum of the school. This curriculum integrates instruction in all departments of the school: Department of Anesthesiology, Department of Biochemistry and Molecular Biology, Department of Cell and Neurobiology, Department of Dermatology, Department of Emergency Medicine, Department of Family Medicine, Department of Medical Education, Department of Medicine, Department of Molecular Microbiology and Immunology, Department of Neurological Surgery, Department of Neurology, Department of Obstetrics and Gynecology, Department of Ophthalmology, Department of Orthopaedics, Department of Otolaryngology – Head and Neck Surgery, Department of Pathology, Department of Pediatrics, Department of Physiology and Biophysics, Department of Preventive Medicine, Department of Psychiatry and the Behavioral Sciences, Department of Radiation Oncology, Department of Radiology, Department of Stem Cell Biology and Regenerative Medicine, Department of Surgery and Department of Urology.

The sections that follow provide a synopsis of the emphases and organization of this four-year curriculum.

### Years I-II (two academic years)

The curriculum is designed to enhance the students' understanding of the basic sciences and their relevance to clinical medicine. The methodology used will improve students' problem-solving and independent study skills. Curriculum themes are delivered in a case-centered format with the integration of small-group learning sessions, directed independent study and newer instructional technologies emphasized.

Year I-II begins in the first semester with Foundations of Medical Sciences followed by organ system review ending with Integrated Case Study section. There is an eight-week summer break between the first and second years. Students also take Clinical Translational Research (CTR), Evidence Based Medicine (EBM), Introduction to

Clinical Medicine (ICM) and Professionalism and the Practice of Medicine (PPM).

Each week of the academic year is composed of approximately 20 hours of lecture and small group sessions with an additional 20 hours of independent directed study, CTR, EBM, ICM and PPM. Examinations in all systems throughout the first two years are graded Pass/Fail. Dean's recognition is awarded on the basis of year-end comprehensive examinations and special projects.

### Foundations of Medical Sciences (FMS)

This 19-week introductory system provides the student with the fundamental knowledge necessary for the integrated study of the basic and clinical sciences in the human organ systems. Foundations of Medical Sciences is divided into three sections: FMS I, II and III. The overarching goal for these sections is the use of knowledge of medical science to describe basic concepts relating to the structure and function of the human body in normal and diseased states, and thus, provide a foundation for comprehending the disease-specific content required to achieve the case-based objectives in subsequent organ systems.

### Gross Anatomy

Cadaver dissection remains a unique teaching tool by which the three dimensional organization of the human body is studied. Gross Anatomy will begin in the Core Principles of health and disease system with the dissection of the body wall and major body cavities followed by head and neck dissection in the neuroskeletal system, limbs, dissection during the musculoskeletal system and pelvic cavity dissection in reproduction system. Continued study of gross anatomy by use of prosected anatomical specimens as well as computer programs, selected review lectures, and so on, continues throughout the integrated organ systems.

### Introduction to Clinical Medicine (ICM)

ICM expresses the strongly patient-centered orientation of the medical school curriculum. The student is introduced to patients and is involved in patient care activities from day one. Students are introduced to the principles of patient care and management and examine what it means to be a physician and how one becomes a physician.

The major content areas of the course include communication in the setting of illness, the unified concept of health and disease (the biopsychosocial model), basic clinical skills and the correlation of basic science with clinical medicine.

ICM emphasizes the systematic acquisition of the clinical skills of interviewing, history taking, physical examination, elementary clinical problem solving and medical record keeping. Throughout the Year I-II continuum, the ICM clinical skills curriculum is integrated with basic science instruction. Students can therefore learn and apply basic science knowledge in the clinical setting. By encouraging a thorough understanding of the direct applications of basic science research to modern clinical medicine, instructors motivate the student to learn, use and retain more of the content and concepts presented in the basic science portions of the curriculum.

A group of five or six students spends from four to eight hours each week with an instructor from the clinical faculty who remains with the group for one to two years. As the group deals with basic medical themes (death, pain and helplessness) and issues (patient responsibility, learning to live with ambiguity and uncertainty), instructors help students to cope with their own feelings. This format opens the door for student-faculty interaction and improvement of student-faculty communication.

Instructors encourage students to take advantage of the learning experiences provided by their roles as helping and therapeutic persons. Students develop their ability to communicate with patients in the setting of illness and are guided by patient concerns to enhance their own growing knowledge, skills, abilities and responsibilities. Students are expected to acquire skills and habits of self-education and self-instruction that will prepare them for lifelong learning.

The unified concept of health and disease presented in this course enables students to comprehend the human organism in all its complexity. Using their clinical experiences as a teaching model, students are taught to consider the patient as an integrated whole and to view the patient's illness or disease as more than simply a disruption of physiologic processes or a collection of physical findings.

Additional learning experiences occur through workshops and focus experiences. ICM workshops provide standardized instruction in history taking and physical examination, as well as integrated instruction in areas that cross disciplines. These include physician well-being, substance abuse, domestic violence, and ethics. Through focus experiences, students are encouraged to explore a variety of practice environments as well as community-based health and social services. For example, students may visit outpatient clinical settings, a geriatrics long term care facility, a hospice care facility or homeless services organizations.

#### *Professionalism and the Practice of Medicine (PPM)*

The purpose of the PPM course is to create a community and social context to provide, identify and facilitate learning from professional role models for students throughout the first two years of the medical school curriculum, as well as to help students gain skills and competence in the areas of communication, the social and community context of health care, ethical judgment, self-awareness and reflection, self-care and personal growth, professionalism, cultural competence, and lifelong learning. The curriculum is dynamic and interactive, allowing for much small-group discussion and participation. Students are encouraged to work collaboratively and enhance small-group skills, in order to improve their participation in Introduction to Clinical Medicine (ICM), Gross Anatomy, MDL laboratories and large-group sessions, as well as to prepare them for the team work of their clinical years.

The PPM course sessions meet on Monday afternoons, typically for two hours per session. The students meet in groups with two faculty members, who serve as their mentors throughout the first year of their pre-clinical education; at least one mentor is a clinician. The clinical faculty comes from multiple disciplines within Keck and the local community. While the course features large lectures, there is a great emphasis on small-group learning acquired from community leaders, faculty-mentored small-group discussions, student presentations and student-led sessions.

The students participate in a core curriculum in Year I, which includes general topics such as cultural competence, ethics, health care policy and finance, professionalism, and empathy. In Year II, the students are allowed to select from nine different areas of interest (selectives), and meet in groups with faculty having expertise in the given area. Examples of selectives presented include advanced ethics, medicine and the mind, spirituality and medicine, medical arts and humanities, global health, complementary and alternative medicine, medicine's intersection with technology, physicians operating outside their comfort zones, and the future of health care.

The PPM course provides students with an opportunity to build a professional identity, develop relationships with

faculty mentors, and increase team-building and community-building skills. Students receive an introduction to the concepts of professionalism and ethics, with a better understanding of their real-world implications. The PPM course encourages leadership while engaging in the process of learning, characterized by presentations within both small and large groups, as well as professional development through exposure to multiple professional, ethical, and cross-cultural scenarios, cases, and providers. Evaluation is provided through student submission of portfolios containing written self-reflections, responses to faculty and peer feedback, and evaluations completed over the course of a two-year longitudinal curriculum. Finally, PPM hones sensitivity and skills relevant to medical professionalism to better prepare students for their transition into the clinical years of the medical school curriculum.

#### *Clinical Translational Research*

This course, a series of on-line lectures accompanied by small group discussion sessions, is intended to introduce students to the methods of clinical and translation research (CTR) and prepare them for carrying out research as medical students. Students are required to complete a Required Scholarly Project (RSP) and this course will provide students with the basic skills and competencies needed to plan, conduct, and complete their RSP. Regardless of a student's future career path, the practice of medicine will be driven by the findings of CTR. Rapid advances in basic sciences, driven to new technologies such as genomics, have brought exciting new possibilities for identifying people at risk for disease, for identifying disease in its earliest stages, and in targeting therapies on an individual basis. On the verge of a new era of "personalized medicine", healthcare provision is driven by what is known about the characteristics of each individual and of the diseases that they may have.

CTR represents the research approach for moving from basic discovery in the laboratory to application in individual patients and in making populations healthier. Medical researchers have long carried out patient-oriented or clinical research. The term CTR is more recent, coming into use over the last decade in recognition of the research continuum from basic discovery in the laboratory to application in patients and on to populations. One problem in bringing discoveries into practice has been a gap between the work of laboratory researchers and clinical investigators; CTR bridges that gap.

#### *Evidence Based Medicine (EBM)*

Evidence-based medicine (EBM) is the clear, conscientious, and prudent use of current best evidence in making patient care decisions. Evidence-based guidelines are considered to be the basis for decision-making in clinical practice, guiding screening, diagnosis and treatment. In a new era of health care reform, EBM will likely be given even greater weight and outcomes are tracked carefully in order to evaluate the effectiveness of guideline-driven care.

Evidence-based practice is primarily based on five well defined steps: 1) Asking Focused Questions: translation of uncertainty to an answerable question; 2) Finding the Evidence: systematic retrieval of best evidence available; 3) Critical Appraisal: testing evidence for validity, clinical relevance, and applicability; 4) Making a Decision: application of results in practice; and, 5) Evaluating Performance: auditing evidence-based decisions.

EBM foundational material is taught during Foundations of Medical Sciences I as part of the biostatistics and epidemiology curriculum. Along with the clinical and translational research series during the first year of medical school, this information lays the foundation for the EBM curriculum during the remaining years of instruction.

#### *Organ System Review*

A sequence of study presenting integrated basic and clinical science instruction involving human organ systems – skin, hematology and clinical immunology, neurosciences, musculoskeletal, cardiovascular, renal, respiratory, endocrine/metabolism, reproduction, gastrointestinal/liver – follows Foundations of Medical Sciences.

#### *Integrated Case Study*

This section completes the second year of the Year I-II continuum and emphasizes patient-centered problems that integrate the basic and clinical science presented in the preceding organ systems. Students will explore the multi-organ effects of disease processes and reinforce diagnostic reasoning skills. In addition, concepts of pathophysiology, evaluation and management that can be applied to any organ system will be included. This section will also reinforce the appropriate use of medical information resources, effective self-directed learning skills, and interpersonal and group communication skills.

Separate review sessions of the important basic science and clinical concepts covered during the previous two years also occur during this seven-week section. These sessions will assist students in preparing to take Step I of the United States Medical Licensing Examination (USMLE).

By early spring of the second year of the Year I-II continuum, students are expected to select their academic clinical advisers and to begin arranging the schedule of clerkships to be taken during Year III-IV. By the end of the fall semester, Year II, each student receives information that describes the curriculum requirements of Year III-IV. Students choose the area of medical practice that they are most likely to pursue and an adviser is assigned from that discipline. The adviser counsels the student on clerkships and opportunities in graduate medical education.

#### *Required Scholarly Project*

The Required Scholarly Project (RSP) is designed to provide medical students with the opportunity to become engaged in hypothesis-driven research to promote analytical thinking skills and ultimately, physician leaders. The aim of the RSP is to expose students to the process of scientific inquiry, teaching them how to formulate an answerable question and the requisite methodology in seeking appropriate answers. Each student undertakes a faculty mentored research project in a discipline of his or her choice. Viable disciplines encompass a wide spectrum to include: biomedical research, from discovery to application, and health care, i.e., basic science, clinical, educational, behavioral science, health services, community and epidemiological activities. The RSP is interwoven with the curriculum, which includes didactic instruction on topics such as study design and biostatistics. The RSP is a longitudinal experience throughout all four years of medical school, with successful completion being required for graduation. Students with projects deemed meritorious by the RSP steering committee will receive "Distinction in Research" recognition at graduation.

#### **Year III-IV (two academic years)**

The final two years of medical school are designed as a continuum of two calendar years, beginning in July at the end of Year II. During the spring of their second year, students schedule clerkship rotations to be taken during the two years. Each student's program is designed with the assistance of faculty advisers and includes 50 weeks of required clerkships, 16 weeks of selective clerkships and 16 weeks of elective clerkships.

All degree candidates are required to take Step I of the United States Medical Licensing Examination (USMLE) prior to entering Year III-IV and pass it before starting their senior year. Students must pass Step II CK and CS of the USMLE as a graduation requirement.

During Year III-IV, each student may schedule 16 weeks of discretionary time for personal convenience, remedial work, funded research work and other non-curricular activities, such as investigating postgraduate training programs. Although every effort is made to provide flexibility in the scheduling of each student's program, some inherent limitations are imposed by the maximum enrollment permitted for each clerkship. Students are a vital part of the university's medical team, which provides health care for patients throughout the year. Vacations are therefore subject to some scheduling adjustments.

#### Required Clerkships

Family Medicine	6 weeks
General Surgery	6 weeks
Surgical Subspecialty	4 weeks
Internal Medicine	6 weeks
Internal Medicine Sub-internship	4 weeks
Neurology	4 weeks
Obstetrics and Gynecology	6 weeks
Pediatrics	6 weeks
Psychiatry	6 weeks
Intersession	2 weeks (two, one-week sessions)

#### Intersession I and II

The Intersession curriculum is two, one-week sessions established for Year III students that will enable learners to pause, reflect and consolidate the many and varied clinical experiences that they encounter in their third year of medical school; to promote advanced clinical skills, professional development, health policy formulation and ethical decision-making, and patient safety; and to further prepare for the residency application process.

This individualized curriculum will allow students to revisit and focus basic-science topics through the prism of newly learned clinical material and to foster capacity for the analysis and formulation of health care policy in light of the political, economic, legal and social, and ethical dimensions of health care.

Students will be instructed in a systems-based approach to patient safety by stimulating the imagination, curiosity and skills of close observation and careful interpretation through engagement with the arts and humanities. Developing and building advanced clinical skills by acquiring, appraising and applying evidence in the context of individual patient decision-making, (i.e., Evidence Based Medicine) are two important goals of the intersession curriculum.

Providing comprehensive, coordinated and consistent career advising along with fostering the continuing professional development of the learners in the frame of clinical practice are key components. Finally, the curriculum will provide ongoing instruction in the provision of culturally competent care and prepare learners for their required community project.

#### Selective Clerkships

*Students are required to schedule 16 weeks of selective clerkships, chosen from a list of four- or six-week clerkships approved by the Clinical Curriculum Committee. Selective clerkships are carried out at USC-affiliated hospitals and encompass virtually all specialty areas. Information is available at medweb.usc.edu.*

#### Elective Clerkship

The elective period consists of 16 weeks, during which electives may be taken on campus, at USC-affiliated hospitals or at more distant medical schools or medical centers. Approved on-campus electives that are offered regularly are listed in the elective catalogue.

Proposals for other on-campus and off-campus electives are reviewed individually by a committee composed of faculty members and students. All petitions must be submitted at least six weeks before the beginning of the rotation. Off-campus electives require documentation from the off-campus preceptor, endorsement of the student's medical school adviser, and prior approval and review by the Clinical Curriculum Committee. Credit is not given for electives until an evaluation has been received from the preceptor and a critique of the elective submitted by the student. Students with an academic deficiency may not schedule off-campus electives.

#### Business of Medicine (BOM)

This course, designed for Year III medical students, will introduce students to the fundamentals of the business of medicine, including the nuts and bolts of medical business, practice management and law, physician leadership, health care finance, and health care quality and costs. The BOM course will be case-based and interactive, and facilitated by leaders in the fields of health care business and management.

#### Program in Medical Humanities, Arts and Ethics

This four-year curriculum begins with collaborative discourse about ethical problems to help students learn to identify, analyze and resolve clinical ethical problems. This exercise is followed by interim skill building/maintenance and by instructor-facilitated discussion of videotaped ethics cases.

In Year II, the program focuses on ethical discernment and action in simulated settings and the study of the human dimensions of medicine. Standardized patients interact with students to help teach the telling of bad news, and students also learn from the humanities about patients as persons. The program concludes with a forum theatre in which students must decide what action to take based on their own convictions.

Year III is devoted to ethics education by clinical role models and encompasses instruction in the core clerkship by ethical standard-bearers. Students also participate in home hospice care and pain management cases.

During Intersession, the program includes a series of sessions that focus on contemporary health care and the physician-in-society. The goal of the sessions is to provide students with the experience of integrating the principles, methods and bedside issues included in Years I-III of the program. Students practice applying the micro-level (individual/clinical) decisions to the ethical dilemmas and policy issues that face physicians at the mezzo-level (health care organizations), and to the macro-level (profession as a whole, state and nation). Topics include issues of professionalism; allocation of resources; the economics, organization and societal oversight of health care; and the care of dying patients.

#### Fifth-year Research Option and Dean's Scholars

USC offers students the opportunity to take a full year of research experience with either a Keck School of Medicine faculty mentor or an approved faculty mentor at another institution. This program is open to any student in good to excellent academic standing who has completed his or her first year of medical school. Students interested in the option should identify a faculty preceptor and present a description of the proposed research program and funds available in support of the program to the associate dean for curriculum. A stipend, comparable to that received by a graduate student at the postgraduate level, is available. Application for this program is made through the Office for Student Affairs (KAM 100B) and will be supervised through the Office of the Associate Dean for Student Affairs (KAM 100B). Dean's research scholarships are available for selected dean's research scholars pursuing this option.

#### M.D./Ph.D. Program

Departments and programs of the University of Southern California and the California Institute of Technology participate in the joint M.D./Ph.D. degree program administered by the USC Graduate School, the Keck School of Medicine and the California Institute of Technology. This program integrates the medical school curriculum with graduate curricula in the basic sciences, to provide a unified course of study leading to both the M.D. and Ph.D. degrees.

This program is especially designed to prepare highly qualified students for careers in academic medicine and medical research. Formal course work and dissertation research provide the student with in-depth scientific preparation and research experience which enhances the application of basic science information to the diagnosis, treatment and prevention of disease. Conversely, the Ph.D. education becomes more meaningful because of its disease-oriented emphasis.

The curriculum for M.D./Ph.D. students differs from that of Ph.D. graduate students in the basic sciences in that the former take medical school courses as well as selected graduate level basic science courses and specific courses designed for M.D./Ph.D. students. The integrated training of the M.D./Ph.D. program enables students to compress their total academic effort by applying some course work toward the requirements of both degrees. On average, completion of the combined program requires a total of eight years.

The following graduate programs from the Keck School of Medicine participate in the M.D./Ph.D. program:

- Cancer Biology and Genomics
- Development, Stem Cells and Regenerative Medicine
- Medical Biology
- Molecular Structure and Signaling
- Biological Sciences/Neurosciences, Molecular and Computational Biology
- Engineering
- Preventive Medicine (Biostatistics, Epidemiology, IPR/Health Behavior, Molecular Epidemiology)

Selected graduate programs from the USC Viterbi School of Engineering and the USC Dornsife College of Letters, Arts and Sciences also participate in the combined degree program.

Time limits for qualifying examinations and other procedures are determined by considering M.D./Ph.D. students as medical students for the periods when they are following the medical curriculum and as full-time graduate students during their years of graduate research prior to advancement to the Junior/Senior Continuum.

M.D./Ph.D. candidates have the option of pursuing a laboratory experience before beginning the Year I medical curriculum through a laboratory rotation at either USC or the California Institute of Technology. This laboratory experience is strongly encouraged although not required.

During the first two years of their program, M.D./Ph.D. students follow the medical school curriculum and gain added exposure to research faculty through a special survey course. Students are guided by the M.D./Ph.D. executive committee, which outlines the integration of the graduate program with the medical school curriculum and serves as the students' liaison until they have selected a graduate program and graduate research adviser. The graduate programs vary widely in the extent to which they allow credit toward the Ph.D. for courses taken during the first two years of medical school. M.D./Ph.D. students are encouraged to select a graduate program by early spring of the second year of medical school. Students are required to apply for admission to the Ph.D. program of their choice by the recommended deadline on the graduate application.

Prior to entering Ph.D. studies, the Keck School of Medicine allows M.D./Ph.D. candidates the option of beginning their clinical training by taking one six-week required clerkship in either Family Medicine or Pediatrics. This can provide an early introduction to clinical medicine and a context for integration with the basic sciences of the thesis years.

Beginning with the third year of the M.D./Ph.D. program, students enter their selected program as full-time graduate students. Although the content of graduate courses required of M.D./Ph.D. students is generally identical to that required of Ph.D. students in the same graduate program, M.D./Ph.D. students are permitted greater latitude in the scheduling of their graduate courses. Four years are commonly necessary to fulfill requirements for the Ph.D., including course work, qualifying examinations, independent dissertation research, and writing of the dissertation.

After completion of the graduate program, the student is advanced to the Junior/Senior Continuum and completes the final two years of clinical training required by the medical school curriculum. No portion of clinical training is deleted from the joint program. Prior to entering the clinical component of the joint degree, students will be expected to participate in a clinical shadowing experience, which could be done throughout the Ph.D. studies or as part of an intensive program prior to entering the clinic. Students will also be required to participate in the Medical Scholars Program clinical tutoring skills program held in the spring of each year and re-take the Year II Objective Structured Clinical Examination at the end of May with the second year medical students.

### Keck School of Medicine-Caltech M.D./Ph.D. Program

A joint program between the Keck School of Medicine and the California Institute of Technology (Caltech) was established for the granting of the M.D./Ph.D. degree. Students do their preclinical and clinical work at the Keck School of Medicine and their Ph.D. work with any member of the Caltech faculty, including the biology, chemistry, engineering, applied sciences divisions and interdisciplinary programs divisions.

Admission to this joint program is made through the usual Keck/USC M.D./Ph.D. process. All applicants are

interviewed at Keck School of Medicine and Caltech. Matriculated students in this program have the option of doing their Ph.D. at USC or Caltech. The M.D. degree will be awarded from the Keck School of Medicine and the Ph.D. from Caltech.

Further information about the M.D./Ph.D. program at the Keck School of Medicine may be obtained by contacting: M.D./Ph.D. Program, Keck School of Medicine, 1975 Zonal Avenue (KAM 200), Los Angeles, CA 90089-9023; (323) 442-2965, FAX: (323) 442-2318; email [mdphdpgm@usc.edu](mailto:mdphdpgm@usc.edu).

### M.D./MBA Dual Degree Program

In response to the ongoing reorganization of health care delivery systems, and the growing awareness of the impact of business decisions on health care, the Keck School of Medicine and the USC Marshall School of Business jointly offer an innovative program for individuals seeking knowledge in both medicine and business administration. The program is designed to prepare its graduates to assume leadership in the design and management of health care systems.

The M.D./MBA program spans five years. Interested students apply during their second or third year of medical school, and begin required MBA courses following successful completion of the first two or first three years of medical school. The remaining time is devoted to the clinical clerkships of the Keck School of Medicine and completion of graduate business elective courses. At the conclusion of the program, students will have completed 48 units in the Marshall School of Business, including required and elective courses, and four years of courses in the Keck School of Medicine. Dual degree students may not count courses taken outside the Marshall School of Business toward the 48 units.

**First and Second Years:** Required medicine courses.

**Third or Fourth Year:** Required MBA courses and graduate business electives.

**Remaining Years:** Keck School of Medicine core, selective, and elective clerkships and graduate business electives.

### Admission Requirements

Students who have a baccalaureate degree from an accredited college or university and have successfully completed at least two years in the Keck School of Medicine will be considered for admission to the Marshall School of Business. Requirements for admission to the regular MBA Program (with the exception of the GMAT) must be fulfilled by the medical student for admission to the Marshall School.

The M.D. and the MBA degrees are awarded simultaneously upon completion of their requirements by the Keck School of Medicine and the Marshall School of Business.

### M.D./Master of Public Health

The joint M.D./MPH program at the Keck School of Medicine is designed for individuals who envision a medical career that combines public health and medical disciplines. Many individuals entering careers as medical doctors or public health practitioners wish to acquire not only medical practice competencies, but also an understanding of the history, organization, goals and philosophy of public health. The joint M.D./MPH program offers a broad-based orientation to public health while the

student completes medical school requirements. The Master of Public Health degree provides increased knowledge of and sensitivity to the political, historical, economic and social environments of health promotion and health services delivery.

The M.D./MPH program spans five years (four years of medical school and one year of public health courses). Students begin the core MPH courses following the successful completion of the first two years of medical school. The last two years of the program are devoted to clinical clerkships of the School of Medicine and to the completion of the elective courses and practicum (field experience) of the MPH program. At the conclusion of the joint degree program, students will have completed 42-46 units in the Master of Public Health program and four years of courses in the Keck School of Medicine.

Students who are enrolled in the Keck School of Medicine must apply to the Master of Public Health program no later than January of their second year. All requirements for admission to the regular MPH program must also be fulfilled by dual degree applicants.

All students in the M.D./MPH program must meet course requirements, grade point average requirements and program proficiency requirements of both programs. Students must have a grade point average of 3.0 in the MPH curriculum to meet graduation requirements.

The M.D. and the MPH degrees are awarded simultaneously upon completion of the Keck School of Medicine and the Master of Public Health program requirements. For more information, contact the MPH Program Office at (323) 442-7257.

### Ph.D. Programs in Biomedical and Biological Sciences (PIBBS)

**Keith Administration Building 409**  
1975 Zonal Avenue  
Los Angeles, CA 90089-9031  
(323) 442-1609  
FAX: (323) 442-1199  
Email: [pibbs@usc.edu](mailto:pibbs@usc.edu)  
[pibbs.usc.edu](http://pibbs.usc.edu)

*Program Director:* Ite A. Laird-Offringa, Ph.D.

The USC Ph.D. Programs in Biomedical and Biological Sciences (PIBBS) is a gateway program into graduate studies at the USC Health Sciences Campus, leading to a Ph.D. degree in a broad range of biological and biomedical disciplines.

PIBBS students experience a common first-year curriculum that will build a solid foundation in biomedical and biological sciences. Students are required to complete 25 units of core classes during the fall, spring and summer semesters of the PIBBS year, including courses in cell biology, molecular biology, human genetics and genomics, biostatistics, bioethics and scientific writing. Students will also complete three research rotations during the first year.

At the end of the spring semester of the first year, students will select a faculty adviser and a specific Ph.D. program from among the four participating programs listed. In the second year, students will take classes that will differ depending on the Ph.D. program they join; second year classes may include, but are not limited to, topics such as biochemistry, epidemiology, stem cell biology, molecular genetics, cancer, human genomics, immunology, and physiology. In addition, each student will complete qualifying examinations for the chosen Ph.D. program and will develop and complete an original research project that will serve as the basis for a doctoral dissertation.

## Ph.D. Graduate Programs

Cancer Biology and Genomics  
Development, Stem Cells, and Regenerative Medicine  
Medical Biology  
Molecular Structure and Signaling

### PIBBS Admission Requirements

*Application Deadline (priority review): December 1*  
Applicants to PIBBS should have a baccalaureate degree in natural sciences, or sufficient courses in mathematics and the life sciences. This is required to provide a strong background for studies in biomedical and biological research. Appropriate undergraduate degrees include biology, physiology, engineering, chemistry or computer science.

Applicants should have a strong record of academic achievement and satisfactory performance on the general and advanced portions of the GRE. Other requirements for admission include: a detailed statement of purpose as well as three letters of recommendation, one of which should be from a wet laboratory or computational research mentor. Previous research experience is expected. Students are admitted for the academic year in the fall semester. Applicants who are accepted with minor deficiencies are expected to correct these during the first year following enrollment. Although there is no formal application deadline, complete applications received by December 1 will be given priority.

### Financial Support

Admitted students are supported by research assistantships or fellowships during their graduate career. Tuition, health insurance and health fees are also covered.

### Lab Rotations

During the first year, students register for INTD 790 Research (4 units in the fall semester and 3 units in the spring semester) and rotate through the labs of three faculty members of the program (potential research advisers). By the first summer of graduate study, but no later than after 12 months in the program, each student is expected to have selected a faculty mentor/research adviser.

### PIBBS Required Core Curriculum and Research

FIRST SEMESTER		UNITS
INTD 531	Cell Biology	4
INTD 561	Molecular Biology	4
INTD 790	Research	4
SECOND SEMESTER		UNITS
BIOC 543	Human Molecular Genetics	4
INTD 577	Writing in the Biomedical and Biological Sciences	1
INTD 790	Research	3
PM 510L	Principles of Biostatistics	4
THIRD SEMESTER		UNITS
INTD 500	Ethics and Accountability in Biomedical Research	1

### Admission Requirements for Ph.D. Programs

Admission to the Keck School of Medicine Ph.D. program is open to all incoming PIBBS students provided all PIBBS admission requirements are met and all first year course and lab rotation requirements have been satisfactorily completed. Students from other sources, such as M.D./Ph.D. students and clinician scientists, may also be eligible on a case-by-case basis.

In general, new graduate students apply for admission to USC through the Ph.D. programs in Biomedical and Biological Sciences (PIBBS), and become enrolled in one of four Ph.D. programs at the Keck School of Medicine after

the successful completion of the PIBBS year. During the PIBBS year, students must complete the core curriculum of 25 units, maintain a 3.0 grade point average with no grade lower than a C on all courses and must complete three laboratory rotations in order to continue into a Ph.D. program.

Application information is available by contacting the PIBBS Program at [pibbs@usc.edu](mailto:pibbs@usc.edu).

### Doctor of Philosophy in Cancer Biology and Genomics

*Program Director:* Gerhard Coetzee, Ph.D.  
The Ph.D. program in Cancer Biology and Genomics (CBG) focuses on training investigators in strategies to understand the mechanisms of cancer development and progression which includes cell biological and genomic approaches. The ultimate objective is to translate basic findings into diagnostics, treatments and ultimate cures. The program applies a multidisciplinary approach toward these goals, with the full realization that cancers in different organs represent different diseases. However all cancers relate to uncontrolled cell proliferation with many cancers having a strong genetic predisposition. Consequently, major features of this program include the breadth of medically related interests and training and faculty characterized by wide and varied skills in many cancer-related research areas. To facilitate the application of multidisciplinary approaches to make cancer a disease of the past, close and regular contact between participating faculty of different disciplines and students is a major theme of this Ph.D. program.

Cancer Biology and Genomics students are required to take CBG 580, INTD 504 and INTD 685; and must complete a total of 4 units from the following: INTD 549, PM 512, PM 517ab, PM 533\*, PM 534\*, PM 570\*, PM 599, MPTX 500 or other courses approved by the academic adviser. In the second year, students are required to register for INTD 575 in the fall and spring semesters. In the third and subsequent years, students should register for INTD 600 every fall and spring semester. In addition, students are required to complete at least 4 units of CBG 794ab Doctoral Dissertation.

Ph.D. students must supplement course work by registering for CBG 790 Research during the fall, spring, and summer semesters as needed to complete the minimum 60 units required for the Ph.D. program.

As part of the requirements for the Ph.D. degree in Cancer Biology and Genomic, students must adhere to the unit/course requirements, guidance committee and dissertation committee guidelines and must complete the qualifying examination, annual research appraisal, and dissertation and oral defense as outlined in the sections following the descriptions of the Ph.D. programs.

\* Course requires prerequisite.

### Doctor of Philosophy in Development, Stem Cells, and Regenerative Medicine

*Program Director:* Gage Crump, Ph.D.  
The goal of the Ph.D. program in Development, Stem Cells, and Regenerative Medicine is to train the next generation of investigators in the history and practice of developmental and stem cell biology. The ultimate aim is to understand how the genomes of animals are translated into complex morphological forms, and to apply this basic knowledge to the emerging field of regenerative medicine. Close and regular contact between participating faculty of different disciplines and students is expected to facilitate the application of multidisciplinary approaches toward regenerative medicine.

Development, Stem Cells, and Regenerative Medicine students are required to complete DSR 542 and at least 2 units from the following: DSR 610, DSR 620, INTD 504 or

other courses approved by the faculty adviser. In the second and subsequent years, students are required to register in DSR 574 every fall and spring semester. In addition, students are required to complete at least 4 units of DSR 794ab Doctoral Dissertation.

Ph.D. students must supplement course work by registering for DSR 790 Research during the fall, spring and summer semesters as needed to complete the minimum 60 units required for the Ph.D. program.

As part of the requirements for the Ph.D. degree in Development, Stem Cells, and Regenerative Medicine, students must adhere to the unit/course requirements, guidance committee and dissertation committee guidelines and must complete the qualifying examination, annual research appraisal, and dissertation and oral defense as outlined in the sections following the descriptions of the Ph.D. programs.

### Doctor of Philosophy in Medical Biology

*Program Director:* W. Martin Kast, Ph.D.  
The objective of the Ph.D. program in Medical Biology (MEDB) is to educate investigators to develop strategies to translate and implement knowledge from cellular, molecular and genetic advances into studies of normal human organ system function as well as mechanisms of human organ system dysfunction in disease and how to reverse this dysfunction by medical treatment. Animal disease models as well as clinical trials in patients are frequently used to advance this field.

The program applies multidisciplinary approaches to understanding the human organism as a whole. Breadth of medically related interests and training are major features of this track and wide and varied skills in many research areas characterize the faculty. To facilitate application of multidisciplinary approaches, close and regular contact between participating faculty and students is a major theme of this Ph.D. program.

The MEDB program caters to M.D./Ph.D. students, clinician scientists and PIBBS students interested in but not limited to the following fields: immunology (including cancer immunology), virology (including cancer virology), microbiology, physiology and pathology (for example: diabetes, obesity, autoimmunity, infectious diseases, gastro-intestinal and liver diseases, heart and lung diseases, hypertension, central nervous system diseases, etc.)

Medical Biology students are required to complete 8 units from the following courses: INTD 504, INTD 522, INTD 549, INTD 550, INTD 551, INTD 572, INTD 573 or other courses approved by the faculty adviser. In the second and subsequent years, students are required to register in INTD 574 every fall and spring semester. In addition, students are required to complete at least 4 units of MEDB 794ab Doctoral Dissertation.

Ph.D. students must supplement course work by registering for MEDB 790 Research during the fall, spring and summer semesters as needed to complete the minimum 60 units required for the Ph.D. program.

As part of the requirements for the Ph.D. degree in Medical Biology, students must adhere to the unit/course requirements, guidance committee and dissertation committee guidelines and must complete the qualifying examination, annual research appraisal, and dissertation and oral defense as outlined in the sections following the descriptions of the Ph.D. programs.

### Doctor of Philosophy in Molecular Structure and Signaling

*Program Director:* Wei Li, Ph.D.  
The goal of the Ph.D. program in Molecular Structure and Signaling is to train students to become future leaders in

biomedical and related fields. The Molecular Structure and Signaling program includes structural biology of proteins, lipids and nucleotides and signaling mechanisms by these molecules. The program encourages students to tackle important molecular problems with a high degree of difficulty and learn about creative thinking, experimental design and problem-solving skills. The Molecular Structure and Signaling program emphasizes elucidation of novel mechanisms and insights into important biomedical problems. In addition, the program promotes its students to become master communicators in science. Prior to graduation, Ph.D. students must demonstrate their understanding of the research, elucidation of a novel structure and/or signaling mechanism and a clear interpretation of its potential for developing novel diagnostics and therapeutics.

Molecular Structure and Signaling students are required to complete: INTD 549, INTD 575, MSS 574 and MSS 580. Other courses may be substituted with the approval of the Molecular Structure and Signaling executive committee. In the second and subsequent years, students are required to register in MSS 574 every fall and spring semester. In addition, students are required to complete at least 4 units of MSS 794ab Doctoral Dissertation.

Ph.D. students must supplement course work by registering for MSS 790 Research during the fall, spring and summer semesters as needed to complete the minimum 60 units required for the Ph.D. program.

As part of the requirements for the Ph.D. degree in Molecular Structure and Signaling, students must adhere to the unit/course requirements, guidance committee and dissertation committee guidelines and must complete the qualifying examination, annual research appraisal, and dissertation and oral defense as outlined in the sections following the descriptions of the Ph.D. programs.

#### Unit/Course Requirements

A minimum of 60 units of graduate course credits is required for the Ph.D., including course work, seminars, research and dissertation units. No more than 8 units of 794 may be applied toward the Ph.D. degree. Students must complete the first year PIBBS core curriculum as well as course requirements for their specific Ph.D. program. Thirty units of course work, including the PIBBS core curriculum, must be completed before they are considered for the qualifying examination. Additional course work relevant to the research interests of the student may be required by the student's qualifying exam committee or by the student's faculty adviser.

#### Guidance Committee

After 30 units of course work, which includes the PIBBS core curriculum and course requirements for one of the four Ph.D. programs, the student, in consultation with his/her faculty adviser, will nominate five faculty members to serve on the guidance committee for the qualifying examination. A minimum of three of the faculty must be from the student's Ph.D. program, and one must be a faculty member from outside the Ph.D. program. The chair of the guidance committee must be a member of the student's Ph.D. program and the faculty adviser is not allowed to be on the committee (but may be a silent presence during the exam). These nominations are submitted to the chair of the program for formal appointment.

#### Qualifying Examination

Students in the Ph.D. program must pass both the written screening and the oral portions of the qualifying examination administered by their guidance committee during the second year of graduate study.

The written screening exam involves writing a research grant proposal. The deadline for completion of the written screening is January 5 of the second year. Students who receive a failing score will be allowed one resubmission, with a deadline of March 5 of the same year. The written portion must be passed before the oral portion can be taken.

The oral examination must be completed no later than September 1 of the beginning of the third year and only after successful completion of the written screening exam. The oral examination consists of two parts. The first part consists of a presentation of the proposed thesis research. The second part consists of an open forum in which the guidance committee asks general questions on any topic related to the student's research.

Final evaluation of the examination is determined by a consensus of the guidance committee. If a student fails, it is at the discretion of the committee to allow the student to repeat the oral examination within 60 days. A second failure will be grounds for dismissal from the program.

#### Advancement to Candidacy

Recommendation for advancement to candidacy for the Ph.D. degree is made on the basis of the successful completion of the qualifying examination, course requirements and the student's maintenance of at least a 3.0 GPA. A student who has not been recommended for advancement to candidacy at the end of the first semester of the third year will be dismissed from the program.

#### Annual Research Appraisal (ARA)

After advancing to candidacy, each graduate student presents a progress report to his or her dissertation research committee. Prior to the meeting, the student prepares a short written document describing significant experiments, problems and projected studies. This document is distributed to the committee and is included in the student's file. The ARA meeting is intended to be a working session between the student and his or her committee; experimental results and problems are discussed with this context. In addition the student presents a research plan for the next year of work. A satisfactory ARA is required of every student for each year of residence after the completion of the qualifying exam. A final ARA is required the semester before the student is permitted to defend the dissertation.

#### Dissertation Committee

After advancement to candidacy, the student must form a dissertation committee, in consultation with their faculty adviser. A minimum of three committee members must be selected, one of which is the faculty adviser, and at least one of which must be a tenured or tenure-track faculty member of the student's Ph.D. program. One committee member may be non-tenure track. The chair of the dissertation committee must be a member of the student's Ph.D. program and may not be the faculty adviser. The dissertation committee is responsible for counseling the student during preparation of the dissertation and conducting the final oral examination during the dissertation defense. Students are expected to meet with the dissertation committee once per year to discuss progress.

Dissertation committee members are expected to read and comment on a dissertation within two weeks from its submission. The student and faculty will coordinate a timeline for the student to present the thesis to the dissertation committee. This timeline must allow all dissertation committee members enough time to fulfill their responsibilities within the four-week deadline.

#### Dissertation and Oral Defense

The student's research is reported in a dissertation written under the guidance of the dissertation committee. The dissertation must demonstrate the student's capacity for independent research, scholarly achievement and technical mastery of a special field. Students should have at least one first author publication accepted in a peer-reviewed journal before the defense.

When the final draft of the dissertation is ready, the student will take the final oral defense. Students must submit their dissertation to the dissertation committee at least one month before the student expects to make final revisions; committee members are expected to respond within two weeks.

The dissertation defense is a formal public presentation of the student's research before the program faculty and students. Dissertation defenses must be publicized at least two weeks prior to the oral defense.

All doctoral candidates must be registered in 794 Doctoral Dissertation each semester (excluding summer sessions) from the time of their advancement to candidacy until their dissertation is approved and submitted to the Graduate School.

#### Courses of Instruction

##### Cancer Biology and Genomics (CBG)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**CBG 580 Topics in Cancer Biology and Genomics (1, max 12, Sp)** Selected topics in Cancer Biology and Genomics including review of contemporary literature and research. Prerequisite: INTD 504. Open only to graduate students.

**CBG 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Open only to doctoral students. Graded CR/NC.

**CBG 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC. Open only to doctoral students.

##### Development, Stem Cells and Regenerative Medicine (DSR)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**DSR 542 Principles of Developmental and Stem Cell Biology (4, Sm)** Introduction to developmental and stem cell biology. Lectures and lab component prepare students for a career in developmental and stem cell biology and regenerative medicine.

**DSR 574 Stem Cell and Developmental Biology Seminar Series (1, max 10, FaSp)** Selected topics in Development, Stem Cell, and Regeneration. Open only to Development, Stem Cell, and Regeneration Ph.D. students. Graded CR/NC.

**DSR 610 Current Topics in Regenerative Medicine (1, max 12, Sp)** Selected topics on sub-fields within developmental and stem cell biology including review of contemporary literature and research. Prerequisite: DSR 542. Open only to master and doctoral students.

**DSR 620 Current Topics in Stem Cell Biology and Organogenesis (1, max 12, Fa)** Selected topics on sub-



fields within stem cell biology and organogenesis. Includes review of contemporary literature and research. *Prerequisite:* DSR 542. Open only to master and doctoral students.

**DSR 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Open only to doctoral students. Graded CR/NC.

**DSR 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC. Open only to doctoral students.

## Medical Biology (MEDB)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**MEDB 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Open only to doctoral students. Graded CR/NC.

**MEDB 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC. Open only to doctoral students.

## Molecular Structure and Signaling (MSS)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**MSS 574 Molecular Structure and Signaling Seminar Series (1, max 12, FaSp)** Selected topics in Molecular Structure and Signaling. Open only to doctoral students.

**MSS 580 Experimental Design and Execution in Molecular Biology (4, Fa)** To provide in depth knowledge on experimental design, execution and data analysis/interpretation for generating high impact publications. Open only to graduate students.

**MSS 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Open only to doctoral students. Graded CR/NC.

**MSS 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC. Open only to doctoral students.

## Courses of Instruction

### Interdepartmental (INTD)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**INTD 500 Ethics and Accountability in Biomedical Research (1, Sm)** The purpose of this course is to engage current (and potential) research trainees in discussions about the responsible conduct of science. The course is designed as an option for meeting current federal regulations which require that all predoctoral and postdoctoral fellows paid from federal contracts and grants have a component of ethical training. Graded CR/NC.

**INTD 501 Recent Advances in Vision Science (1, max 4, FaSp)** Recent advances in the understanding of the ocular surface are reported and discussed; students will learn how to read papers critically, develop speaking skills to explain a research paper and attend a three-day

workshop on NIH proposal development and scientific manuscript preparation. Graded CR/NC.

**INTD 504 Molecular Biology of Cancer (4, 2 years, Sp)** Epidemiology, pathobiology, carcinogenesis, tumor biology and heterogeneity; retroviruses, oncogenes, cell cycle control, genetics of cancer, tumor immunology; treatment strategies.

**INTD 522 Infection and Host Responses (4, Sp)** Overview of microbes, their life cycles and the host response they elicit, evade or exploit, including the manipulation and the malfunction of the immune system.

**INTD 531 Cell Biology (4, Fa)** Current perspectives on major research areas in cell biology. Emphasis will be on in-depth examination of cellular structures, regulatory processes, intra-cellular routing and targeting, and cell/environmental interactions.

**INTD 535 Continuing Introduction to Clinical Medicine for M.D./Ph.D. Students (1, FaSp)** Course for M.D./Ph.D. students in Ph.D. years designed to allow maintenance and improvement of clinical skills prior to re-entry in clinical rotations in the Year III medical curriculum. Open only to medical students who have completed Years I and II. Graded CR/NC.

**INTD 537 The Structure of Scientific Revolutions in Molecular Biology (1, Irregular)** A course in how scientists make breakthrough discoveries and whether there are predictable ingredients for significant changes in perception of the living system. Open only to graduate-level students in any of the biological sciences. *Recommended preparation:* one year in cell and molecular biology.

**INTD 549 Protein Chemistry – Structure and Function (4, Sp)** Chemistry of peptides and proteins; protein structure and folding; molecular basis of protein action. *Recommended preparation:* general biochemistry.

**INTD 550 Introduction to Pathology (4, Fa)** Normal histology and introduction to basic pathological concepts. Provides a solid and basic understanding of normal structures and how they relate to function.

**INTD 551 Pathobiology of Disease (4, Sp)** Relationship between histopathological and clinical manifestations of disease and their underlying molecular mechanisms. Topics include inflammatory, developmental, environmental, degenerative, and neoplastic disease processes. *Prerequisite:* INTD 550.

**INTD 555 Biochemical and Molecular Bases of Disease (4)** Biochemical and molecular abnormalities in disease states. *Prerequisite:* general biochemistry.

**INTD 561 Molecular Biology (4, Fa)** Biochemistry and molecular biology of replication, transcription, RNA processing, translation, and regulation of gene expression with emphasis on multicellular eukaryotic organisms and comparisons to prokaryotes.

**INTD 567 Molecular and Cellular Neurobiology (4)** (Enroll in NSCI 531)

**INTD 571 Biochemistry (4, Sp)** Physical-chemical basis of life processes: protein structure and enzyme function; synthesis and metabolism of carbohydrates, lipids, amino acids, and nucleotides. (Duplicates credit in former BIOC 441.) *Prerequisite:* open to qualified students.

**INTD 572 Systems Physiology and Disease I (4, Fa)** Mammalian organ systems operation during health, and pathophysiologic analysis of related diseases with focus on muscle, respiratory, cardiovascular and renal systems. Faculty from basic and clinical sciences. Open to graduate students in biomedical science only.

**INTD 573 Systems Physiology and Disease II (4, Sp)** Mammalian organ systems operation during health, and pathophysiologic analysis of related diseases with focus on neuroscience, immunology, metabolism, endocrine, reproduction, GI and liver. Faculty from basic and clinical sciences. Open to graduate students in biomedical science only.

**INTD 574 Systems Biology and Disease Seminar (1, max 16, FaSp)** Selected topics in systems biology and disease. Graded CR/NC. Open only to integrative biology of disease Ph.D. students.

**INTD 575 Interdisciplinary Research Presentations (1, max 12, FaSp)** Broad Topics on Biomedical Research, Human Diseases and Career Development. Open only to doctoral students.

**INTD 577 Writing in the Biomedical and Biological Sciences (1, Sp)** Writing instruction for graduate students focusing on grant proposals and scientific papers. Includes both writing and providing critiques of classmates' work. Lectures and discussion. Open only to doctoral students in the school of Medicine.

**INTD 600 Student Research Presentation (1, max 12, FaSp)** Students prepare and present their own research to an audience of faculty and peers. Graded CR/NC. Open only to graduate students.

**INTD 620 Medical Students Elective Program (0)** Opportunities for medical students as preceptors in research laboratories or in field medical service under guidance of sponsors approved by faculty committees. Graded CR/NC.

**INTD 621ab Introduction to Clinical Medicine (ICM) for HTE (a: 3, Fa; b: 3, Sp)** A strongly patient-centered course in which both Ph.D. engineering and M.D. students experience how doctors handle communications, basic diagnostic thinking and engineering perspectives. Open only to Health, Technology and Engineering students. Graded CR/NC.

**INTD 621L Pre-clinical System Block for Health, Technology and Engineering (3-9, FaSp)** A three-to-nine week block of lectures and laboratories focused on particular body system (e.g., cardiovascular, renal, etc.). Open only to Health, Technology and Engineering students. Graded CR/NC.

**INTD 650 Stem Cell Biology and Medicine (4, FaSpSm)** Basic principles, available embryonic and adult stem cells, principles of organogenesis and regeneration, animal models, delivery of engineered tissues to patients, promise and limitations of stem cells. Open to master's and Ph.D. students on the Health Sciences Campus and to medical and post-doctoral fellow trainees only.

**INTD 685 Bioinformatics in Genome Analysis (4, Sm)** Basic programming concepts for computational genomic analysis.

**INTD 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Open only to doctoral students. Graded CR/NC.

## Master of Academic Medicine

Keith Administration Building 211  
1975 Zonal Avenue  
Los Angeles, CA 90033  
(323) 442-2372  
FAX: (323) 442-2051  
Email: nyquist@usc.edu

*Program Director:* Julie G. Nyquist, Ph.D.

## Faculty

*Professors:* Donna Elliott, M.D., Ed.D. (*Pediatrics*); Jerry Gates, Ph.D. (*Family Medicine*); Win May, M.D., Ph.D. (*Medical Education*); Julie G. Nyquist, Ph.D. (*Medical Education*); Beverly Wood, M.D., Ph.D. (*Medical Education*)

*Associate Professors:* Kathleen Besinque, Pharm.D., M.S.Ed. (*Pharmacy*); Cha-Chi Fung, Ph.D. (*Medical Education*)

*Assistant Professors:* Dixie Fisher, Ph.D. (*Medical Education*); Lori Marshall, Ph.D., MSN (*Pediatrics*); Niurka Rivero, M.D. (*Pediatrics*); Samuel Yanofsky, M.D., M.S.Ed. (*Anesthesiology*)

The Master of Academic Medicine is offered by the Keck School of Medicine in collaboration with the Schools of Dentistry and Pharmacy. The goal is to develop leaders who will create and enhance academic and training programs for health care professions globally. Academic medicine is defined in broad terms as relating to those who lead training worldwide in medicine or in other health care related fields. Enacting this vision is possible due to the flexible delivery model selected. The program employs a hybrid model, combining on-campus face-to-face sessions, blended with online course work. During the 32-unit program, the majority of sessions will be delivered using interactive online delivery methods. All students will also be on campus for one-week intensive sessions in the spring of each year, which focus on community building and the development and evaluation of skills.

The program addresses the unique population of medical and health professions faculty who are focused on leading the academic enterprise for health professionals at the undergraduate, graduate and continuing education levels. Our graduates will be positioned to guide future generations of health professionals around the world toward better meeting the health needs of our global society. For those with a clear focus on the academic enterprise, a complementary degree in academic medicine offers the specialized skills needed to lead worldwide development of enhanced training for health professionals, increases professional capacity and provides new opportunity for promotion. The audiences for this degree will typically have primary professional degrees in health fields (e.g., M.D., DDS, DPT, R.N., MSN, P.A., DVM, D.O., Pharm.D., D.C., DOM). The Master of Academic Medicine will provide the needed complementary training for clinician educators.

## Admission

Applicants for admission to the Master of Academic Medicine program are generally expected to have an advanced degree in a health profession. Proof of graduation is required. For applicants who do not have a degree in a health profession, a bachelor's degree or its equivalent from an accredited institution is required, a grade point average of 3.0 (A = 4.0) is usually expected as well as satisfactory scores on the Graduate Record Examinations (GRE) General Test and three letters of recommendation. For specific information on admission and application procedures, contact the Office of Medical Education, (323) 442-2372.

Students are admitted for the academic year beginning in the fall, although those admitted prior to March 15 may enroll in summer courses. Although there is no formal application deadline, complete applications received before March 1 will be given priority. Application inquiries should be made to: Master of Academic Medicine Program, University of Southern California, Office of Medical Education, 1975 Zonal Avenue, KAM 211, Los Angeles, CA 90033, telephone (323) 442-2372.

## Satisfactory Academic Progress

A graduate GPA of at least 3.0 is required at all times. Any student whose graduate GPA falls below 3.0 will be placed on academic probation. Students on academic probation who do not raise their GPA to 3.0 after two semesters of written notification of academic probation will be academically disqualified.

A minimum of 32 units of graduate-level course work is required.

## Degree Requirements

Academic Courses (26 units)		Units
ACMD 501	Introduction to Academic Medicine Worldwide	3
ACMD 502	Becoming a Leader in Academic Medicine Worldwide	3
ACMD 503	Leading Change in Academic Medical Centers	3
ACMD 511	Competencies in Academic Medicine and Health I	3
ACMD 512	Competencies in Academic Medicine and Health II	3
ACMD 513	Professionalism in Academic Medicine and Health	3
ACMD 514	Accreditation and Program Evaluation in Academic Medicine	3
ACMD 591	Designing Research on Innovations in Academic Medicine	2
ACMD 592	Implementing Research on Innovations in Academic Medicine	2
ACMD 621	Capstone Portfolio for the Master of Academic Medicine	1

## Electives (6 units)

Six units of electives may be selected from the recommended courses below, or these may be replaced with approved courses at the 500 level or within USC that equal 6 units.

ACMD 593	Foundations of Scholarly Writing in Academic Medicine	1
ACMD 598	Fieldwork in Designing Innovations for the Health Professions	1-3
ACMD 604	Supporting the Educational Enterprise in Academic Medicine	3
ACMD 605	Faculty Development for Health Sciences Faculty Educators	2
ACMD 615	Maintenance of Competence in the Health Professions	2
INTB 603	Systematic Approach to Scientific Writing	2
MPTX 517	Structure and Management of Clinical Trials	4
PM 513	Experimental Designs	3

## Courses of Instruction

### ACADEMIC MEDICINE (ACMD)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**ACMD 501 Introduction to Academic Medicine Worldwide (3)** Introduces the master's program; includes historical development of training in the health professions; current issues, challenges and opportunities in academic medicine and health worldwide. Open only to Academic Medicine majors.

**ACMD 502 Becoming a Leader in Academic Medicine Worldwide (3)** Current approaches to leadership within

the context of global academic medicine and health professions education; individual applications, group dynamics, teamwork, and interpersonal skill enhancement. Open only to Academic Medicine majors.

**ACMD 503 Leading Change in Academic Medical Centers (3)** Exploration and practice of skills for promoting programs within academic medicine and health professions' education; building trust, organizational change, conflict resolution, negotiation, and managing resources. Open only to Academic Medicine majors.

**ACMD 511 Competencies in Academic Medicine and Health I (3)** Acquisition of cognitive knowledge and problem-solving skills in health professions worldwide; instructional methods, assessment techniques, designing curricula for health professions education. Open only to Academic Medicine majors.

**ACMD 512 Competencies in Academic Medicine and Health II (3)** Learning theory, teaching methods, assessment techniques related to acquisition and reinforcement of competencies related to patient care, practice-based learning and improvement and systems-based practice. Open only to Academic Medicine majors.

**ACMD 513 Professionalism in Academic Medicine and Health (3)** Acquisition and evaluation of interpersonal and communication skills and professionalism including ethics and cultural competence; within the context of health care disparities and health initiatives. Open only to Academic Medicine majors.

**ACMD 514 Accreditation and Program Evaluation in Academic Medicine (3)** Evaluating health professions training programs within guidelines of relevant accreditation organizations; models of evaluation, designing plans and tools for evaluation of program elements. Open only to Academic Medicine majors.

**ACMD 591 Designing Research on Innovations in Academic Medicine (2)** Introduction to design and scholarly review of innovations in health professions education; needs assessment, problem selection, use of research methods to study an innovation. Open only to Academic Medicine majors.

**ACMD 592 Implementing Research on Innovation in Academic Medicine (2)** Mentored research on an innovation in academic medicine leading to the master's degree. The project will result in a formal written research report. Open only to Academic Medicine majors. *Prerequisite:* ACMD 591.

**ACMD 593 Foundations of Academic Writing (1)** Academic writing for conference papers, grant proposals and journal articles. Open only to Academic Medicine majors. *Recommended preparation:* A completed study of an innovation in academic medicine or other health-related field that is ready to move to publication.

**ACMD 598 Fieldwork: Designing Innovations for the Health Professions (1-3, max 3)** Individual projects designing curricular or other innovations for the home program as an application of Year 1 concepts and as part of the capstone experience. Open only to Academic Medicine majors.

**ACMD 604 Supporting the Educational Enterprise in Academic Medicine (3)** Explores support functions in academic medical centers and health professions schools; financial, scientific, educational, faculty and student affairs departments, and offices of medical education. Open only to Academic Medicine majors.

**ACMD 605 Faculty Development for Health Sciences Faculty Educators (2)** Role of faculty development programs in health professions schools; tools for delivering effective continuing education and faculty development; models for mentoring clinical faculty. Open only to Academic Medicine majors.

**ACMD 615 Maintenance of Competence in the Health Professions (2)** Maintenance of competence and continuing professional development (CPD) of physicians and other health care professionals; trends, needs, strategies, assessing outcomes, examining effectiveness of CPD programs. Open only to Academic Medicine majors.

**ACMD 621 Capstone Portfolio for the Master of Academic Medicine (1)** Role of portfolios for teachers and learners; develop a personal capstone portfolio that represents each learner's accomplishment of the core competencies of the MACM program. Open only to Academic Medicine majors. Graded CR/NC.

## Master of Science in Clinical, Biomedical and Translational Investigations

Keith Administration Building 200  
(323) 442-2965  
Email: msclnbio@usc.edu

### Program Co-Directors:

Stanley P. Azen, Ph.D., *Professor, Co-Director of Biostatistics, Preventive Medicine, Co-Director CETCD*

Michael L. Paine, B.Sc., B.D.S., Ph.D., *Associate Professor, Director, Graduate Program in Craniofacial Biology*

The Master of Science in Clinical, Biomedical, and Translational Investigations (CBTI) is a joint effort to train medical students, fellows or other health professionals, including faculty and other scientists conducting clinical-related research, in clinical research methods to translate clinical, biomedical and technological discoveries into advances in population-based, clinical or basic science research. The M.S. Program of Clinical, Biomedical, and Translational Investigations (CBTI) is available to medical students who have completed their second year of medical school, and pre-doctoral students who are interested in expanding their pre-doctoral training to include methodology associated with conducting translational research. Pre-doctoral students will earn a joint degree (Ph.D. in their research area and an M.S. in CBTI). In addition, the M.S. CBTI Program is tailored to MDs doing fellowships at USC or Children's Hospital Los Angeles (CHLA), faculty interested in expanding their research careers, or are recipients of Young Investigator Awards, including Southern California Clinical Translational Science Institute's (SC CTSI) Center for Education, Training, and Career Development K and T Awardees. Tracks include: 1) Clinical Translational Research, 2) Community-based Intervention Trials, 3) Design, Conduct and Analysis of Clinical Studies, 4) Epidemiology and Disease Etiology, 5) Health Outcomes Research, 6) Environmental Epidemiology, 7) Molecular Biology, 8) Cell Biology, 9) Vision Science, and 10) Alternative Options Track.

The M.S. program in Clinical and Biomedical Investigations is designed to train students, fellows and faculty for future independent research careers in an academic, government or private sector setting. The objective of the M.S. program is to produce a clinical researcher with either an in-depth knowledge in laboratory methodologies or statistical and analytic skills in population-based, clinical studies or outcomes research. The program gives students a solid background in the methodological aspects of translational research, and in statistical thinking as applied to molecular epidemiology, as well as a solid grounding in biostatistical, epidemiological methods, and community based intervention strategies.

## Admission Requirements

Applicants must apply to the Graduate School and meet the minimum requirements for admission to the Graduate School. The Departments of Preventive Medicine, Cell and Neurobiology, Family Medicine, and the Center for Education, Training and Career Development (CETCD) jointly administer the program through the MS Program Office.

The program will consider applicants who satisfy all requirements for admission to the Graduate School. For the M.S. program in Clinical and Biomedical Investigations, MCAT scores may be substituted for the GREs. Applicants not meeting Graduate School requirements for regular standing may, with approval of the Graduate School, be conditionally admitted. Regular standing is contingent upon maintaining a GPA of 3.0 in the first 12 units of graduate studies. All graduate students must maintain a GPA of 3.0 throughout their graduate studies.

## General Requirements

Graduation requires the completion of a minimum of 29 units, of which a minimum of 13 units are didactic course credits taken in the first year (including summer sessions), with the remaining units being directed to: a) PM 590 (directed research, 1-12 units) and PM 594ab (thesis, 4 units) taken in the second year. The equivalent of one year of full-time effort must be devoted to research leading to a master's thesis. The thesis provides a structure for the development of a plan to address a research problem and a suitable approach to the analysis and presentation of the results.

Because the background and interests of applicants varies widely, one of the co-directors will consult with each student prior to the first year in order to design an individualized schedule of recommended courses, or this may be negotiated with a student's faculty sponsor. At the end of the first year, the trainee must submit a final program plan to the co-directors. This will summarize the courses taken, the proposed thesis title, and the names and credentials of the M.S. thesis committee. One of the members of the M.S. thesis committee will be the trainee's research adviser and will serve as the chair of the committee. At least one member of the thesis committee must be from outside the student's department. For faculty, at least two members of the thesis committee must be from outside the student's department.

For those trainees or SC CTSI's CETCD K and T awardees who do not wish to pursue an M.S. degree, the school offers a certificate in clinical, biomedical, and translational investigations (CBTI). The certificate program requires completion of 12 credits, and a minimum of six months of practical research experience working on a research project (PM 590) approved by either an Oversight Committee or the CETCD's K and T Award Committee Review Process.

Students are expected to attend the three day workshop on NIH proposal development if offered by Thomas Ogden, M.D., Ph.D., and a workshop on the principles of scientific manuscript preparation.

## Certificate in Clinical, Biomedical and Translational Investigations

Students who do not wish to pursue an M.S. degree may earn a university certificate in clinical, biomedical, and translational investigations. The certificate program requires 12 didactic credits and a minimum of six months (PM 590 Directed Research, 3 units) of practical experience working on a research project approved by the faculty mentor and co-directors.

## Recommended Core Courses for Each Research Track

Clinical Translational Research		(13-16 Units)
PM 510L	Principles of Biostatistics	4
PM 512	Principles of Epidemiology	4
PM 523	Design of Clinical Studies, or	3
PM 612abc	Clinical Translational Research	12

Electives (Pick one course)		Units
BIOC 543	Human Molecular Genetics	4
MPTX 511	Introduction to Medical Product Regulation	3
MPTX 602	Science, Research, and Ethics	2
PM 511b	Data Analysis	4
PM 512	Principles of Epidemiology	4
PM 518a	Statistical Methods for Epidemiological Studies I	3
PM 570	Statistical Methods in Human Genetics	4
RSCI 530	Translational Medicine: An Overview	2

Community-Based Intervention Trials		(16 UNITS)
PM 512	Principles of Epidemiology	4
PM 528	Program Design and Evaluation	4
PM 563	Organizing and Mobilizing Communities for Public Health	4

Electives (Pick one course)		Units
PM 526	Communications in Public Health	4
PM 562	Intervention Approaches for Health Promotion and Disease Prevention	4

Design, conduct and analysis of clinical studies		(18 Units)
PM 510L	Principles of Biostatistics	4
PM 511a	Data Analysis	4
PM 523	Design of Clinical Studies	3
PM 538	Introduction to Biomedical Informatics	3
PM 570	Statistical Methods in Human Genetics	4

Epidemiology and Disease Etiology		(14-15 Units)
PM 510L	Principles of Biostatistics	4
PM 512	Principles of Epidemiology	4
PM 517a	Research Methods in Epidemiology	3

Electives (Pick one course)		Units
PM 518a	Statistical Methods for Epidemiological Studies I	3
PM 527	Epidemiology of Infectious Disease	4
PM 529	Environmental and Occupational Health: An Epidemiological Approach, or	
PM 533	Genetic and Molecular Epidemiology	3

Health Outcomes Research		(16 Units)
PM 511a	Data Analysis	4
PMEP 538	Pharmaceutical Economics	4
PMEP 539	Economic Assessment of Medical Care	4
PMEP 540ab	Seminar in Pharmaceutical Economics and Policy	2-2

ENVIRONMENTAL EPIDEMIOLOGY		(17-18 UNITS)
PM 510L	Principles of Biostatistics	4
PM 512	Principles of Epidemiology	4
PM 518a	Statistical Methods for	3

PM 529	Epidemiological Studies I Environmental Health: An Epidemiological Approach	3
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Electives (Pick one course)		Units
PM 511a	Data Analysis	4
PM 533	Genetic and Molecular Epidemiology	3
PM 570	Statistical Methods in Human Genetics	4
PM 599	Special Topics	4

Molecular Biology		(16 Units)
INTD 531	Cell Biology	4
INTD 561	Molecular Biology	4
INTD 571	Biochemistry	4

Electives (Pick one course)		Units
BIOC 543	Human Molecular Genetics	4
INTD 504	Molecular Biology of Cancer	4
INTD 555	Biochemical and Molecular Bases of Disease	4
MICB 551	Prokaryotic Molecular Genetics	4

Cell Biology		(15 Units)
INTD 531	Cell Biology	4
INTD 571	Biochemistry	4
PATH 553	Methods in Cellular and Clinical Pathology	3

Electives (Pick one course)		Units
INTD 504	Molecular Biology of Cancer	4
INTD 555	Biochemical and Molecular Bases of Disease	4

Vision Science		(19-26 Units)
INTD 501	Recent Advances in Vision Science	1, max 4
INTD 531	Cell Biology	4
INTD 571	Biochemistry	4
INTD 573	Systems Physiology and Disease II	4
PHBI 608ab	Advanced Cellular, Molecular and Systemic Physiology	2 or 4 each
PSCI 667	Intracellular Drug Delivery and Targeting	2

#### Alternative Options Track (Minimum 16 units)

Courses are determined by mentor and student, based on research interests, with approval from the oversight committee.

#### Seminars/Workshops

Participation is required in a Recent Advances Journal Club to learn how to read papers critically and develop the speaking skills necessary to explain a research paper. Faculty members in the program rotate as course directors in order to emphasize new topics. Students are expected to attend the three-day workshop on NIH Proposal Development if offered by Thomas Ogden, Ph.D., and a workshop on the principles of scientific manuscript preparation.

## Master of Science in Global Medicine

Keith Administration Building 317  
1975 Zonal Avenue  
Los Angeles, CA 90089-9024  
Tel: (323) 442-3141

FAX: (323) 442-1766  
keck.usc.edu/msgm

Program Director: Elahe Nezami, Ph.D.

The Master of Science in Global Medicine (MSGM) is offered by the Department of Educational Affairs of the Keck School of Medicine. The program aims to train medical, dental and pharmacy students; current physicians and allied health professionals; and those planning to pursue degrees in the allied health professions to analyze and address critical issues in global medicine. The program provides a solid foundation in basic science while also exposing students to a broad scope of pertinent issues in global medicine. The program offers an advanced standing option for physicians, dentists, current medical/dental students and applicants with a Pharm.D. degree from accredited institutions. Students admitted to the advanced standing option may use previous equivalent course work for 8 units of credit toward MEDS 503L Core Principles System I and MEDS 504L Core Principles System II course requirements. The advanced standing option allows students to bypass the foundation course work and focus on globally oriented course work.

By providing the knowledge and training necessary to address current and future global medical challenges, the M.S. in Global Medicine program responds to the Institute of Medicine's recommendation that the education of health professionals include course work that promotes literacy in global medicine. In addition to gaining a strong medical science foundation, students are immersed in course work that examines methods used to create innovative programming, solutions and responses to global health challenges, thereby furnishing them with the problem-solving skills and analytical frameworks essential to their future career paths. Through partnerships with the Marshall School of Business and the Viterbi School of Engineering, the M.S. in Global Medicine also includes a management track for students who intend to pursue international health management.

Upon completion of the M.S. in Global Medicine, students will be equipped to serve as leaders within the allied health field, including, but not limited to: medicine, pharmacy, dentistry and nursing. In addition, graduates will be prepared to collaborate with or seek employment from a variety of international aid, nonprofit, and global health organizations such as: the United Nations, the International Red Cross, United Nations Joint Programme on HIV/AIDS, United Nations Children's Fund, World Health Organization, World Bank and the Centers for Disease Control and Prevention.

#### Admission

Applicants for admission to the program must have a bachelor's degree or its equivalent from an accredited institution and have earned a GPA of 3.0 (A = 4.0) in undergraduate work. Prerequisite undergraduate course work for Clinical Track applicants must include one year of general biology, one year of general chemistry, one year of organic chemistry and one semester of calculus. Applicants to the Management Track should consult with advisers for prerequisite exceptions.

All applicants are required to have taken the Graduate Record Examinations (GRE) General Test, the Dental Admission Test (DAT) or the Medical College Admission Test (MCAT). A minimum score of 300 (1000 on old scale) on the GRE, 18 on the DAT or 28 on the MCAT is required. International Medical Graduates (IMGs) from accredited institutions can submit their USMLE results in lieu of GRE, DAT or MCAT scores. Applicants must also supply three letters of recommendation from evaluators qualified to assess their potential for graduate work. If applying for the advanced standing option, U.S. applicants must have successfully completed their first year of an M.D. (Doctor of Medicine) or DDS (Doctor of Dental Surgery) program or earned a Pharm.D. degree from a U.S.-accredited

institute; international applicants must have earned a bachelor's degree in medicine and surgery or a degree equivalent of DDS (Doctor of Dental Surgery) or a Pharm.D. degree from an accredited institute.

Applicants must supply a completed application for graduate studies including: transcripts from all institutions previously attended, standardized test scores and three letters of recommendation. Applications are considered for enrollment in both fall and spring semesters. For further information contact: Dr. Elahe Nezami, Master of Science in Global Medicine Program, 1975 Zonal Ave., KAM 317, Los Angeles, CA 90089-9024, Tel: (323) 442-3141, Fax: (323) 442-1766.

#### Advisement

The program recommends that students meet with an academic adviser of the program each semester prior to registration.

#### Satisfactory Academic Progress

A graduate GPA of at least 3.0 is required at all times. Any student whose graduate GPA falls below 3.0 will be placed on academic probation. Students on academic probation who do not raise their GPA to 3.0 after two semesters of written notification of academic probation will be academically disqualified. A minimum of 32 units of graduate level course work is required for graduation from the clinical or management track. A minimum of 24 units of graduate level course work is required for graduation with the advanced standing option.

#### Degree Requirements

CORE COURSES	UNITS	
<i>GM Clinical Track Core</i>		
MEDS 500	Basic Concepts in Global Health	4
MEDS 503L	Core Principles System I	4
MEDS 504L	Core Principles System II	4
<i>GM Management Track Core</i>		
GSBA 520	Business Fundamentals for Non-Business Professionals	3
DSO 582	Service Management: Economics and Operations	3
MEDS 500	Basic Concepts in Global Health	4
MEDS 502	Global Epidemiology of Diseases and Risk Factors	4
<i>GM Advanced Standing Track Core</i>		
MEDS 500	Basic Concepts in Global Health	4
MEDS 502	Global Epidemiology of Diseases and Risk Factors	4

ELECTIVE COURSES	UNITS	
(GM Clinical track students must complete at least 20 GM elective units; GM Management track students must complete at least 12 GM electives units; GM Advanced Standing track students must complete at least 16 GM elective units)*		
<i>GM Electives</i>		
MEDS 501	Critical Issues in Global Health	4
MEDS 502	Global Epidemiology of Diseases and Risk Factors	4
MEDS 510	Global Health Modules, Malaria	2
MEDS 511	Global Health Modules, Tuberculosis	2
MEDS 512	Global Health Modules, Maternal and Child Health I	2
MEDS 513	Global Health Modules, Maternal and Child Health II	2
MEDS 514	Global Health Modules, Tropical Diseases	2
MEDS 515	Global Health Modules, HIV/AIDS	2
MEDS 516	Cultural Competence in Health and Medicine	2
MEDS 517	Health and Human Rights	2
MEDS 518	Children in Emergency	2

	Situations: Global Policies & Programs	
MEDS 520	Medical Spanish for the Health Professions	2
MEDS 521	Emerging and Re-emerging Infectious Diseases	2
MEDS 522	Human Hepatitis Viruses	2
MEDS 523	Global Toxicity and Carcinogenesis	2
MEDS 524	Grantwriting for Non-Government Organizations	2
MEDS 525	Global Mental Health	2
MEDS 526	Alternative and Eastern Medicine: A Biomedical Approach	2
MEDS 527	Zoonotic Infectious Diseases	2
MEDS 528	Global Health Modules, Sexually Transmitted Infections	2
MEDS 529	Refugee Healthcare	2
MEDS 530abc	Foundation of Medicine: Anatomy, Physiology, and Pathology	4-4-4
MEDS 535	Culture, Lifestyle, and Health	2
MEDS 550	Clinical Medicine and Healthcare Reform in Taiwan	2
MEDS 551	Clinical Medicine and Socioeconomic Factors in Uganda	2
MEDS 552	Clinical Medicine and Healthcare Reform in Jordan	2
MEDS 553	Clinical Medicine and Healthcare Challenges in India	2
MEDS 554	Clinical Medicine and Healthcare Delivery in Panama	2
MEDS 555	Clinical Medicine and Healthcare Access in Honduras	2
MEDS 556	Global Health Field Study, New York	2
MEDS 590	Directed Research	2-4
MEDS 599	Special Topics	2-4
<i>GM Management Track Electives</i>		
ISE 507	Six-Sigma Methods and Applications	3
ISE 508	Health Care Operations Improvement	3
MKT 565	Global Marketing	3
MOR 470	Global Leadership	4
MOR 569	Negotiation and Deal-making	3

*Note: On a case-by-case basis, GM students and GM Management students may take classes outside their particular group.*

*\* Students will take 8 units of electives that have a global focus, chosen in consultation with their adviser from among MEDS courses.*

## M.D./Master of Science, Global Medicine

The dual degree in Doctor of Medicine and Master of Science in Global Medicine will provide medical students with formal education in the field of global health. Students will benefit from a curriculum that supplements and strengthens their medical knowledge with additional expertise in cultural competence, the specific diseases that affect various populations worldwide, and the unique issues respective to practicing medicine in a developing country or in vulnerable, underserved populations domestically.

### Requirements

Current enrollment in the Keck School of Medicine M.D. program and successful completion of at least the first two years of the M.D. curriculum are required prior to submitting an application to the M.S. in Global Medicine

program for admission to the dual degree program. Students must gain admission to and fulfill the degree requirements for both programs, which include four years of course work for the Doctor of Medicine and 24 units of the M.S. in Global Medicine (Clinical track only).

For the dual degree with Global Medicine Clinical Track, 24 GM elective units should be successfully completed. The M.D. and the M.S. in Global Medicine degrees are awarded simultaneously upon successful completion of both degree requirements.

### Program Adaptation

For the dual degree with Global Medicine Clinical Track, there are no Global Medicine core unit requirements. Students enrolled in M.D./M.S.G.M. dual degree will be eligible to apply 2 GM study-abroad elective units and 2 other GM elective units (except MEDS 503L, MEDS 504L, MEDS 520, MEDS 524 and MEDS 530abc) toward their MD program elective requirements. GM Management Track electives cannot be applied toward either degree requirements.

## Pharm.D./Master of Science, Global Medicine

The dual degree in Pharmacy and Global Medicine is designed for students who are interested in providing pharmaceutical care to underserved populations around the world. Students enrolled in this dual degree program will benefit from an advanced understanding of the role of, and issues surrounding, modern medicine in developing countries.

### Requirements

Students must gain admission to and fulfill the degree requirements for both programs, which include 138 units for the Doctor of Pharmacy and 24 units for the M.S. in Global Medicine. Six units of MEDS elective units can be used toward the Pharm.D. elective requirement, and PHRD 503 and PHRD 504 substitute for MEDS 503 and MEDS 504.

### Program Adaptation

Because MEDS 503 and MEDS 504, core requirements for the M.S. in Global Medicine program, cover the same material as PHRD 503 and PHRD 504, the Pharm.D./Global Medicine dual degree program substitutes PHRD 503 and PHRD 504 for MEDS 503 and MEDS 504 as core requirements for the dual degree.

## Graduate Certificate in Global Medicine

The certificate program in global medicine is for students who do not wish to pursue an M.S. degree in global medicine, but hope to pursue or expand careers in global health care. Students will study current topics in global health and health care, and will have a strong grounding in cultural competence, specific diseases, and creating and implementing health interventions in developing countries.

Students take 16 units of graduate course work that may not be used or have been used for any other degree or certificate program. These units include two core classes and eight units of electives, as follows:

CORE COURSES		UNITS
MEDS 500	Basic Concepts in Global Health	4
MEDS 502	Global Epidemiology of Diseases and Risk Factors	4

### ELECTIVE COURSES:

Students will take 8 units of electives, chosen in consultation with their adviser, from among all MEDS courses numbered 510 or above. For example, there are

groups of courses relevant to women's and family health; infectious diseases; health care in developing countries; working with diverse populations in the United States, etc.

## Courses of Instruction

### Medical Sciences (meds)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**MEDS 500 Basic Concepts in Global Health (4, FaSpSm)** Exploration of global health issues facing resource-poor societies; emphasizes contributing factors including behavioral and physiological bases, economic, social, and political context.

**MEDS 501 Critical Issues in Global Health (4, FaSpSm)** Evaluation of government and non-government organizations' new global health responses, and critical issues affecting global health including: environment, workforce conditions, obesity, nutrition, drugs, poverty.

**MEDS 502 Global Epidemiology of Diseases and Risk Factors (4, FaSpSm)** Survey of major populations' crises and risk factors accounting for global health challenges. Evaluation of case studies of global health interventions and effective methodologies.

**MEDS 503L Core Principles System I (4, FaSpSm)** Introduction to basic medical concepts and biological system functions; examination of core principles of science and medical treatment.

**MEDS 504L Core Principles System II (4, FaSpSm)** Continuation of concepts from MEDS 503L. Basic medical concepts and biological system functions; examination of core principles of science and medical treatment.  
*Prerequisite: MEDS 503L.*

**MEDS 510 Global Health Modules, Malaria (2, FaSpSm)** Critical issues in international control and treatment of malaria. Exploration of biological and epidemiological fundamentals of human-parasite interaction, including dynamics of transmission among populations.

**MEDS 511 Global Health Modules, Tuberculosis (2, FaSpSm)** Exploration of biological and epidemiological fundamentals of tuberculosis including dynamics of transmission among populations. Overview of clinical manifestations, diagnosis, and treatment of infections.

**MEDS 512 Global Health Modules, Maternal and Child Health I (2, FaSpSm)** Biopsychosocial, cultural and economic aspects of women's health: pregnancy, childbirth, marriage. Examination of health promotion and policy efforts to improve women's health globally.

**MEDS 513 Global Health Modules, Maternal and Child Health II (2, FaSpSm)** In-depth examination of women's health issues; health promotion and policy efforts to improve women's health globally.

**MEDS 514 Global Health Modules, Tropical Disease (2, FaSpSm)** Examination of prevalent tropical diseases: epidemiology, clinical manifestations, treatment, impact on economies of tropical countries. Key issues related to these diseases; World Health Organization responses.

**MEDS 515 Global Health Modules, HIV/AIDS (2, FaSpSm)** HIV epidemiology, basic biology of transmission and pathophysiology, associated opportunistic infections, and challenges to providing care in the developing world, including government responses.

**MEDS 516 Cultural Competence in Health and Medicine (2, FaSpSm)** Practical approach to the development of professional skills for providing culturally sensitive clinical health services to ethnically and linguistically diverse patients.

**MEDS 517 Health and Human Rights (2, FaSpSm)** The relationship between health and human rights, and the study of human rights issues relevant to health care professionals.

**MEDS 518 Children in Emergency Situations: Global Policies and Programs (2, Sp)** Focuses on children in emergency situations, including natural and man-made disasters, such as floods, earthquakes, conflicts, or war, with an emphasis on the poorest and most vulnerable children. Open only to Global Medicine majors.

**MEDS 519 Global Oral Health (2, FaSpSm)** Better understand the key issues impacting global oral health, how better care can help reduce the disease prevalence, and ways to prepare the next generation of global health leaders to address the key issues. Open only to Global Medicine majors.

**MEDS 520 Medical Spanish for the Health Professions (2, FaSpSm)** Spanish language course for students planning to enter the health professions.

**MEDS 521 Emerging and Re-emerging Infectious Diseases (2, FaSpSm)** Exploration of the threat of major worldwide epidemics and diseases with a focus on the recent emergence of new plagues.

**MEDS 522 Human Hepatitis Viruses (2, FaSpSm)** Human hepatitis and the viruses that cause them, how they are spread, symptoms, treatment, and prevention.

**MEDS 523 Global Toxicity and Carcinogenesis (2, FaSpSm)** Covers the occurrences of toxic substances and the toxicity/diseases they cause, and chemical carcinogens and the types of cancer they cause worldwide.

**MEDS 524 Grantwriting for Non-Government Organizations (2, FaSpSm)** Instruction on the process and methods of writing effective grants from identifying appropriate funders to implementing project upon receipt of funding award.

**MEDS 525 Global Mental Health (2, FaSpSm)** Examines the major mental health diagnoses from clinically relevant perspectives and their prevalence in specific geographical regions around the world.

**MEDS 526 Alternative and Eastern Medicine: A Biomedical Approach (2, FaSpSm)** Exploration of issues of complementary and alternative medicine (CAM) and traditional Eastern medical views of health and illness from a Western biomedical perspective.

**MEDS 527 Zoonotic Infectious Diseases (2, SpSm)** Background information on a group of infections that are transmitted via animal contact. Understanding of the epidemiology, clinical manifestations, treatment, and impact of the diseases on the economies of the countries in which they are found. Open only to graduate students. *Recommended preparation:* MEDS 500.

**MEDS 528 Global Health Modules, Sexually Transmitted Infections (2, SpSm)** Examines clinically relevant perspectives from distinguished international authors on STI issues and the devastating effect on particular geographical regions around the world.

**MEDS 529 Refugee Health Care (2)** Introduction to refugee health care and life events which impact health. Discuss medical needs of long-term displaced populations with specific case studies. Open only to graduate students.

**MEDS 530abc Foundation of Medicine: Anatomy, Physiology, and Pathology (4-4-4, FaSpSm) a:** Fundamentals of physiology, chemistry, anatomy, biochemistry and microbiology, as well as pharmacological issues, mathematical basis of lab instruments or techniques, and computational modeling. **b:** The basics of human anatomy (gross anatomy, histology, radiographic anatomy), physiology (cellular physiology, organ system areas) and pathology (general, systemic, cellular pathology). **c:** Continues material from MEDS 530a and MEDS 530b, covering human anatomy (gross anatomy, histology, radiographic anatomy), physiology (cellular physiology, organ systems) and pathology (general, systemic, cellular pathology).

**MEDS 531 The Politics of Global Health (2, FaSpSm)** Examines the impact of politics on global health progress and declines. Open only to Global Medicine majors.

**MEDS 535 Culture, Lifestyle, and Health (2, FaSpSm)** Overview of national and international variations in health status indicators in regard to cultural and lifestyle differences.

**MEDS 550 Clinical Medicine and Health Care Reform in Taiwan (2, Sm)** Two-week in-depth study abroad in Taipei, Taiwan, focused on understanding Taiwan's health care system, health priorities, and needs.

**MEDS 551 Clinical Medicine and Socioeconomic Factors in Uganda (2, Sm)** Two-week course that provides students with hands-on experience in clinical medicine/public health and exposure to the various socioeconomic factors impacting health in the developing world.

**MEDS 552 Clinical Medicine and Health Care Reform in Jordan (2, Sm)** A two-week, in-depth study abroad course that explores the economic, social, political, and health issues in the Middle East region and specifically Jordan.

**MEDS 553 Clinical Medicine and Health Care Challenges in India (2, Sm)** Two-week study abroad course that explores the health dynamics and health care settings of India.

**MEDS 554 Clinical Medicine and Healthcare Delivery in Panama (2, SpSm)** A two-week course providing students with hands-on experience in the practice of rural medicine as they gain exposure to the various socio-economic factors present in Bocas del Toro, Panama. *Recommended preparation:* MEDS 500, MEDS 501, MEDS 510, MEDS 511, MEDS 514, MEDS 515. Open only to Global Medicine majors.

**MEDS 555 Clinical Medicine and Healthcare Access in Honduras (2, Sm)** A three-week hybrid course providing students with hands-on experience in clinical medicine/public health and exposure to the various socio-economic factors impacting healthcare delivery in the developing world, specifically in Honduras. *Recommended preparation:* MEDS 500, MEDS 501, MEDS 513, MEDS 514, MEDS 515. Open only to Global Medicine majors.

**MEDS 556 Global Health Field Study, New York (2, Sp)** Two-week course providing students with a solid understanding of the United Nations' major agencies influential in global health, their mandate, their strengths and challenges. Includes field visit to selected UN organizations all located in NYC. Open only to Global Medicine majors.

**MEDS 557 Clinical Medicine and Healthcare Dynamics in Denmark (2, SpSm)** Two-week course that provides a venue for careful examination and assessment of the economic, social, political, and specific health issues currently faced by countries in the European Region. Open only to Global Medicine majors.

**MEDS 558 Clinical Medicine and Translational Research in Argentina (2, SpSm)** Two week in-depth course examining and assessing the economic, social, political and unique health issues faced by the Latin-American Region especially Argentina. Open only to Global Medicine majors.

**MEDS 559 Clinical Medicine and Healthcare Determinants in China (2, SpSm)** A two-week intensive course abroad in Shanghai, China, focused on understanding clinical realities of Chinese medicine, health determinants and healthcare delivery. *Recommended preparation:* MEDS 500, MEDS 501, MEDS 515, MEDS 535. Open only to Global Medicine majors.

**MEDS 590 Directed Research (1-12, max 12, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**MEDS 597ab Health Technology Internship (1-1, FaSpSm) a:** Internship course on the use of new technology based on sensors and wireless communications to the healthcare industry. **b:** Internship course on the use of new technology based on sensors and wireless communications to the healthcare industry. Continues material from GM 597a. Open only to M.S., Electrical Engineering (Wireless Health Technology) students. Graded CR/NC.

**MEDS 599 Special Topics (2-4, FaSpSm)** Lecture and discussion focused on specific topics within global medicine. Course topic will vary from semester to semester.

## Graduate Certificate in Health, Technology and Engineering (HTE@USC)

*Academic Director:* Terry Sanger, M.D., Ph.D., *Provost Associate Professor of Biomedical Engineering, Neurology, Biokinesiology, and Physical Therapy*

*Administrative Director:* George Tolomiczenko, Ph.D., *Assistant Professor, Neurology*

This program offers current second-year USC Ph.D. engineering students and first-year M.D. students an opportunity to learn about and gain experience in medical device and process innovation. Through project-based and interdisciplinary collaboration, students will augment their current programs with a set of courses and lab experiences linking medical and engineering research groups. By applying design-informed approaches toward problem identification and solution prototyping, students will be involved in all the steps of medical device innovation from conception to commercialization. The program aims to create interdisciplinary, boundary-spanning, inventive entrepreneurs seeking early practical experience with device and method innovation in health care. Program participants will form bonds with a group of like-minded medical students and engineers who will be their mentors, colleagues and contacts as they advance in their careers.

The courses unique to the program include a seminar sequence (Topics in Health, Technology and Engineering), which must be taken during the first two years of involvement with the HTE@USC program, a case studies sequence taken during the second year and a research course to earn project-related credits:

Courses		Units
BME 566abcd	Topics in Health, Technology and Engineering	2-2-2-
		2
BME 567ab	Case Studies in Health,	1-1

790	Technology and Engineering Research (in the student's major department)	2-8
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Other required courses that are part of the M.D. curriculum (Ph.D. students enroll in INTD course versions of the same courses open only to HTE students on CR/NC basis):

INTD 621ab	Introduction to Clinical Medicine (ICM) for HTE	3-3
INTD 622L	Pre-clinical System Block for Health, Technology and Engineering	3-5

Candidates interested in applying should contact [HTE@usc.edu](mailto:HTE@usc.edu) via email.

## Undergraduate Minor Program

### Minor in Health Care Studies

The USC Dornsife College of Letters, Arts and Sciences and the Keck School of Medicine offer an interdisciplinary minor in health care studies. This minor is targeted to those undergraduates who wish to pursue a postgraduate career in health care or health care related fields. The minor brings together a background in fundamental science necessary to understand the biological basis of medicine with course work that explores health care both in classroom and clinical settings. The minor requires a minimum of 28 units, at least 16 of which must be at the upper-division level. If the core required courses listed below are already included in a student's major, then other lower division courses may be selected from the electives list.

Students should consult their advisers in selecting courses. Depending on the major, prerequisites may increase total units required to complete this minor.

REQUIRED COURSES (12 units)		Units
BISC 220L	General Biology: Cell Biology and Physiology, or	
BISC 221L	Advanced General Biology: Cell Biology and Physiology	4
CHEM 103LX	General Chemistry for the Environment and Life, or	
CHEM 105aL	General Chemistry	4
MDA 110	Contemporary Issues and Cases in Health Care	2
MEDS 220	Preparation for the Clinical Experience	2

Electives: Students must choose a minimum of 16 upper division units from the following lists.

#### Introduction to Human Health I

ANTH 101	Body, Mind and Healing	4
BISC 150LX	The Nature of Human Health and Disease	4
PSYC 100	Introduction to Psychology	4
PSYC 360*	Abnormal Psychology	4

#### Introduction to Human Health II

BISC 320L*	Molecular Biology	4
BISC 421*	Neurobiology	4
BISC 450L*	Principles of Immunology	4
MEDS 260	Challenges in the Forefront of Biomedical Ethics	2
MEDS 280	The History of Medicine: A Doctor's Perspective	2
MEDS 300	Statistical Methods for Biomedical	4

PSYC 336L*	Research Developmental Psychology	4
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#### The Biological Bases for Disease Processes

BISC 300L*	Introduction to Microbiology	4
BISC 307L*	General Physiology	4
BISC 330L*	Biochemistry	4
MEDS 320*	Clinical Perspectives on Human Anatomy	4
MEDS 335*	Human Development: From Stem to Sternum	2
MEDS 340L*	The Brain in Health and Disease	4
MEDS 350*	Drugs and the Brain	2
MEDS 360*	Current Research Approaches to Biomedical Problems	2
MEDS 370*	Organ Failure: Non-Communicable Chronic Disease	2
MEDS 380*	Stem Cells: Fact, Fiction and the Future of Mankind	2

#### Clinical and Biomedical Experience

BISC 423*	Epilepsy to Ecstasy: Biological Basis of Neurological Disorders	4
MEDS 425*	Medical Examiner-Coroner: Investigating Death	2
MEDS 440*	Introduction to Surgical Principles	3
MEDS 445*	Cancer: Introduction to Oncology in the Modern Era	2
MEDS 450*	OB/GYN: The Medicine and Surgery of Reproduction	2
MEDS 460*	Emergency Health Care	2
MEDS 465*	Wilderness and Survival Medicine	4
MEDS 490*	Directed Research in Biomedical Science	2-8

\* Prerequisite required

## Courses of Instruction

### Medical Sciences (meds)

The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.

**MEDS 220 Preparation for the Clinical Experience (2, FaSpSm)** Discussion and exercises in clinically relevant topics (professional behavior, patient privacy, medical ethics, cultural competency, teamwork, etc.) in preparation for experience in the clinical setting.

**MEDS 260 Challenges in the Forefront of Biomedical Ethics (2, Sp)** Examination of fundamental ethical concepts and principles in clinical health care and biomedical research. Use of film, case studies and discussion. *Recommended preparation:* MDA 110 or MEDS 220.

**MEDS 280 The History of Medicine: a Doctor's Perspective (2, Fa)** Explores the role of medicine/surgery in society, whose ideas about health and disease have undergone enormous changes from antiquity to the present day.

**MEDS 300 Statistical Methods for Biomedical Research (4, Fa)** Fundamental basis for various statistical tests, underlying assumptions, and statistical analyses used in biomedical and clinical research.

**MEDS 320 Clinical Perspectives on Human Anatomy (4, FaSp)** Anatomical structure and function of the major

regions of the human body as related to health and disease, using clinical cases, lectures and cadaveric demonstrations. *Prerequisite:* BISC 220L or BISC 221L.

**MEDS 335 Human Development: From Stem to Sternum (2, Fa)** An introduction to transformation of a single cell into a mature organism. *Prerequisite:* BISC 220L or BISC 221L. *Recommended preparation:* BISC 320L.

**MEDS 340 The Brain in Health and Disease (4, Fa)** Study of the human brain with emphasis on structure-functional relationships, illustrative case studies, current imaging techniques, with illustrative laboratory exercises using specimens and slides. *Prerequisite:* BISC 220L or BISC 221L; CHEM 103 or CHEM 105a or CHEM 115a.

**MEDS 350 Drugs and the Brain (2, Sp)** Effects of legal and illegal drugs on human brain function. Introduction to common prescribed drugs, pharmacokinetics, pharmacodynamics, and brain pathways utilized by common drug classes. *Prerequisite:* BISC 220L or BISC 221L; and CHEM 103Lx or CHEM 105aL or CHEM 115aL; *recommended preparation:* BISC 320L or BISC 330L.

**MEDS 360 Current Research Approaches to Biomedical Problems (2, Fa)** A theoretical basis of laboratory approaches that help the biomedical or physician scientist in understanding the etiology of disease and targeting disease processes. *Prerequisite:* BISC 220L or BISC 221L; and CHEM 103Lx or CHEM 105aL or CHEM 115aL; *recommended preparation:* BISC 320L or BISC 330L.

**MEDS 370 Organ Failure: Non-Communicable Chronic Disease (2, Sp)** An examination of frequently treated diseases with the greatest impact on society. Involvement of medical specialists and actual patients as guests. *Prerequisite:* MEDS 220 and BISC 220L or BISC 221L; and CHEM 103Lx or CHEM 105aL or CHEM 115aL; *recommended preparation:* MEDS 320 or EXSC 301L.

**MEDS 380 Stem Cells: Fact, Fiction and The Future of Mankind (2, Sp)** Exploring how stem cells and regenerative medicine are portrayed in culture, the scientific underpinnings of what is currently possible, and visions into the future. *Prerequisite:* BISC 220L or BISC 221L.

**MEDS 425 Medical Examiner-Coroner: Investigating Death (2, Fa)** Emphasizes the team-based approach used by forensic scientists, medical examiners and coroners to investigate the circumstances and determine the cause/manner of death. *Prerequisite:* BISC 220 or BISC 221 and MEDS 220. Open only to juniors and seniors.

**MEDS 440 Introduction to Surgical Principles (2, Sp)** Introduction to the spectrum of surgical care, taught by surgeons, with the goal of developing an appreciation of the role that surgery plays in society. *Prerequisite:* BISC 220 or BISC 221; and CHEM 103 or CHEM 105a or CHEM 115a; and MEDS 220. Open only to juniors and seniors.

**MEDS 445 Cancer: Introduction to Oncology in the Modern Era (2, Fa)** Introduction to the spectrum of clinical and scientific issues surrounding contemporary cancer care - molecular diagnostics, genomic medicine, modern therapeutics, and community/patient engagement. *Prerequisite:* BISC 220 or BISC 221 and MEDS 220. Open only to juniors and seniors.

**MEDS 450 OB/GYN: The Medicine and Surgery of Reproduction (2, Fa)** An introduction to the practical realities of modern obstetric and gynecology practice from the point of view of practicing surgeon scientists at USC. *Prerequisite:* BISC 220 or BISC 221 and MEDS 220.

**MEDS 460 Emergency Health Care (2, FaSp)** Principles of emergency medical services, ranging from pre-hospital care and advanced life-saving, to minor injuries and illnesses. Interactive experience with ER physicians/emergency health care providers. *Prerequisite:*

BISC 220 or BISC 221; and MEDS 220. *Recommended preparation:* MEDS 260.

**MEDS 465 Wilderness and Survival Medicine (4, Sp)**  
Medical physiology principles of people under "extreme" wilderness conditions, factors affecting remote medical care, and basic survival strategies, led by Emergency Medicine physicians. *Prerequisite:* BISC 220 or BISC 221; and MEDS 220.

**MEDS 490x Directed Research in Biomedical Science (2-8, max 8, FaSpSm)** Individual research and readings. Not available for graduate credit. *Prerequisite:* BISC 220L or BISC 221L and CHEM 103L or CHEM 105aL or CHEM 115aL; *recommended preparation:* MEDS 300, MEDS 360.

## Department-Specific Programs

### Department of Anesthesiology

**Nurse Anesthesia Program**  
1540 Alcazar Street  
Center for Health Professions #205  
Los Angeles, CA 90089-9012  
(323) 442-2037  
FAX: (323) 442-1701  
Email: [uscnap@usc.edu](mailto:uscnap@usc.edu)  
[keck.usc.edu/nurse-anesthesia](http://keck.usc.edu/nurse-anesthesia)

*Program Director:* Michele E. Gold, Ph.D.

*Associate Program Director:* Teresa Norris, Ed.D.

*Assistant Program Director of Clinical Services:* Kären Embrey, Ed.D.

#### Faculty

*Chair and Professor:* Philip Lumb

*Professor of Pediatrics and Anesthesiology:* Randall Wetzel

*Professors of Clinical Anesthesiology:* Jack Berger; Mary Joseph; Ronald Katz; Duraiyah Thangathurai; Vladimir Zelman

*Associate Professors of Clinical Anesthesiology:* Steven Haddy; Jeffrey Lee; Michele Gold; Rajesh Patel; Steven Richeimer; Earl Strum

*Assistant Professors of Clinical Anesthesiology:* Rudolfo Amaya; Dimiter Arnaudov; Tawfik Ayoub; Armin Azad; Jason Bang; Maxim Benbassat; Martin Bohorquez; Kari Cole; Ahmed Darwish; James Daniel; Kären Embrey; Maria Espi; Gligor Gucev; Wayne Kaufman; Mona Kulkarni; Rodney McKeever; Mariana Mogos; Rana Movahedi; Ali Nemat; Teresa Norris; Shatel Patel; Catherine Rodziewicz; Ashraf Sedra; Faye Takla; Candace Tay; Chelsea Varner; Samuel Yanofsky

*Instructors of Clinical Anesthesiology:* Roberta Ashley; Deborah Avnet; Brindusa Bauer; Paula Belson; Eric Bowles; Douglas Brannan; James Carey; Jennilyn Casalme; Johnny Cheng; Geoffrey Edwards; Judith Franco; Charlotte Garcia; Katharine Getz; Dolores Gibbs; Amy Gilb; Sarah Giron; Elizabeth Glazer; David Godden; Jessica Harris; Jennifer Hogan; Dina Hunt; Monique Jabbour; Kim Jones-Tang; Rory Keenan; Cathy Kiem; Alla Kryukova; Vadim Kuraev; Benjamin Lindsey; Victoria McKinzie; Cameron Meyer; Blair Mostofi; Arthur Norcliffe; Michelle Olivares; Margaret Oliveto; Robert Olsen; Patricia Omoto Paik; Nilu Patel; Nancy Perez; Erin Peters; Gabriel Punsalan; Christina Quinn; Ellie Rawson; Dhanya Renjith; Ilene Richards; Sara Rondinone; Joseph Sammut; Susan Shenkosky; Tahira Smith; Helen Stepan; Crystal Trinooson; Regalado Valerio; Rhona Wang; Kelly Zhou

The nurse anesthesia program prepares qualified nurses in the specialty of nurse anesthesia and qualifies the graduate to sit for the certification examination given by the Council on Certification of Nurse Anesthetists. The graduate attains a high level of clinical competence with an extensive body of didactic knowledge relevant to the specialty and advanced practice nursing. The mission of the USC Program of Nurse Anesthesia is scholarly education and professional development of future nurse anesthetists with the academic strength and leadership skills to advance our profession.

Students enrolling in the M.S., Nurse Anesthesia course of study must complete the nurse anesthesia core curriculum and specialty practicum. The program consists of 47 units and is completed in 27 months of continuous enrollment (seven semesters; the first semester 2-unit course is provided in a hybrid online platform). There is an optional one-semester clinical fellowship offered in the eighth semester of enrollment to provide specialty training in a clinical area of choice: critical care, cardiovascular, neurosurgical, ambulatory anesthesia or pain management. Students may sit for the certification examination during this semester.

The program is based in the Department of Anesthesiology, and classroom instruction is provided by nurse anesthesia program faculty and faculty from the Department of Anesthesiology, the Department of Physiology and Biophysics, and the Department of Cell and Neurobiology within the Keck School of Medicine, as well as clinical faculty from the program clinical sites. Clinical training occurs at Los Angeles County + USC Medical Center, Keck Hospital of USC, Harbor-UCLA Medical Center, Long Beach Veterans' Administration Medical Center and West Los Angeles Veterans' Administration Medical Center for the primary rotations. Advanced rotations occur at those sites, as well as Cedars-Sinai Medical Center, Children's Hospital of Los Angeles, Northridge/Hallmark Pain Management and Surgery Center, Arrowhead Regional Medical Center and UCLA Medical Center.

#### Master of Science (in Nurse Anesthesia)

General requirements for admission include a minimum 3.0 undergraduate grade point average, a minimum score on the verbal and quantitative sections of the Graduate Record Examination of 300 (or a score of 1000 on the GRE prior to September 2011), completion of the university and Program supplemental application, current licensure as a Registered Nurse, a bachelor's degree in nursing or a related field from an accredited university or college, submission of an essay describing the applicant's career goals, professional resume and three letters of reference.

Competitive applicants will be interviewed and must demonstrate an acceptable understanding of the role and responsibilities of certified registered nurse anesthetists. Shadowing experience of CRNAs must be demonstrated. Selections are made on the basis of the formal interview and consideration of a variety of factors that include academic record, type and amount of clinical experience and professionalism.

#### Academic and Scientific Prerequisites

The admission requirements also include appropriate undergraduate course work in biology, anatomy, physiology, chemistry, biochemistry, physics and statistics (or nursing research). A minimum of one year of experience in critical care nursing as a registered nurse is required. Licensure as an RN in California and current BCLS, ACLS and PALS certifications are required prior to enrollment. Conversational Spanish is strongly recommended.

#### Computer Skill Requirements

During the program, students must have a personal computer or notebook with Internet. The primary mode of program communication is email. Computer accounts are provided by the university to all students and can be activated online.

#### Advisement

Prospective students should contact the program's admission office, (323) 442-2037 or [uscnap@usc.edu](mailto:uscnap@usc.edu) for evaluation of previous course work and clinical background.

#### Admission

Admission procedures follow the information in the USC Graduate School section of this catalogue. Admission standards for the USC nurse anesthesia program are established jointly by the Keck School of Medicine, the USC Graduate School and the Department of Anesthesiology. Interested students should apply online at [usc.edu/admission/graduate/apply](http://usc.edu/admission/graduate/apply). Additional admissions requirements and the supplemental application must be obtained from the nurse anesthesia program and can be requested through email at [uscnap@usc.edu](mailto:uscnap@usc.edu) or accessed at [keck.usc.edu/nurse-anesthesia](http://keck.usc.edu/nurse-anesthesia).

Degree Requirements	Units
<i>Academic Courses</i>	
ANST 500 Human Anatomy	3
ANST 501 Advanced Pharmacology of Anesthesia Practice I	4
ANST 502 Principles of Nurse Anesthesia Practice	4
ANST 503 Advanced Pharmacology of Anesthesia Practice II	4
ANST 504 Advanced Pathophysiology Related to Anesthesia Practice	4
ANST 506 Advanced Principles of Nurse Anesthesia Practice	4
ANST 508 Research: Investigative Inquiry	3
ANST 510 Leadership and Professional Aspects of Nurse Anesthesia	3
ANST 512 Research Integration: Capstone Experience	2
ANST 607 Advanced Health Assessment	2
INTD 572 Systems Physiology and Disease I	4
<i>Residency Courses</i>	
ANST 505 Clinical Residency in Nurse Anesthesia I	2
ANST 507 Clinical Residency in Nurse Anesthesia II	2
ANST 509 Advanced Clinical Residency in Nurse Anesthesia I	2
ANST 511 Advanced Clinical Residency in Nurse Anesthesia II	2
ANST 513 Advanced Clinical Residency in Nurse Anesthesia III	2
Total Units	47
<i>Optional Course</i>	
ANST 514 Specialty Fellowship	2

All students will take the Self-Evaluation Examination (SEE) administered by the Council on Certification of Nurse Anesthetists at the end of the first clinical year. Student scores must be above the national mean for advancement into the research capstone experience.



## Courses of Instruction

### Anesthesiology (ANST)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**ANST 500 Human Anatomy (3, Fa)** Lectures and laboratory simulation in anatomy emphasizing structure and function of major organs to include brain, cardiovascular, lungs, liver, kidneys and musculoskeletal system. Open to nurse anesthesia students only.

**ANST 501 Advanced Pharmacology of Anesthesia Practice I (4, Fa)** Pharmacokinetic and pharmacodynamic principles, uptake and distribution of inhalational anesthetics, and pharmacology of respiratory and cardiovascular drugs. Application of pharmacologic principles to anesthetic management.

**ANST 502 Principles of Nurse Anesthesia Practice (4, Fa)** Basic theory of anesthesia administration, preanesthetic assessment, physical examination, monitoring. Case management including airway and blood/fluid management, anesthesia machine, and postoperative pain. Lecture/case study format. Open to nurse anesthesia students only.

**ANST 503 Advanced Pharmacology of Anesthesia Practice II (4, Sp)** Pharmacokinetic/pharmacodynamic principles of drugs covering different organs systems (cardiovascular, CNS, hematology, endocrine), herbal therapies, chemotherapeutics, antimicrobials. Application of pharmacology to anesthetic management using problem-based learning. *Prerequisite:* ANST 501 and ANST 502.

**ANST 504 Advanced Physiology/Pathophysiology for Anesthetists (4, FaSpSm)** In-depth advanced study of cardiovascular, respiratory, renal, liver, endocrine and neurophysiology and pathophysiology with application of these principles to anesthetic case management across the lifespan. *Prerequisite:* ANST 501, ANST 502.

**ANST 505 Clinical Residency in Nurse Anesthesia I (2, FaSpSm)** Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory in the clinical setting with observation and supervised clinical residency.

**ANST 506 Advanced Principles of Nurse Anesthesia Practice (4, Sm)** Advanced theory of anesthesia management for general and specialized procedures, diagnostic procedures, pediatrics and obstetrics. *Prerequisite:* ANST 503, ANST 504, ANST 505.

**ANST 507 Clinical Residency in Nurse Anesthesia II (2, FaSpSm)** Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory in the clinical setting with observation and supervised clinical residency. Open only to nurse anesthesia majors. *Prerequisite:* ANST 503, ANST 504, ANST 505.

**ANST 508 Research: Investigative Inquiry (3, Fa)** Utilization of research, which includes the evaluation of research, problem identification within the practice setting, awareness of practice outcomes and the clinical application of research. Recommended preparation: research course; basic statistics.

**ANST 509 Advanced Clinical Residency in Nurse Anesthesia I (2, FaSpSm)** Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory expanded to geriatric, obstetrical, and pediatric anesthesia; anesthetic management to include medically compromised patients.

Open only to nurse anesthesia majors. *Prerequisite:* ANST 505, ANST 506, ANST 507.

**ANST 510 Leadership and Professional Aspects of Nurse Anesthesia (3, Fa)** Emphasis on the professional components of nurse anesthesia practice, including socialization, regulation, culture, ethics, law, employment, advocacy, and contemporary practice issues.

**ANST 511 Advanced Clinical Residency in Nurse Anesthesia II (2, FaSpSm)** Correlation of techniques of anesthesia administration with application of scientific and pharmacologic theory expanded to neuroanesthesia, cardiac anesthesia, trauma anesthesia, critical care and pain management. Open only to nurse anesthesia majors.

**ANST 512 Research Integration: Capstone Experience (2, FaSpSm)** A capstone course that requires students to demonstrate ability to integrate theory, research, and practice through a mentored research experience with direct relevance to graduate specialization. Open only to nurse anesthesia majors.

**ANST 513 Advanced Clinical Residency in Nurse Anesthesia III (2, FaSpSm)** Correlation of advanced techniques of anesthesia administration with application of scientific and pharmacologic theory in diverse specialty anesthesia rotations. *Prerequisite:* ANST 511.

**ANST 514 Specialty Fellowship (2, Fa)** Optional internship to develop advanced skills and critical assessment of anesthesia specialty or clinical research. Graded CR/NC. *Prerequisite:* ANST 513; graduate of an accredited nurse anesthesia program.

**ANST 590 Directed Research (1-12, FaSpSm)** Research leading to the master's degree in nurse anesthesia. Maximum units which may be applied to the degree to be determined by the department. Open to nurse anesthesia majors only. Graded CR/NC. *Prerequisite:* ANST 508.

**ANST 591 Special Projects (1-4, max 4, FaSpSm)** Supervised learning in functional and/or clinical area of focus reflecting current trends and development in the field of nurse anesthesia. Open to nurse anesthesia majors only. Graded CR/NC.

**ANST 607 Advanced Health Assessment (2, Sm)** Advanced health assessment of all human systems utilizing advanced assessment techniques, concepts and approaches. Graded CR/NC. Open to nurse anesthesia majors only.

## Department of Biochemistry and Molecular Biology

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Email: [janet.stoeckert@usc.edu](mailto:janet.stoeckert@usc.edu)

[http://keck.usc.edu/en/Education/Academic\\_Department\\_and\\_Divisions/Department\\_of\\_Biochemistry\\_and\\_Molecular\\_Biology.aspx](http://keck.usc.edu/en/Education/Academic_Department_and_Divisions/Department_of_Biochemistry_and_Molecular_Biology.aspx)  
[usc.edu/pibbs](http://usc.edu/pibbs)

### Faculty

Michael R. Stallcup, *Chair and Professor of Biochemistry and Molecular Biology*

Zoltan A. Tokes, *Vice Chair for Doctoral Education and Master of Science Program*

Joseph G. Hacia, *Vice Chair for Medical Education*

*Catherine and Joseph Aresty Chair in Urologic Research:* Chih-Lin Hsieh

*Ralph Edgington Chair in Medicine:* Zea Borok

*Judy and Larry Freeman Chair in Basic Science Research:* Amy S. Lee

*H. Leslie Hoffman and Elaine S. Hoffman Chair in Cancer Research:* Peter A. Jones

*William M. Keck Chair in Biochemistry and Molecular Biology:* Peggy Farnham

*J. Harold and Edna L. LaBriola Chair in Genetic Orthopaedic Research:* Baruch Frenkel

*Rita and Edward Polusky Chair in Basic Cancer Research:* Michael Lieber

*Provost Professor of Medicine and Pharmacy:* Michael Kahn

*Professors:* N. Arnheim (*Biological Sciences*); Z. Borok (*Medicine*); E. Cadenas (*Molecular Pharmacology and Toxicology*); P.V. Danenberg; Y.A. De Clerck (*Medicine*); R. Farley (*Physiology and Biophysics*); P. Farnham; B. Frenkel (*Orthopaedics*); C.L. Hsieh (*Urology*); D. Johnson; P.A. Jones (*Urology*); M. Kahn; V.K. Kalra; R. Langen; A.S. Lee; D. Levy; M. Lieber (*Pathology*); F.S. Markland, Jr.; R.E. Maxson; M.E. Nimni (*Pediatrics*); P. Patel; D. Polk (*Pediatrics*); M.R. Stallcup; Z. Tokes; A. Warshel (*Chemistry*)

*Associate Professors:* W. An; P. Cannon (*Pediatrics*); I.S. Haworth (*Pharmacy*); J. Hacia; Y. Hong (*Surgery*); I. Laird-Offringa (*Surgery*); P. Laird (*Surgery*); R.D. Mosteller; S. Reddy; J. Rice; H. Sucov (*Cell and Neurobiology*); T. Ulmer

*Assistant Professors:* R. Bajpai (*Dentistry*); S. Curran (*Biogerontology*); M. Frey (*Pediatrics*); A. Kobiela (*Otolaryngology*); C. Lien (*Pediatrics*); A. Merrill (*Dentistry*); W. Lu; A. Siemer

*Assistant Professors of Research:* T. Miki; S. Swenson; D. Weisenberger; S. Zhong

The USC Department of Biochemistry and Molecular Biology prides itself on maintaining a broad-based approach to various aspects of biochemical and molecular biological research. In 2010, the department received more than \$10 million in research funding for its primary faculty members.

Altogether, the department numbers 49 primary and joint-appointment faculty members, who conduct research in a variety of areas including: molecular biology and genetics of development and cell differentiation; mammalian and human genetics; DNA methylation, replication, recombination and repair; membrane transport; kinetics and mechanism of enzyme action; protein structure-function interrelationships; carcinogenesis and cancer chemotherapy; and stem-cell biology.

The department also has major research programs in the molecular basis of control and regulation of gene expression, epigenetics, molecular mechanisms of signal processing and transduction, developmental and stem cell biology, detailed analysis of macromolecular structure and function, the biochemistry and molecular biology of the brain, and genetic medicine including gene therapy.

The department's exceptionally strong research into various aspects of the biochemistry and cell biology of cancer is internationally recognized. Ongoing research programs in this area include mechanism of action of cancer chemotherapeutic agents, tumor cell invasion and metastasis, and cancer cell epigenetics and gene regulation.

Many members of the department are members of the USC Norris Comprehensive Cancer Center, USC Institute for Genetic Medicine (IGM), USC Zilkha Neurogenetic Institute (ZNI), Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research at USC, and Children's Hospital Los Angeles (CHLA).

The USC Norris Comprehensive Cancer Center maintains a microchemical core facility that includes capabilities for gas phase protein sequencing, amino acid analysis, peptide synthesis, DNA synthesis and sequencing. The Institute for Genetic Medicine maintains a customized microarray core facility. Other facilities available to support the research of members of the department include mass spectroscopy, transgenic mice, flow-cytometry, biostatistics, microchemical resource for DNA, and protein sequencing and synthesis core facilities.

The primary offices and laboratories of the department are located on the Health Sciences Campus.

## Graduate Programs

### Admissions

The prerequisite for applicants to the graduate program in biochemistry and molecular biology is a bachelor's degree with an undergraduate major in one of the natural sciences. Undergraduate course work should have included organic chemistry, the physics and mathematics required of a chemistry major and some courses in the biological sciences. A course in general biochemistry is also required, but may be taken during the period of graduate study. Previous course work in physical chemistry is strongly recommended. A minimum GPA of 3.0 in the natural sciences (including mathematics) is normally required.

Applicants must pass satisfactorily the general portions of the Graduate Record Examinations. In addition, the department requires at least three letters of recommendation from faculty members who can evaluate the applicant's potential for graduate work and independent research.

Faculty members of the Department of Biochemistry and Molecular Biology participate in a variety of interdisciplinary Ph.D. programs. Students interested in pursuing a Ph.D. degree in the fields related to biochemistry, molecular and cellular biology, and genetics should apply to USC's Programs in Biomedical and Biological Sciences (PIBBS). Applications for the Ph.D. Programs in Biomedical and Biological Sciences should be submitted online through the PIBBS Website ([usc.edu/pibbs](http://usc.edu/pibbs)).

Applications should be submitted before the application due date specified on the PIBBS Website. Applications for the M.S. program in biochemistry and molecular biology can be obtained from the department at the address listed below. In addition to the university application, a supplemental departmental application must be completed and returned with transcripts, GRE scores and letters of recommendation to: Graduate Admissions Committee, Department of Biochemistry and Molecular Biology, 1333 San Pablo Street, Los Angeles, CA 90089-9151.

### Fellowships

Students admitted to PIBBS are awarded fellowships which pay for tuition and provide a stipend. No fellowships are available for master's degree students.

### Master of Science

The Department of Biochemistry and Molecular Biology offers a program for the Master of Science degree. The primary objectives of this program are to provide the necessary theoretical preparation for biochemical careers

and to expose students to biochemistry and molecular biology related research activities culminating with the Master of Science degree. Goals of the program are to train students in preparation for (1) further doctoral study, (2) advanced biochemical research positions in industry and academia and (3) teaching positions at the community college level.

In general, admission requirements are the same as for the Doctor of Philosophy degree. The prerequisite for applicants to the graduate program in biochemistry is a bachelor's degree with an undergraduate major in one of the natural sciences. A minimum GPA of 3.0 in the natural sciences (including mathematics) is normally required. Applicants must satisfactorily pass the general and advanced (chemistry, or biology or molecular biology) portions of the Graduate Record Examinations. In addition, the department requires at least three letters of recommendation from faculty members who can evaluate the applicant's potential for graduate work and independent research. Demonstrated proficiency in the English language is required. Special circumstances may provide consideration for conditional admission.

The master's degree in biochemistry and molecular biology requires 34 units of elective graduate study to be determined by the student's advisory committee. Fourteen or more course units must be taken in biochemistry and molecular biology; eight units may be pursued outside the department. Students interested in the commercial aspects of biotechnology may take courses focusing on business entrepreneurship, finance, management and marketing in the USC Marshall School of Business. Master's students have the option of completing a research thesis allowing state-of-the-art laboratory-based investigation or a non-research-based theoretical thesis. Upon approval, a maximum of 10 units of directed research in biochemistry will be applied to the degree. Up to six units of graduate course work taken outside of USC may be applied toward the M.S. degree. Flexibility exists to plan each student's program to suit individual needs, ambitions and background.

### Master of Science, Molecular Epidemiology

A joint program with the Department of Preventive Medicine offers an M.S. degree in Molecular Epidemiology that requires 37 units of graduate study (see the program page for course requirements). Students must also complete a master's thesis. Students can register for up to 10 units of master's research units. Interested students should contact the Department of Preventive Medicine.

### Ph.D. in Molecular Epidemiology

Faculty members in the Department of Biochemistry and Molecular Biology participate in the Molecular Epidemiology Ph.D. program. For admission information and degree requirements, see the Department of Preventive Medicine.

## Courses of Instruction

### Biochemistry (BIOC)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**BIOC 501 Recent Advances in Biochemistry (2-4, max 16, Fa)** Lectures on areas of intermediary metabolism and the chemistry of natural products. *Prerequisite: BISC 435, CHEM 430ab.*

**BIOC 502 Biochemistry Seminar (1, max 12, FaSp)** Formal presentations and discussion by students of material from research literature.

**BIOC 504 Molecular Biology of Cancer (4, Sp)** (Enroll in INTD 504)

**BIOC 510 Introductory Molecular Biology (2, Sp)** Principles of molecular biology with applications to the medical sciences. Nucleic acid structure, function, and analysis. *Recommended preparation:* a course in biochemistry.

**BIOC 512 Molecular Basis of Cell Proliferation and Differentiation (2, Irregular)** An advanced seminar course in molecular cell biology, discussing current literature with significant impact on the understanding of the cell cycle and differentiation of various cell types. *Recommended preparation:* *basic cell biology and molecular biology.* (Frenkel)

**BIOC 522 Applications of Physical Methods in Biochemistry (2, FaSp)** Applications of physical analytical methods commonly utilized in research in biochemistry and molecular biology. *Concurrent enrollment:* CHEM 521. (Langen)

**BIOC 531 Cell Biology (4)** (Enroll in INTD 531)

**BIOC 536 Molecular Biology of Cellular Communication in the Nervous System (2, Sp)** Discussion of cellular communications in the nervous system through neurotransmitters and their receptors, neuromodulators; biochemical changes during development and the impact of human genomic research. *Recommended preparation:* one year of general biochemistry or molecular biology. (Tokes)

**BIOC 542 Cellular and Molecular Basis of Animal Development (4, Fa)** Processes of cell type specification, determination, and morphogenesis in metazoans from vertebrates to insects. Genetic, paragenetic and molecular biological approaches to developmental processes. *Prerequisite:* INTD 571. (Maxson)

**BIOC 543 Human Molecular Genetics (4, Fa)** Comprehensive course covering basic principles of human genetics, genetic disease, the Human Genome Project, and gene therapy. *Recommended preparation:* undergraduate genetics. (Allayee)

**BIOC 549 Protein Chemistry - Structure and Function (4, FaSpSm)** (Enroll in INTD 549)

**BIOC 551 Prokaryotic Molecular Genetics (4, Fa)** (Enroll in MICB 551)

**BIOC 555 Biochemical and Molecular Bases of Disease (4)** (Enroll in INTD 555)

**BIOC 561 Molecular Biology (4, Fa)** (Enroll in INTD 561)

**BIOC 571 Biochemistry (4, Fa)** (Enroll in INTD 571)

**BIOC 573 Optimal Research Presentations by Ph.D. Students (1, max 12, FaSp)** Students will attend lectures by peers, and after their first year in the Ph.D. program, prepare and present their own research to an audience of faculty and peers. Open to Ph.D. students in Genetic, Molecular and Cellular Biology Program (GMCB), Biochemistry and Molecular Biology and Molecular Epidemiology only. Graded CR/NC. (Hong)

**BIOC 574 Systems Physiology and Disease II (4, Sp)** (Enroll in INTD 573)

**BIOC 575 Predictive and Prognostic Biomarkers in Cancer Treatment (2)** Exploration of how appropriate biomarkers can predict response to cancer therapy, tumor recurrence after surgery, rapid detection of tumor response and overall prognosis. *Recommended preparation:* INTD 571 and a basic understanding of molecular biology.

**BIOC 590 Directed Research (1-10, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**BIOC 594abz Master's Thesis (2-2-0, FaSpSm)** Credit on acceptance of thesis. Graded IP/CR/NC.

#### **BIOC 599 Special Topics (2-4, max 8)**

**BIOC 601 Molecular Biology of Gene Regulation (2, max 8, FaSp)** Current techniques and systems in molecular biology from an interdisciplinary perspective: microbiological, biochemical, and pharmaceutical.

**BIOC 604 Current Topics in Animal Development (2, Sp)** (Enroll in CNB 604)

**BIOC 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**BIOC 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Department of Cell and Neurobiology

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FAX: (323) 442-2494  
Email: [janet.stoeckert@usc.edu](mailto:janet.stoeckert@usc.edu)

### Faculty

*Professor and Chair:* Mikel H. Snow

*W.M. Keck Provost Professor of Neurogenetics, Neuroscience, Psychiatry, Psychology and Pharmacy:* Pat Levitt, Ph.D.

*Professors:* J. Chen; M. E. Fini; P. Levitt; A. McDonough; T.H. McNeill\*; J.E. Schechter\*; M. Snow; R. I. Wood\*; S.Y. Ying

*Associate Professors:* G.H. Albrecht\*; K. Eagleson; J.A. Garner\*; R. Gopalakrishna\*; J.D. Miller; P. Elyse Schauwecker; H. Sucov\*; Q-L Ying

*Assistant Professors:* G. Adams; A. Bonnin; K. Chang; G. Crump; G. Field; M. Habib; F. Mariani; B. Patel; H. Tao; M. Winfield; H. Wu

*Emeritus Professor:* Dwight Warren III

\* *Recipient of university-wide or school teaching award.*

The Department of Cell and Neurobiology provides interdisciplinary training in molecular, cellular and systems biology. Ongoing programs explore basic mechanisms in molecular and cellular neurobiology, neurogenetics, endocrinology, pharmacology, stem cell biology and vertebrate evolution. Disease-oriented research, bridging basic and clinical disciplines, investigates inherited or acquired disorders in vision, stroke, Parkinson's disease, Alzheimer's disease, epilepsy and steroid abuse. The challenge is to weld interdisciplinary activities into a conduit for transferring basic science discoveries into more effective and innovative clinical interventions in the treatment of disease-related disabilities.

The Department of Cell and Neurobiology has 24 primary faculty members.

The graduate program of the Department of Cell and Neurobiology is dedicated to excellence and state-of-the-art training and education in molecular and cellular aspects of normal function and in acquired or genetic disorders that cause human disease. Professional and intellectual development is fostered through a broadly based curriculum from which students can tailor a menu of specialization and by a supportive environment of faculty interactions. Graduate education is designed to prepare the student for a lifetime of learning, exploring the limits of research, teaching and creative activities.

### Cell and Neurobiology Graduate Program

The graduate program offered in cell and neurobiology provides a flexible, individualized course of study directed toward developing independent, resourceful scholars. The major thrust of this program is devoted to students training for the Ph.D. degree but study toward the M.S. degree is also possible.

#### Admissions

##### **Master of Science**

*(No longer accepting applications)*

The prerequisite for applicants to the M.S. graduate program in cell and neurobiology is a bachelor's degree with a science major or equivalent. Applicants should have a superior undergraduate record at an accredited college or university. Additional requirements include three letters of recommendation and satisfactory performance on the general and advanced (biology or chemistry) portions of the Graduate Record Examinations. Students are normally admitted for the academic year beginning in the fall; however admission to the master's program can begin in the spring semester with approval from the Graduate Admission Committee. Application deadline for the following academic year is January 1.

##### **Doctor of Philosophy**

*(No longer accepting applications)*

Doctoral candidates interested in working with CNB faculty in the areas of neural, computational, cognitive and behavioral science should apply through either of the two university wide interdisciplinary graduate programs at USC: the Neuroscience Graduate Program or the Program in Biomedical and Biological Science (PIBBS). Applicants interested in working with CNB faculty as part of the M.D./Ph.D. program should apply directly to the Keck School of Medicine.

#### Application deadlines:

- M.D./Ph.D. program — American Medical College Application Service (AMCAS) — November 1; Supplemental — December 1
- Neuroscience Graduate Program — January 15 (see the Graduate School section for Ph.D. student funding deadline information)
- PIBBS — December 1

#### Master of Science

The Master of Science degree is awarded for demonstrated competence in the cell biological sciences, broadly defined. Two options are available: (1) a non-thesis M.S. program based entirely on course work followed by a comprehensive examination; and (2) a thesis M.S. program that includes fewer courses but requires a written thesis based on original laboratory research. Students take courses both from the Department of Cell and Neurobiology and other departments to obtain a broad appreciation of structure and function. Students must maintain a minimum GPA of 3.0. The Master of Science candidate may engage in teaching if this is beneficial to the individual program.

Students in the non-thesis program must complete a minimum of 34 units of graduate level courses (500 or higher) beyond the baccalaureate degree.

Non-thesis students must take 16 units from the following list of courses: BISC 421, BME 552, BME 575L, BME 670, BME 671, CNB 501ab, CNB 511abL, CNB 512L, CNB 513, CNB 521, CNB 525, CNB 534, CNB 631, INTD 504, INTD 531, INTD 555, INTD 561, INTD 571, INTD 572, INTD 573, MICB 551, NSCI 524. All students must pass additional courses totaling 18 units. All course work must be approved by the student's graduate adviser and the chair of the graduate program.

Students in the thesis program must complete a minimum of 38 units of graduate level courses (500 or higher) beyond the baccalaureate degree.

The regulations for thesis students are the same as specified above, except the student is required to take only 12 units from the course list and an additional 16 units from other departmental or non-departmental courses. Students will also take 6 units of CNB 590. The thesis M.S. student is required to take at least 4 units of Master's Thesis (CNB 594). All course work must be approved by the student's graduate adviser and the chair of the graduate program.

#### Doctor of Philosophy

The Ph.D. student develops background knowledge in cellular, molecular and structural biological sciences. The objective of the Ph.D. program is rigorous, original research experience obtained by design and execution of a dissertation project. Active research areas for which guidance is available include cell and molecular biology, neurobiology of circadian rhythms, visual neuroscience, neuropharmacology, neurodegenerative and neurogenetic diseases, developmental and cellular neuroscience, neuroendocrinology, reproductive endocrinology and evolutionary biology.

#### Research Tool-Statistics

Each student must demonstrate competence in statistics. The student must demonstrate competence in the theory and use of statistics including knowledge of regression, correlation and analysis of variance. A student who has prior experience in statistics should consult the faculty adviser and petition the Graduate Advisory Committee to waive the research tool requirement. This requirement may be fulfilled by obtaining a grade of B (3.0) or higher in specified courses. This requirement must be fulfilled before the qualifying examination.

#### Course Requirements

A minimum of 60 units of course credit is required for the Ph.D. Course requirements vary according to the specific needs of the student. Graduate students must take at least 16 units from the following list of courses: BISC 421, BME 552, BME 575L, BME 670, BME 671, CNB 501ab, CNB 511abL, CNB 512L, CNB 521, CNB 525, CNB 534, CNB 631, INTD 504, INTD 531, INTD 555, INTD 561, INTD 571, INTD 572, INTD 573, MICB 551, NSCI 524. Ph.D. students must take additional classes or research units totaling 44 units from other departmental or non-departmental courses. All course work must be approved by the student's graduate adviser and the chair of the graduate program.

Prior to the qualifying examination, each student must complete at least three, eight-week periods of introductory research in the laboratories of departmental faculty. The purpose of the laboratory rotations is to encourage one-on-one interactions between new students and departmental faculty while at the same time providing an introduction to research in a sampling of departmental laboratories.

Course work outside of the departmental offerings is often encouraged and may be required by the student's qualifying exam committee. In most instances, a program will include extra departmental courses such as physiology, biochemistry and molecular biology. A grade point average of a least 3.0 (A = 4.0) must be maintained in both departmental and overall course work.

#### Communication Skills Requirement

The department considers teaching experience to be an important part of graduate education. Students in the Ph.D. program are required to serve a teaching practicum during at least one semester of their graduate training.

#### Screening Procedure

The graduate affairs committee conducts a screening for each student at the end of one full year in the program. The committee reviews thoroughly all facets of the student's performance in the graduate program. The student's progress must be judged satisfactory before a qualifying exam committee can be nominated.

#### Qualifying Exam Committee

Students are expected to select a general area of research interest and a dissertation adviser as soon as possible but no later than 18 months after entering the graduate program in this department. The dissertation adviser and the graduate affairs committee consult with the student to select a qualifying exam committee. After the student has successfully completed the first-year screening, the qualifying exam committee's nomination is forwarded to the Graduate School.

#### Qualifying Examination

Before the end of their fifth semester of graduate standing, students in the Ph.D. program must pass both the written and oral portions of a qualifying examination. The examination is intended to reveal the student's insight and understanding of general concepts and the ability to design and defend a dissertation research project. The examination is designed and administered by the student's qualifying exam committee.

#### Dissertation and Oral Defense

After the student has passed the qualifying examination, a dissertation committee (commonly comprising the former qualifying exam committee) is appointed to advise the student regarding the research project and to supervise writing of the dissertation. The dissertation must be an original contribution giving evidence of the student's ability to perform independent and innovative research. The final oral defense shall be open to the public and the dissertation adviser will entertain questions from the dissertation committee and assembled audience.

## Courses of Instruction

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

### Cell and Neurobiology (CNB)

**CNB 501ab Gross Human Anatomy (3-4, FaSp) A** complete dissection of the adult human body. Supplementary lectures and demonstrations. Emphasis on correlating development, structure and function.

**CNB 511abL Microscopic Anatomy (3-3, FaSp)** Lectures and laboratory in microscopic anatomy emphasizing embryonic origin of the basic body plan,

cells, tissues, and organs; ultrastructural and functional correlations.

**CNB 512L Pharmacology I (5, Fa)** Actions, chemical properties, bodily distribution, and toxicology of drugs. Laboratory. (Duplicates credit in former PHNU 510L.)

**CNB 513 Pharmacology II (3, Sp)** Continuation of 512L. (Duplicates credit in former PHNU 511L.) *Prerequisite:* CNB 512L.

**CNB 521 Neuroanatomy (3, Sp)** Structure and function of the human nervous system with emphasis on central conduction pathways, especially those of clinical significance.

**CNB 525 Neural Development (3, Fa)** Cellular, molecular, and physiological features of development and plasticity in the nervous system. Lecture and student presentations and discussion of classic and current research literature. *Prerequisite:* BISC 524; *recommended preparation:* background in neurosciences.

**CNB 530 Anatomy for the Artist (1-2, Irregular)** This course includes lectures and demonstrations of human anatomy specifically for the artist, and art instruction on drawing the human figure.

**CNB 531 Cell Biology (4, Fa)** (Enroll in INTD 531)

**CNB 534 Molecular Aspects of Neuropharmacology (2, FaSp)** Current advances in selected areas of molecular neuropharmacology, e.g., mechanisms by which drugs affect neurotransmitter systems, neural plasticity, treatment of neurological and psychiatric diseases.

**CNB 550 Cell and Neurobiology Seminar (1, max 6, FaSp)** Reports and discussion on recent advances in anatomy. Graded CR/NC. (Duplicates credit in former ANCB 550.)

**CNB 561 Molecular Biology (4, Fa)** (Enroll in INTD 561)

**CNB 571 Biochemistry (4, Fa)** (Enroll in INTD 571)

**CNB 572 Systems Physiology and Disease I (4, Fa)** (Enroll in INTD 572)

**CNB 573 Systems Physiology and Disease II (4, Sp)** (Enroll in INTD 573)

**CNB 590 Directed Research (1-12, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**CNB 594abz Master's Thesis (2-2-0, FaSpSm)** Credit on acceptance of thesis. Graded IP/CR/NC.

**CNB 598 Introductory Laboratory Rotations (1-3, FaSp)** Introductory laboratory rotations wherein students are directed in individualized research, reading and discussion to provide perspective and supplemental background in areas of faculty research interests.

**CNB 599 Special Topics (2-4, max 8, FaSp)** Special topics provides background for instruction and research in the Department of Cell and Neurobiology through lectures, discussions, assigned readings, and student presentations. (Duplicates credit in former ANCB 599 and PHNU 599.)

**CNB 600 Literature Tutorial (1, max 3, FaSp)** Individualized readings and discussions culminating in a literature-review paper; to promote the acquisition of critical thinking skills in the evaluation of scientific problems. *Recommended preparation:* background in biological sciences.

**CNB 603 Current Topics in Vision Research (2, Sp)** Basic science (e.g., anatomy, cell biology, electrophysiology) and clinical aspects of the eye: cornea,

lens, retina, and optic nerve. USC faculty and authorities from other institutions will lecture.

**CNB 604 Current Topics in Animal Development (2, 2 years, Sp)** Current research in selected aspects of mammalian and nonmammalian developmental biology, including the molecular genetics and molecular biology of organogenesis, morphogenesis, lineage specification, and differentiation. *Prerequisite:* INTD 561 and CNB 542.

**CNB 631 Morphogenesis and Regeneration (2, 2 years, Sp)** Analysis of developing and regenerating systems: historical and recent interpretations of morphogenetic movements, tissue interactions, fields, gradients, differentiation, and determination.

**CNB 641 Brain-Endocrine Interactions in Reproduction (2, 2 years, Fa)** Past and current experimental approaches to morphology and endocrinology at hypothalamic, pituitary, and gonadal levels in both males and females. *Prerequisite:* CNB 511abL or a general endocrinology course.

**CNB 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**CNB 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Department of Family Medicine

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*Program Director:* Kevin Loheny, Ph.D., PA-C

*Medical Directors:* Ignacio DeArtola, M.D.; Raymond Waliany, M.D.

### Faculty

*Professor of Clinical Family Medicine:* D. Lie, M.Ed., M.D.

*Assistant Professors of Clinical Family Medicine:* I. DeArtola, M.D.; C. Forest, MSHS, PA-C; L. Landry-Taylor, M.A., P.A.; K. Loheny, Ph.D., PA-C; J. Mabee, Ph.D., PA-C; A. Vallejo, Ph.D.; R. Waliany, M.D.

*Instructors of Clinical Family Medicine:* M. D'Aquila, PA-C; M. Maldonado, MPH, PA-C; D. Mayo, MPAS, P.A.; J. Tramel, MS-HPE, PA-C; A. Walsh, MMSc, PA-C; J. Wegler, MMS, PA-C

The faculty listed above are faculty with the Primary Care Physician Assistant Program.

The Primary Care Physician Assistant Program prepares students to practice medicine under the supervision of a physician. Students earn a Master of Physician Assistant Practice (MPAP) degree upon completion of the program.

The MPAP degree program offered by the Division of Physician Assistant Studies is part of the Department of Family Medicine. Preclinical instruction is provided by physician assistant program faculty and faculty from other departments within the Keck School of Medicine, the USC School of Pharmacy, other divisions within the Health Sciences Campus, as well as clinicians from the surrounding communities. Emphasis is placed on primary

care medicine and caring for medically underserved populations. Clinical training occurs at various clinical sites throughout the greater Los Angeles region, including the Los Angeles County+USC Medical Center, Arrowhead Regional Medical Center, Long Beach Memorial Family Practice Residency, private offices and managed-care settings, community-based clinics, VA facilities and specialty settings. Opportunities to train in selected off-site settings serving Native American populations in the Southwest are also available to students upon approval.

Students complete eight, six-week clinical clerkships in emergency medicine, family medicine, internal medicine/geriatrics, orthopedics/occupational medicine, pediatrics, general surgery and women's health. These clerkships emphasize the development of necessary clinical skills as well as learning how to work as part of a health care team. The Primary Care Physician Assistant Program is committed to recruiting diverse applicants and preparing graduates to practice in medically underserved communities.

The USC Primary Care Physician Assistant Program is accredited by the Accreditation Review Committee on Education for the Physician Assistant (ARC-PA), which is sponsored by seven national medical associations including the American Medical Association. The program is approved by the Physician Assistant Committee (PAC) of the Medical Board of California. Graduates must pass the National Commission on Certification of Physician Assistants (NCCPA) Physician Assistant National Certifying Exam to qualify for licensure throughout the United States.

## Master of Physician Assistant Practice

### Admission Requirements and Procedures

Application to the Physician Assistant Program requires completion of a bachelor's degree (in any discipline) from a regionally accredited four-year institution and completion of academic prerequisite requirements.

Admission to the program is for the fall semester only. Admission is granted by the physician assistant admissions committee after careful review of all applications. Selections are made on the basis of a formal interview (for competitive applicants) and consideration of a variety of factors which include: academic record, type and amount of clinical experience, multicultural sensitivity, community service experience and professional experience.

Applicants are required to submit an application through the Central Application Service for Physician Assistants (CASPA) as well as a USC Supplemental Application by November 1 of each year. Further details regarding admission procedures including those for international student applicants are provided online at [usc.edu/pa](http://usc.edu/pa).

### Transfer Students or Advanced Placement

The Physician Assistant Program does not accept transfer students, nor do we allow advanced placement based on prior education or clinical experience. Each applicant who is admitted is required to complete the full Master of Physician Assistant Practice curriculum in residence at USC. No waivers or substitutions are permitted.

### Registration

Students receive information regarding registration procedures during an orientation program held the week before classes begin.

### Advisement

Information sessions are available for prospective students who would like to receive more information regarding the program. Applicants are encouraged to attend one of the program's information sessions where PA faculty and staff describe the program, the application process and answer general questions. Information sessions are held on the Alhambra Campus, Building A11. Contact the PA Program for further details and RSVP at [uscpa@usc.edu](mailto:uscpa@usc.edu) or call (626) 457-4240. The information session schedule may be viewed at [usc.edu/pa](http://usc.edu/pa).

### Degree Prerequisites

A bachelor's degree from a regionally accredited institution and completion of all prerequisite course work are required for admission to the Physician Assistant Program.

### Science Prerequisites

A one-year general biology sequence with lab and a one-year general chemistry sequence with lab, each course designed for science majors. All science prerequisites must be completed within 10 years of application to the program.

Three semester units or 4 quarter units of each of the following: human anatomy with lab; human physiology with lab; and microbiology with lab.

Distance learning courses are acceptable provided they are equivalent in all dimensions (including laboratory requirements) to courses taught in "traditional" educational settings (e.g., hybrid courses). All distance learning course credit must be provided by regionally accredited institutions of higher education.

Online science courses are not eligible for consideration as a prerequisite.

Students are expected to have a strong competency in medical terminology.

All science prerequisites should be completed within 10 years of application to the program. Exceptions to the 10-year science prerequisite time frame may be granted on an individual basis to those individuals who have completed one of the following: 1) at least 8 semester units of graduate credit in a medically related natural science discipline with an overall grade point average of 3.0 or better, completed within seven years of the application deadline, or 2) received an advanced degree in the natural or clinical sciences (e.g., M.S., DVM, Pharm.D., Ph.D., M.D.) within 10 years of the application deadline. In either case, all course work completed and degrees conferred must be from institutions of higher education accredited by an accrediting agency recognized by the Secretary of the U.S. Department of Education. Requests for this 10-year exemption should be directed to the chair of Admissions.

### Non-science Prerequisites

Three semester units or 4 quarter units of each of the following: general psychology and statistics.

Two semesters of beginning college level Spanish language earned through course work or by placement examination. There are no language substitutions or waivers.

Two semester units or three quarter units of English composition are required for international applicants only. AP course work is acceptable.

Students who intend to apply to the Physician Assistant Program should contact the admission office for

evaluation of previous baccalaureate and/or post-baccalaureate course work.

### Standardized Tests

Applicants are required to take either the GRE or MCAT examination. The examination must be taken within five years of the application deadline of November 1. Official scores of the general and analytical sections of the GRE must be submitted to USC by using the Institutional Code 4852 (departmental code is not necessary). Applicants with MCAT scores must provide their AAMC verification code to the USC PA Program. GRE or MCAT scores must be submitted by November 1. The PA Program expects that all applicants earn a combined quantitative and verbal GRE score of no less than 1,000 (on the older version of the exam) and 295 (on the newer version of the exam).

### Clinical Experience Prerequisite

"Hands-on" patient care experience is preferred. Most successful applicants typically have 2,000 hours or more of paid clinical hours and have worked as one of the following: emergency medical technician, licensed vocational nurse, medical assistant, medical scribe, medical technologist, military medical corpsman, paramedic, psychiatric technician, physical therapy aide, radiological technician, respiratory therapist or registered nurse. Other health care experience is equally acceptable as long as the experience is "hands-on" in nature.

### Physician Assistant Shadowing Experience

Shadowing a physician assistant in a clinical setting is expected. This activity provides the applicant with the up-close experience needed to understand the role and responsibilities of the PA and may help the applicant make a better informed decision in choosing a career as a physician assistant.

### Community Service Prerequisite

Community service activities/projects are expected of all applicants. Service which benefits medically underserved or disadvantaged populations is preferred.

### Curriculum Requirements

The completion of the 33-month professional curriculum is required to earn the Master of Physician Assistant Practice degree. Students do not have choices of courses to take nor are they permitted to drop any course or courses during the semester. Progress is permitted only when the prior semester is successfully completed. Students should view the curriculum outlined here as advisory only and subject to modification.

### Summative Evaluation

A summative evaluation is conducted on each student during the sixth and final semester of the program to verify that each student is prepared to enter clinical practice.

### Health Requirements and Technical Standards

All accepted candidates are required to meet the PA program's technical standards (physical and psychological competencies of performance) prior to entering the program and throughout training. Upon acceptance, students will be required to submit and maintain evidence of current health status and immunizations. Specific details outlining these technical standards are located at [usc.edu/pa](http://usc.edu/pa).

### Background Check

All USC Physician Assistant students are required to pass a background check upon admission to the Master of Physician Assistant Practice (MPAP) Program.

### Degree Requirements

All students in the Master of Physician Assistant Practice degree program must meet course and grade point average requirements. All course requirements must be completed with a grade of "B" or better. The degree will not be conferred until the student has successfully completed all degree requirements. Students are subject to the degree requirements in the catalogue current for the semester of their admission into the program.

Physician assistant students are enrolled in a standard curriculum during their 33 months in the program. The following courses must be successfully completed in order to earn the Master of Physician Assistant Practice degree. Only physician assistant students may enroll in these courses. Departmental clearance is required to enroll.

Year I, Fall Semester		Units
PCPA 503	Behavioral Sciences I	4
PCPA 523	Clinical Skills I	4
PCPA 530	Basic Medical Sciences	6
PCPA 543	Topics in Medicine I	4
		18

Year I, Spring Semester		Units
PCPA 506	Behavioral Sciences II	4
PCPA 526	Clinical Skills II	6
PCPA 546	Topics in Medicine II	6
		16

Year II, Fall Semester		Units
PCPA 509	Behavioral Sciences III	4
PCPA 529	Clinical Skills III	6
PCPA 549	Topics in Medicine III	6
		16

Year II, Spring Semester		Units
PCPA 561	Clinical Assignment I	3.5
PCPA 562	Clinical Assignment II	3.5
PCPA 564a	Clinical Assignment IV	3.5
PCPA 565a	Clinical Assignment V	3.5
		14

Year II, Summer Session		Units
PCPA 564b	Clinical Assignment IV	0
PCPA 565b	Clinical Assignment V	0

Year III, Fall Semester		Units
PCPA 563	Clinical Assignment III	3.5
PCPA 566	Clinical Assignment VI	3.5
PCPA 567	Clinical Assignment VII	3.5
PCPA 568	Clinical Assignment VIII	3.5
		14

Year III, Spring Semester		Units
PCPA 532	Clinical Skills IV	3
PCPA 583	Advanced Topics in PA Studies: Education	4
PCPA 586	Advanced Topics in PA Studies: Research	4
PCPA 589	Advanced Topics in PA Studies: Medical Care Organization	4
		15

Requests for further information may be addressed to: Primary Care Physician Assistant Program at USC, 1000 South Fremont Avenue, Unit 7, Building A11, Room 11-150,

Alhambra, CA 91803, or via email at [uscpa@usc.edu](mailto:uscpa@usc.edu). The program's Website is [usc.edu/pa](http://usc.edu/pa).

## Courses of Instruction

### Primary Care Physician Assistant (PCPA)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**PCPA 503 Behavioral Sciences I (4, Fa)** First of three-semester sequence in current topics in behavioral medicine, psychological and cultural factors in health and illness, interpersonal and sociological aspects of patient care, and competencies for PA practice. Open to physician assistant practice majors only.

**PCPA 506 Behavioral Sciences II (4, Sp)** Second of three-semester sequence in current topics in behavioral medicine, psychological and cultural factors in health and illness, interpersonal and sociological aspects of patient care, and competencies for PA practice. Open to physician assistant practice majors only. *Prerequisite:* PCPA 503.

**PCPA 509 Behavioral Sciences III (4, Fa)** Last of three-semester sequence in current topics in behavioral medicine, psychological and cultural factors in health and illness, interpersonal and sociological aspects of patient care, and competencies for PA practice. Open to physician assistant practice majors only. *Prerequisite:* PCPA 506.

**PCPA 523 Clinical Skills I (4, Fa)** Laboratory experiences with basic clinical skills essential to medical practice. First of four courses. Open to physician assistant practice majors only.

**PCPA 526 Clinical Skills II (6, Sp)** Laboratory experiences with basic clinical skills essential to medical practice. Second of four courses. Open to physician assistant practice majors only. *Prerequisite:* PCPA 523.

**PCPA 529 Clinical Skills III (6, Fa)** Laboratory experiences with basic clinical skills essential to medical practice. Third of four courses. Open to physician assistant practice majors only. *Prerequisite:* PCPA 526.

**PCPA 530 Basic Medical Sciences (6, Fa)** A one-semester overview of clinical anatomy, physiology, pathophysiology, and pathology essential to understanding disease mechanisms commonly encountered in primary care and specialty practices of medicine. Open to physician assistant practice majors only.

**PCPA 532 Clinical Skills IV (3, SpSm)** Laboratory experiences with basic clinical skills essential to medical practice. Last of four courses. Open to physician assistant practice majors only. *Prerequisite:* PCPA 529.

**PCPA 543 Topics in Medicine I (4, Fa)** Basic instruction in normal/abnormal states of organ systems in the study of human disease. The first of three courses that includes instruction in pathophysiology, pharmacology, diagnostic studies, and medicine. Open to physician assistant practice majors only.

**PCPA 546 Topics in Medicine II (6, Sp)** Basic instruction in normal/abnormal states of organ systems in the study of human disease. The second of three courses that includes instruction in pathophysiology, pharmacology, diagnostic studies, and medicine. Open to physician assistant practice majors only. *Prerequisite:* PCPA 543.

**PCPA 549 Topics in Medicine III (6, Fa)** Basic instruction in normal/abnormal states of organ systems in the study of human disease. The third of three courses

that includes instruction in pathophysiology, pharmacology, diagnostic studies, and medicine. Open to physician assistant practice majors only. *Prerequisite:* PCPA 546.

**PCPA 561 Clinical Assignment I (3.5, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 562 Clinical Assignment II (3.5, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 563 Clinical Assignment III (3.5, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 564ab Clinical Assignment IV (a: 3.5; b: 0, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 565ab Clinical Assignment V (a: 3.5; b: 0, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 566 Clinical Assignment VI (3.5, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 567 Clinical Assignment VII (3.5, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 568 Clinical Assignment VIII (3.5, FaSpSm)** One discrete consecutive five-day-a-week intensive field placement under a program-approved supervising preceptor in a program-approved clinical setting. Graded CR/NC.

**PCPA 583 Advanced Topics in PA Studies: Education (4, Sp)** Seminar format: students explore educational theories and methods used by PAs in a variety of settings, including clinical practice, classroom and community. Open to physician assistant practice majors only.

**PCPA 586 Advanced Topics in PA Studies: Research (4, Sp)** Seminar format: students receive an integrated experience in research methods including methodology, data collection, analysis and evaluation. Open to physician assistant practice majors only.

**PCPA 589 Advanced Topics in PA Studies: Medical Care Organization (4, Sp)** Seminar format: students will explore current topics in medical care organization and physician assistant practice including administration, financing, changing organizational settings, and workforce issues. Open to physician assistant practice majors only.

## Department of Molecular Microbiology and Immunology

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[keck.usc.edu/en/Education/Academic\\_Department\\_and\\_Divisions/Department\\_of\\_Molecular\\_Microbiology\\_and\\_Immunology](http://keck.usc.edu/en/Education/Academic_Department_and_Divisions/Department_of_Molecular_Microbiology_and_Immunology)

## Faculty

*Distinguished Professor and Chair:* Jae U. Jung, Ph.D.

*Fletcher Jones Foundation Chair of Molecular Biology and Immunology and Hastings Foundation Professor of Molecular Microbiology and Immunology:* Jae Jung, Ph.D.

*Rita and Edward Polusky Chair in Basic Cancer Research:* Michael Lieber, Ph.D., M.D.

*Walter A. Richter Chair in Cancer Research:* W. Martin Kast, Ph.D.

*Leslie P. Weiner Professor of Neurology and Richard Angus Grant, Sr., Chair in Neurology:* Leslie P. Weiner, M.D.

*Chair, Graduate Advisory Committee:* Stanley M. Tahara, Associate Professor

*Professors:* S. Chen; G. Coetzee (*Urology*); L. Comai; S.J. Gao; D.A. Horwitz (*Medicine*); M. Lieber (*Pathology, Biochemistry and Molecular Biology*); W.M. Kast; M. McMillan; J.-H. Ou; P. K. Pattengale (*Pathology*); L.P. Weiner (*Neurology*)

*Associate Professors:* Omid Akbari; E. Bogenmann (*Pediatrics*); P. Cannon; R. Duncan (*Pharmacy*); P. Feng; H.K.W. Fong (*Ophthalmology*); C. Hill (*Radiation Oncology*); A. Jong (*Pediatrics*); J.R. Landolph; H. Lee; A. Schönthal; S. Tahara; E. Zandi

*Assistant Professors:* R.W. DePaolo; X.F. Huang; C. Liang; K. Machida; T. Saito (GI Liver-Medicine); W. Yuan

*Associate Professor of Research:* S.Y. Park

*Assistant Professors of Research:* H. Lee; Z. Toth

*Emeritus Professors:* F. Aladjem; M. Lieb; G. Dennert

*Clinical Assistant Professor:* Jie Li

*Distinguished Professor, Emeritus:* Michael M.C. Lai

The Department of Molecular Microbiology and Immunology is located on the Health Sciences Campus in the Elaine Stevely Hoffman Medical Research Center, in the USC Norris Comprehensive Cancer Center and at the USC Institute for Genetic Medicine. Faculty guidance and specialized facilities are available for advanced research in animal virology, eucaryotic cell biology and cellular differentiation, molecular and cellular immunology, genetic diseases, microbial and molecular genetics, regulation of gene expression, and chemical and viral carcinogenesis.

## Graduate Programs

### Admissions

An applicant to the graduate programs in molecular microbiology and immunology must have a bachelor's degree from an accredited college or university with a major in science – usually biology, chemistry or physics. The applicant must have demonstrated strength in science or mathematics. Undergraduate course work should have included at least one year of biology, chemistry through organic chemistry, mathematics through calculus, physics and physical chemistry. Deficiencies may be made up early in the predoctoral program.

The department encourages applicants to contact its office prior to making formal application. Each applicant must pass satisfactorily the general and advanced (biochemistry, cell and molecular biology or biology,

chemistry or physics) portions of the Graduate Record Examinations, and must also arrange for three letters of recommendation to be written. In addition, the applicant must provide a one-page statement of career objectives, including the general area of research interest. This statement is intended to facilitate selection of those students who will most benefit from the department's graduate program. A personal interview is strongly recommended but not required.

Applicants who have attended graduate school at another university may be admitted to advanced standing upon recommendation of the department.

### Training Grants and Fellowships

Incoming domestic students may be supported by a departmental training grant or by a research grant to a specific faculty mentor during their first year; subsequently, students are supported by research grants awarded to individual faculty members. International students are supported by research assistantships.

### Master of Science

The primary objective of the Master of Science program is to prepare students for a career in the broad field of biomedical sciences with focus on, but not limited to, microbiology, virology, immunology and cancer research. This program provides extensive theoretical preparation in combination with hands-on research, where students are trained in research laboratories located on the Health Sciences Campus (HSC), comprising the Keck Medical School, the School of Pharmacy and the USC Norris Comprehensive Cancer Center, or located at Children's Hospital Los Angeles (CHLA).

Goals of the program are to prepare students for employment opportunities in: academic research or teaching at universities, institutes or not-for-profit research centers; research and development in industry (biotech, pharma, petrol, dairies, breweries); health care (hospitals and health care providers, medical technology, diagnostic laboratories); law firms (patents, intellectual property rights, technology transfer, toxic torts); environmental organizations (advisory, management, planning); government (public health, waste management, EPA, FDA, NIH, etc.); publishing (journalism, journal editor).

**Admission Requirements** Applicants are expected to have a bachelor's degree in science (usually biology, chemistry or physics) from an accredited college or university. Generally required courses include: at least one year of college-level biology, chemistry through organic chemistry, mathematics through calculus, and one year of college-level physics. Students who do not meet all requirements may still apply, and admission will be decided on a case-by-case basis. In general, a minimum undergraduate GPA of 3.0 is expected. Additionally, a student must take the Graduate Record Examinations (GRE), and a minimum score of 1000 is expected. International applicants are expected to provide results from the International English Language Testing System (IELTS) or the Test of English as a Foreign Language (TOEFL; results from Internet-based, computer-based or paper-based tests are acceptable).

**Course Requirements** A total of 34 units is required. Students may pursue a thesis option, which requires completion of MICB 594abz (2-2-0) plus 30 units of approved course work, no more than 8 of which can be MICB 590 Directed Research. Students pursuing a non-thesis option must complete 34 units of approved course work. Students must choose one of these options by the end of the first year of study.

Fourteen or more course units must be taken in the Department of Molecular Microbiology and Immunology; 8 units may be pursued outside the department and, upon

approval, a maximum of 8 units of directed research in molecular microbiology and immunology may be applied to the degree. No more than 4 units of course work taken outside of USC can be applied toward the M.S. degree requirements. Students considering such an action should submit a petition to the department and document a rigorous academic standard for the course (reading materials, tests and other performance criteria, lecture content, etc.). The graduate advisory committee will review the petition and inform the student of its decision.

### Doctor of Philosophy

*(No longer accepting applications)*  
The Department of Molecular Microbiology and Immunology offers a Ph.D. degree program geared toward training students for future independent research careers in an academic or industrial setting. The program introduces students to research early in their first year through rotations in laboratories. Subsequent required course work in basic and advanced topics and an intensive research experience are designed to foster independent and critical thinking.

Students normally select a faculty research adviser for their dissertation by the end of their first year.

**Course Requirements** A minimum of 60 units of graduate study is required for the Ph.D. degree; at least 30 of these must be taken at USC. Because the background of applicants varies widely, the department's graduate advisory committee consults with each student to design an individualized schedule of prescribed courses. In the course of their program, all students are expected to become familiar with the principles of microbiology and general biochemistry and to study advanced biochemistry, microbial physiology and genetics, immunology, virology, molecular biology, and chemical and viral oncology.

**Screening Procedure** Before completing more than six courses (24 units) in regular graduate status, each student is required to pass a written screening examination administered at the end of the first year of graduate study. This examination consists of questions submitted by the faculty and is intended to expose any areas of weakness in the student's abilities. After passing the screening examination, the student is expected to select an area of research and obtain the consent of a member of the department to serve as research adviser.

**Qualifying Exam Committee** The department's graduate advisory committee serves as the advisory committee for all first- and second-year graduate students. To replace the graduate committee, a five-member qualifying exam committee is appointed for each student after the departmental screening examination is passed. The qualifying exam committee is responsible for counseling the student, preparing the student for the qualifying examination, administering the examination, and recommending advancement of the student to candidacy for the Ph.D. degree. The student may recommend a chair for this committee, who must be a departmental faculty member but not the student's Ph.D. adviser. Appointment of the chair is subject to approval of the student's research adviser, the department chair and the graduate advisory committee. Other committee members must include three faculty members from within the department (other than the student's Ph.D. adviser) and one faculty member from another Ph.D. granting department. Members of the committee must be approved by the department chair and the full training committee faculty and are officially appointed by the dean of graduate studies.

**Qualifying Examination** Students in the Ph.D. program must pass both the written and oral portions of the qualifying examination administered by their qualifying exam committee during the second year of graduate study. The examination consists of a research

proposition that must be presented in written form and defended orally. The written proposition is an independent research proposal, outside of the student's immediate area of thesis research and supported by documentary references.

The graduate advisory committee and the qualifying exam committee will instruct the student in how to prepare the proposition in appropriate subdisciplines of microbiology. The final draft of the written proposition must be submitted to the department faculty at least two weeks in advance of the oral examination. The oral examination is open, and all members of the department faculty may participate in questioning the student. The examination will include exploration of the student's written proposition but need not be restricted to it; faculty may also question the student on relevant areas of science covered in course work or in current scientific literature. All portions of the oral examination must be completed at the same time.

Final evaluation of the examination is by vote of the qualifying exam committee alone. If there is more than one dissenting vote from the qualifying exam committee, the student is judged to have failed the examination. At the discretion of the committee, the student may be allowed to repeat the examination once within a period of one year from the date of the original examination but not before six months.

**Annual Research Appraisal (ARA)** Beginning in the second year, each graduate student presents a progress report to his or her research committee. For students not yet appointed to candidacy, their major adviser, one faculty member from within the department and one faculty member from outside the department comprise the committee. Students appointed to candidacy meet with their dissertation committee. Prior to the meeting, the student prepares a short written document describing significant experiments, problems and projected studies. This document is distributed to committee members and is included in the student's file. The ARA meeting is intended to be a working session between the student and his or her committee; experimental results and problems are discussed within this context. In addition the student presents a research plan for the next year of work.

A satisfactory ARA is required of every student for each year in residence.

A final ARA is required before the student is permitted to write the dissertation. The student collects and organizes all experimental data to be written into the dissertation as the final ARA document. This will be considered a preliminary draft of the dissertation. At the conclusion of the final ARA meeting, the dissertation committee will either recommend further experiments or approve the document and give permission for writing the dissertation.

**Advancement to Candidacy** When the student has successfully passed the qualifying examination, the qualifying exam committee recommends the student's advancement to candidacy for the Ph.D. degree. Admission is by action of the dean of graduate studies. At this time the qualifying exam committee also approves the student's dissertation topic.

**Dissertation Committee** After advancement to candidacy and approval of the dissertation topic, and with the unanimous recommendation of the committee to the dean of graduate studies, the qualifying exam committee may be reduced to a three-member dissertation committee. Members of the dissertation committee should include the student's research adviser as chair, another faculty member from the department and one faculty member from outside the department; additional members may be appointed. This committee is responsible for counseling the student during preparation

of the dissertation, and conducting the final oral examination during the dissertation defense.

**Dissertation and Oral Defense** The student's research is reported in a dissertation written under the guidance of the research adviser. The dissertation must demonstrate the student's capacity for independent research, scholarly achievement and technical mastery of a special field. When the final draft of the dissertation is ready, the student will take the final oral examination, which is open to the university community. This examination is a defense of the major research conclusions of the dissertation.

All doctoral candidates must be registered in 794 Doctoral Dissertation each semester (excluding summer sessions) from the time of their advancement to candidacy until their dissertation is approved for final text preparation. Under exceptional circumstances students may be excused from registration for a semester by petitioning the Graduate School for a leave of absence. The granting of a leave does not alter the student's responsibility to meet the time schedule for completion of all degree requirements.

**Time Requirements** It is the policy of the department to encourage students to complete the degree program for the Ph.D. as rapidly as possible. Ph.D. degrees are currently taking an average of four-and-a-half to five years. The university requires that the student complete the degree within six or eight years of the date on which USC graduate work commenced, depending upon whether the student was admitted with a prior applicable master's degree. Extensions may be granted for compelling reasons, but in no case may the time be extended for more than two years.

## Courses of Instruction

### Molecular Microbiology and Immunology (MICB)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**MICB 500L Introductory Medical Microbiology (4, Irregular)** A survey of microorganisms which cause human infectious diseases including mechanisms of pathogenesis, principles of antibiotic usage, pertinent microbial genetics; lectures, laboratories and demonstrations. *Prerequisite:* one year general biology, one semester biochemistry.

**MICB 501 Introduction to Immunology (1, Irregular)** Basic introduction into molecular, cellular, and clinical immunology for second year medical students and graduate students in Microbiology. (Duplicates credit in BISC 450L.)

**MICB 502 Molecular and Cellular Immunology (2, max 8, Fa)** Specific topics to be scheduled on a yearly and rotating basis. *Prerequisite:* MICB 501.

**MICB 503 Current Topics in Immunology (1, max 8, Irregular)** Discussion forum on the diverse areas of research which constitute modern immunology. *Prerequisite:* MICB 501.

**MICB 504 Molecular Biology of Cancer (4, Sp)** (Enroll in INTD 504)

**MICB 522 Infection and Host Responses (4, Sp)** (Enroll in INTD 522)

**MICB 531 Cell Biology (4)** (Enroll in INTD 531)

**MICB 542 Animal Virology (2, max 6, Irregular)** Virus structure and chemistry; virus-cell interactions; aspects of virus genetics; molecular biology; pathogenesis, immunology, and evolution of viral infections.

**MICB 549 Student Seminar Series (1, max 8, FaSp)** Microbiology students will present research seminars describing their thesis progress.

**MICB 550 Microbial Pathogenesis (2, Irregular)** Critical discussion of recent developments in pathogenesis of select microbial, viral and parasitic agents with particular emphasis on molecular factors and their synergistic (antagonistic) actions.

**MICB 551 Prokaryotic Molecular Genetics (4, Sp)** Macromolecular processes and their regulation in prokaryotes; DNA replication, transcription, and post-transcriptional events in general and as related to operons, phage biology, and eucaryotic organelles.

**MICB 560 Recent Advances in Microbiology (1, max 6, Irregular)** Intensive examination of selected topics in microbiology. Student presentations and critiques. Required for all graduate students.

**MICB 561 Molecular Biology (4, Fa)** (Enroll in INTD 561)

**MICB 570 Microbiology Research Seminar (1, max 10, FaSpSm)** Critical discussion of current research topics. Students present published and unpublished research results for discussion and critique. *Prerequisite:* current enrollment in Microbiology Ph.D. program.

**MICB 571 Biochemistry (4, Fa)** (Enroll in INTD 571)

**MICB 572 Systems Physiology and Disease I (4, Fa)** (Enroll in INTD 572)

**MICB 573 Systems Physiology and Disease II (4, Sp)** (Enroll in INTD 573)

**MICB 590 Directed Research (1-12, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**MICB 594abz Master's Thesis (2-2-0, FaSpSm)** Credit on acceptance of thesis. Graded IP/CR/NC.

**MICB 601 Molecular Biology of Gene Regulation (2, max 8, FaSp)** (Enroll in BIOC 601)

**MICB 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**MICB 794abcdz Doctoral Dissertation (2-2-2-0-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Institute for Neuroimaging and Informatics

2001 N. Soto Street  
Suite 102  
Los Angeles, CA 90032  
(323) 44-BRAIN  
FAX: (323) 442-0137  
Email: NIIN@ini.usc.edu

NIIN Core Faculty

*Provost Professor, Director, INI:* Arthur W. Toga, Ph.D.

*Professor:* Paul M. Thompson, Ph.D.



*Associate Professors of Neurology:* Hongwei Dong, Ph.D.; John Darrell Van Horn, Ph.D.

*Assistant Professors of Neurology:* Kristi Clark, Ph.D.; Neda Jahanshad, Ph.D.; Judy Pa, Ph.D.; Yonggang Shi, Ph.D.

*Associate Professor of Research:* Naveen Ashish, Ph.D.

*Assistant Professors of Research:* Meredith Braskie, Ph.D.; Derrek Hibar, Ph.D.; Houri Hintiryan, Ph.D.; Xue Hua, Ph.D.; Andrei Irimia, Ph.D.; Junning Li, Ph.D.; Scott Neu, Ph.D.

## Introduction

The Master of Science (M.S.) in Neuroimaging and Informatics (NIIN) program provides students with an understanding of the scientific and clinical underpinnings of neuroimaging science and how to leverage that knowledge to make new and important discoveries in biomedicine. Students who successfully complete the program will be ideally positioned to apply to formalized medical training programs, join Ph.D. research training programs, obtain laboratory or administrative employment in the growing field of brain imaging neuroscience, or engage in public policy or regulatory administration of academic, clinical or business efforts in this expanding discipline.

The program comprises to courses (eight 3-unit and two 1-unit) to be taken in one academic year. Three didactic lecture courses address the technology of neuroimaging, a detailed examination of brain anatomy and function, and the variety of data-type dependent as well as integrative computational processing approaches. Two laboratory modules (1) provide guided, hands-on experience with neuroimaging data collection approaches for examining anatomy, connectivity, and functional activity; and (2) examine and develop optimized data processing strategies. Finally, studies are enriched by several distinct faculty-guided, discussion-based courses that allow detailed examination of specific aspects of neuroimaging of elemental neurological processes and carefully selected applications in neurological and psychiatric medicine. Graduation requires completion of 26 units.

## Admissions Requirements

Applicants must supply a completed application for graduate studies including: transcripts from all institutions previously attended, standardized test scores, a personal statement describing scientific and career interests, and two letters of recommendation. Applications are generally anticipated for fall enrollment, but applications for spring enrollment will also be considered. Applicants to the program must apply to the USC Graduate School and must meet the minimum requirements for admission to the Graduate School. Students are required to have a 3.0 or better overall GPA (or equivalent) and have achieved graduation with a B.S. or B.A. degree (or equivalent) before matriculation. Students are expected to have taken the general portion of the GRE exam before application and to have met or exceeded university score requirements. Applicants not meeting Graduate School requirements for regular standing may, with the approval of the Graduate School, be conditionally admitted. International students from non-English speaking home countries are expected to demonstrate English language proficiency or take remedial English language courses, according to Graduate School policy. Specific prerequisites for this program include completed course work with a B or better grade (or equivalent) in neuroscience, computer science, mathematics, biology or a related field.

## Advisement

The program recommends that students meet with the program director each semester prior to registration.

## Satisfactory Academic Progress

A graduate GPA of at least 3.0 is required at all times. Any student whose graduate GPA falls below 3.0 will be given written notification that they have been placed on academic probation. Students who do not raise their GPA to 3.0 after two semesters on academic probation will be academically disqualified.

## Degree Requirements

Graduation requires completion of 26 units, according to the required course schedule outlined below. None of the NIIN courses may be waived or substituted for other courses in the USC Catalogue. This program is intended to be completed within one academic year, and, while optional, does not include a requirement for independent laboratory research or a thesis. Students may request approval to undertake laboratory research and continuing course work during a second year research option; students must already be matriculated into the program before making this request, and not all students will be granted this opportunity (selection will be based on academic performance and student research interests, and on availability of laboratory space). None of these courses may be substituted or waived.

REQUIRED COURSES OF INSTRUCTION		Units
<i>Fall</i>		
NIIN 500	Neuroimaging and Systems Neuroscience	3
NIIN 510	Fundamentals of Human Neuroimaging	3
NIIN 520	Experimental Design for Neuroimaging	3
NIIN 530	Neuroimaging Data Acquisition	3
<i>Spring</i>		
NIIN 540	Neuroimaging Data Processing Methods	3
NIIN 550	Computational Modeling in Neuroimaging	3
NIIN 560	Microscopy Techniques and Neuroinformatics in Animal Models	3
NIIN 570	Neuroimaging Genetics and Phenomics	3
<i>Fall or Spring</i>		
NIIN 597	Current Topics in Neuroinformatics	1
NIIN 598	INI External Speaker Seminar Series	1

## Courses of Instruction

### Neuroimaging and Informatics (NIIN)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**NIIN 500 Neuroimaging and Systems Neuroscience (3, Fa)** Overview of elemental neuroanatomy and brain systems with an emphasis on a neuroimaging perspective in the human and mouse. Open only to Neuroimaging and Informatics majors.

**NIIN 510 Fundamentals of Human Neuroimaging (3, Fa)** Survey of anatomical and functional neuroimaging approaches and their use to explore the healthy as well as diseased human brain. Open only to Neuroimaging and Informatics majors.

**NIIN 520 Experimental Design for Neuroimaging (3, Fa)** Examine experimental design approaches for experimental and clinical neuroimaging investigation.

Topics on how to develop rigorous experiments to test theories of cognitive and clinical neuroscience. Open only to Neuroscience and Informatics majors.

**NIIN 530 Neuroimaging Data Acquisition w/ Magnetic Resonance Imaging (3, Fa)** Introduces the various approaches used to image the living brain using MR-based techniques. Covers neuroimaging scanning technologies, pulse sequence design, and sources of image artifact. *Recommended preparation:* familiarity with Matlab. Open only to Neuroscience and Informatics majors.

**NIIN 540 Neuroimaging Data Processing Methods (3, Sp)** Comprehensive investigation of data processing methods, software strategies, and workflow design and execution methodologies. Open only to Neuroimaging and Informatics majors.

**NIIN 550 Computational Modeling in Neuroimaging (3, Sp)** Addresses the current neuroinformatics approaches to large-scale data representations, mining, and visualization in brain imaging. Open only to Neuroimaging and Informatics majors.

**NIIN 560 Microscopy Techniques and Neuroinformatics in Animal Models (3, Sp)** Introduction to methodological approaches to neuroscience: identification of neurochemicals and genetic content in discrete anatomical locations using immunohistochemistry, in situ hybridization, and polymerase chain reaction. Open only to Neuroscience and Informatics majors.

**NIIN 570 Neuroimaging Genetics and Phenomics (3, Sp)** Lectures on the linkage of genomic methods for identifying genes and their allelic variants in the context of demographic, neuropsychological, and clinical variables. Open only to Neuroimaging and Informatics majors.

**NIIN 597 Current Topics in Neuroinformatics (1, FaSp)** Student-led presentations with faculty-guided discussion of recent literature in the subject of neuroimaging and neuroinformatics. Open only to Neuroscience and Informatics majors.

**NIIN 598 INI External Speaker Seminar Series (1, FaSp)** Reading and discussion of recent papers by the INI speaker of the week and attendance at the speaker's seminar. Open only to Neuroimaging and Informatics.

## Department of Pathology

**Hoffman Medical Research Center 204**  
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Los Angeles, CA 90089-9092

*M.S. Student Adviser:* Cheng-Ming Chuong, M.D., Ph.D., (323) 442-1296

*Ph.D. Student Adviser:* Florence M. Hofman, Ph.D., (323) 442-1153

FAX: (323) 442-3049

## Faculty

Michael E. Selsted, M.D., Ph.D., *Professor and Chair*

*Renette and Marshall Ezralow Family Chair in Cancer Therapeutics:* Parkash Gill, M.D.

*Harold E. Lee Chair in Cancer Research:* Michael F. Press, M.D., Ph.D.

*Kenneth T. Norris Jr. Chair in Medicine and Hastings Professor of Medicine:* Edward D. Crandall, M.D., Ph.D.

*Rita and Edward Polusky Chair in Basic Cancer Research:* Michael Lieber, Ph.D., M.D.

*Rupert and Gertrude Stieger Vision Research Chair:* Narsing Rao, M.D.

*Gavin S. Herbert Professor of Vision Research:* David R. Hinton, M.D.

*Professors:* V. Askanas (*Neurology*); T.C. Chen (*Neurological Surgery*); C.-M. Chuong; T.D. Coates (*Pediatrics*); E.D. Crandall (*Medicine*); L. Dubeau; W.K. Engel (*Neurology*); A.L. Epstein; P.S. Gill (*Medicine, Urology*); S. Govindarajan; D. Hinton (*Neurological Surgery, Ophthalmology*); F.M. Hofman (*Ophthalmology, Neurological Surgery*); R.W. Jelliffe (*Medicine*); M.N. Koss; P.R. Levitt (*Pediatrics, Cell & Neurobiology*); M.R. Lieber (*Biochemistry and Molecular Biology, Molecular Microbiology and Immunology*); T.M. Mack (*Family and Preventive Medicine*); C.A. Miller (*Neurology*); A. Ouellette; P.K. Pattengale (*Molecular Microbiology and Immunology*); M.F. Press; F.P. Quismorio, Jr. (*Medicine*); N.A. Rao (*Ophthalmology*); S. Rasheed; M.E. Selsted; D.K. Shibata; I.A. Shulman; M.R. Stallcup (*Biochemistry and Molecular Biology*); C.R. Taylor; T.J. Triche (*Pediatrics*); H. Tsukamoto

*Professor (Clinical Scholar):* M.R.G. O'Gorman (*Pediatrics*)

*Associate Professors:* S. Bellusci (*Surgery*); A. Erdreich-Epstein (*Pediatrics*); B.H. Gross (*Psychiatry and Behavioral Sciences, Medicine*); A. Kovacs (*Pediatrics*); B.W. Kovacs (*Obstetrics and Gynecology*); J.R. Landolph (*Molecular Microbiology and Immunology, Molecular Pharmacology and Toxicology*); H.A. Liebman (*Medicine*); S.E. Martin; S.B. Turkel (*Psychiatry and Behavioral Sciences, Pediatrics*)

*Associate Professor (Clinical Scholar):* A.R. Judkins

*Assistant Professors:* S. Asgharzadeh (*Pediatrics*); E.P. Kartalov; Y.M. Kim (*Pediatrics*); K. Kobieliak; T. Saito; B. Stiles (*Pharmacology and Pharmaceutical Sciences*); D. Tian

*Clinical Professors:* R.D. Aller; C.A. Bell; H.N. Canawati; J.N. Carberry; J. Ciciarelli (*Urology, Surgery*); K.A. Frankel; F.H. Gilles (*Neurological Surgery, Neurology*); D.S. Harrington; R.E. Horowitz; G. Kanel; L. Klawli; D.V. Kon; O.T. Kuzma (*Medicine*); D.H. Mills; D.L. Moyer; J. Nelson; P. Nichols; R.Y. Osamura; P.N. Rao; C. Rogers; A.A. Roscher; L. Sathyavagiswaran (*Medicine*); S.-R. Shi; S.V. Sostrin; A. Verity

*Clinical Associate Professors:* C. J. Cobb; M.M. Cosgrove; T.E. Howard; G. Pezeshkpour; M. Pietruszka; A.S.S. Raza; J.S. Wollman

*Clinical Assistant Professors:* J.D. Augustine; A. Baltayan; E. Carpenter, Jr.; J.A. Chan; W. Chick; O. Chinwah; P.D. Colman; E.C. Dinovo; R. Djabourian; R. Gellibolian; K.E. Grimm; M.D. Haimowitz; J. Iqbal; M. Kennedy; M.T. Kiyabu; B. Kwok; B.J. Le Berthon; M.S. Lewis; K. Matsuda; V. Nelson; S.D. Oh; M. Osby; L.A. Pena; R. Phan; G. Pinsky; S. Prabhu; S.T. Pullarkat; L.A. Scheinin; R.A. Soni; J.P. Tovar; K.J. Young; S.K. Young

*Professors of Clinical:* R.K. Brynes; K.-M. Chan; D.L. Commins; J.F. Emerson; D.B. Endres; J.C. Felix (*Obstetrics and Gynecology*); E.M. Gomperts (*Pediatrics*); A.L. Hiti; Y. Iwaki (*Urology, Surgery*); P. Mhawech-Fauceglia; W.Y. Naritoku; D.M. Parham; L.M. Petrovic; A.E. Sherrod; H. Shimada; S. Wu (*Pediatrics*)

*Professors of Research:* J. Groffen (*Pediatrics*); E. Heisterkamp (*Pediatrics*)

*Associate Professors of Clinical:* M. Aron; N.J. Barr; D.B. Casebolt; A.N. Fedenko (*Orthopaedic Surgery*); S. He (*Ophthalmology*); Y. Ma; L.L. Wang (*Surgery*); P.M. Ward; G.D. Zeiger

*Adjunct Associate Professor of Clinical:* D. Hawes

*Assistant Professors of Clinical:* J. Dien Bard; R.C. (She) Bender; J.A.M. Benjamin; M. Burnett (*Neurology*); A.J. Correa; B.K. DeClerck (*Dermatology*); W.A. Elatre; X. Fu; H.T. Hardy; K.M. Hurth; G.H. Kim (*Dermatology*); K.K.Y. Lai; L. Li; F. Medeiros; A.C. Perumbeti; J.L. Poisson; P. Sanchez (*Pediatrics*); N.M. Shillingford; M.E. Sibug Saber (*Ophthalmology*); I.N. Siddiqi; J.G. Vallone; L.Wang; Y. Wang; S. Zhou

*Associate Professors of Research:* K. Asahina; W. Cozen (*Preventive Medicine*); R.B. Widelitz; L. Wu; J.F. Zhong

*Assistant Professors of Research:* D.E. Feldman; T. Jiang; R.D. Ladner; R.A. Moats (*Radiology*); K.A. Nash; P. Tongaonkar; P. Wu; Jun Xu; D. Zhu

*Research Assistant Professors:* P. Hu; N.W. Marten; Y. Ouyang

*Adjunct Research Associate Professor:* S.A. Imam

*Resident Clinical Instructors:* L. Aye; M. Boonyasampant; E. Broxman; T. Chong; K. Duncan; J. Friedman; A. Garcia; T. Hacopian; A. Hagiya; S. Hamidi; T. Jenkins; B. Kay; G. Kim; C. Lee; X. Li; C. Magana; V. Martin; T. Meneses; C. Pang; M. Pessarakli; N. Plaza; O. Press; K. Qidwai; M. Sharifian; J. Smith; S. Walia; D. Yau; E. Yung; H. Zhang

*Resident Clinical Instructors - Fellows:* K. Grogan; D. Hawes; H. Huynh; M. Iverson; Y. Lu; D. Patel; M. Sy; M. Vergara-Lluri

*Emeritus Professors:* S.B. Chandor; P.T. Chandrasoma; B.N. Nathwani; J.W. Parker; A. Richters; N.E. Warner; E.T. Wong

*Emeritus Associate Professor:* A.D. Cramer

*Emeritus Clinical Professors:* M. Greenblatt; G.G. Hadley; W.H. Kern; E.B. Reilly; D.S. Shillam; R.J. Schroeder

*Emeritus Clinical Associate Professor:* W.C. Smith

*Emeritus Clinical Assistant Professors:* R.L. McClure; J.K. Waken

*Emeritus Professors of Clinical:* J.F.P. Dixon; C.B. Inderlied; T.T. Noguchi (*Emergency Medicine, Surgery*)

*Emeritus Associate Professor of Clinical:* W.P. Lewis

*Emeritus Assistant Professor of Clinical:* R.B. Hopper

*Emeritus Professor of Research:* T.L. Lincoln

*\* Recipient of university-wide or school teaching award.*

The Department of Pathology provides training for both medical and graduate students. Medical students are trained in general, systemic and cellular pathology, providing them with an understanding and visualization of the basic processes underlying symptoms and clinical courses, as well as the ability to evaluate laboratory findings. This department also contributes to the training of residents and fellows at the LAC+USC Healthcare Network, Keck Hospital of USC and USC Norris Cancer Hospital, and the VA Greater Los Angeles Healthcare Network, providing these residents and fellows with an intensive residency program in anatomic and clinical pathology and offering subspecialty fellowship training in surgical pathology, cytopathology, hematopathology and neuropathology.

The Department of Pathology has a Master of Science program. The two-year M.S. program provides training in the latest technologies and concepts of biomedical research and provides the graduate with enhanced opportunities for positions in biotechnology companies, teaching colleges and various health department/governmental positions.

With more than 87 full-time faculty and more than 40 residents and fellows in training, the USC Department of Pathology is one of the largest pathology departments in the United States. The department is particularly strong in areas of surgical pathology, cytopathology, hematopathology, immunocytochemistry, immunopathology, neuropathology, and AIDS-related research. The department maintains active research programs in hematopathology, neuropathology and translational cancer research and has begun to expand its base in radioimmunoimaging and immunotherapy. It also has ongoing research projects in the new areas of molecular and genetic pathology. Since October 2003, the VA Greater Los Angeles Healthcare System Pathology Residency Training Program has been incorporated with the LAC+USC Medical Center Pathology Residency Training Program.

The department provides diagnostic laboratory services for the LAC+USC Medical Center, the USC Norris Cancer Hospital, the Doheny Eye Institute, Keck Hospital of USC and the USC Clinical Laboratories Group. Approximately 40 of the department's full-time faculty members work in service laboratories throughout the LAC+USC Medical Center, where they are supported by 40 residents and fellows and a technical and clerical staff numbering in excess of 500. The USC Norris Cancer Hospital and Research Institute and Keck Hospital of USC houses seven full-time pathologists, two fellows, two residents and approximately 25 clerical and support staff.

## Graduate Programs

### General Admissions

Applicants to the graduate program in pathology must have a bachelor's degree from an accredited college or university with an undergraduate major in one of the natural sciences; a minimum cumulative GPA of 3.0 for undergraduate work is required. Applicants must submit undergraduate transcripts and letters of recommendation from two undergraduate teachers with their application. All applicants must take the general portion of the Graduate Record Examinations (GRE). A combined score of at least 1100 for the verbal and quantitative scores is required. International students whose native language is not English must submit scores from the IELTS (International English Language Testing System) or the TOEFL (Test of English as a Foreign Language) examination. Personal interviews by members of the department's graduate committee may be requested.

Original application materials, except letters of recommendation, should be sent to the Office of Admission, University of Southern California. To expedite consideration of the application, applicants should also send photocopies of the application, transcripts and GRE scores to the Pathology Department's graduate committee secretary, Lisa Doumak. Letters of recommendation should be addressed directly to the secretary, graduate committee. Applications are considered for admission to both the fall and spring semesters.

### Residency and Fellowship Programs

The Department of Pathology offers seven first-year residency positions and 28 residency positions in its fully approved four-year training program in anatomic and clinical pathology at the LAC+USC Medical Center. Training is offered in autopsy and surgical pathology, neuropathology, cytology, microbiology, hematopathology, immunohematology, clinical chemistry, toxicology, immunopathology, radioisotopes, cytogenetics, instrumentation, management, computer techniques, electron microscopy, molecular pathology and other specialty areas. The Department of Pathology also offers the Accreditation Council on Graduate Medical Education (ACGME) fully credited fellowship training in cytopathology (four positions), hematopathology (two

positions) and neuropathology (one position). The Surgical Pathology Fellowship Training Program recently received five years full accreditation of their program (seven positions).

#### *Master of Science in Experimental and Molecular Pathology*

The Department of Pathology offers a program for the master of science degree with a major in experimental and molecular pathology. The primary objectives of this program are to provide the necessary theoretical and practical training in experimental pathology that culminates with the master of science degree. Goals of the program are to train students in preparation for senior research staff or senior technician positions in academic or industrial institutes, further M.D. or Ph.D. study, consultancies requiring multidisciplinary backgrounds or advanced teaching positions in community colleges.

**Admissions** The prerequisite for applicants to this program in pathology is a bachelor's degree with an undergraduate major in one of the natural sciences. A minimum GPA of 3.0 in the natural sciences (including mathematics) is usually required. Applicants must achieve a competitive score on the general portions of the Graduate Record Examinations (GRE). In addition, the department requires at least three letters of recommendation from faculty members who can evaluate the applicant's potential for graduate work. Demonstrated proficiency in the English language is required. International students whose native language is not English must submit scores from the IELTS (International English Language Testing System) or the TOEFL (Test of English as a Foreign Language) examination. Special circumstances may provide consideration for conditional admission.

**Course Requirements** At least 34 units of graduate study are required. The required courses include INTD 522 Infection and Host Responses (4), INTD 531 Cell Biology (4), INTD 550 Introduction to Pathology (4), INTD 551 Pathobiology of Disease (4), INTD 571 Biochemistry (4), PATH 553 Methods in Cellular and Clinical Pathology (3), PATH 554 Methods in Molecular Pathology (2) and PATH 570ab Seminar in Pathology (2). Fourteen or more course units must be taken in the Department of Pathology, 8 units may be pursued outside the department, and a maximum of 8 units of directed research in pathology may be applied to the degree. No more than 4 units of course work taken outside of USC should be applied toward the M.S. degree requirements. Students considering such an action should submit a petition to the pathology graduate committee and document a rigorous academic standard for the course (reading materials, texts and other performance criteria, lecture content, etc.). The pathology graduate committee reviews the petition and informs the student of its decision.

#### *Master's Examinations/Master's Thesis*

The Master of Science has the option of either an experiment-based thesis or theory-based thesis course of study. Each student's program will be tailored to suit individual needs and background. Students who require training mainly in the knowledge of pathology may opt for the theory-based thesis course of study. Students also have an opportunity to register for directed research (PATH 590). For the experiment-based thesis option, the student must take PATH 594ab Master's Thesis. For the theory-based thesis option, the student must take GRSC 810 Studies for Master's Examination during the semester they plan to graduate if not otherwise enrolled.

## Courses of Instruction

### Pathology (PATH)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**PATH 500ab Basic and Applied Systemic Pathology (3-2, Irregular)** Clinical, gross, and microscopic study of basic disease processes. Pathophysiology of major organ systems; etiology, pathogenesis and histopathology of important diseases; oral manifestations, clinical recognition.

**PATH 531 Cell Biology (4)** (Enroll in INTD 531)

**PATH 550 Introduction to Pathology (4, Fa)** (Enroll in INTD 550)

**PATH 551 Pathobiology of Disease (4)** (Enroll in INTD 551)

**PATH 553 Methods in Cellular and Clinical Pathology (3, Fa)** Includes advanced techniques in cell biology, protein and immunochemistry. A practical approach to acquaint new graduate students with current methodologies and applications used in biomedical research. (Duplicates credit in former PATH 552a.)

**PATH 554 Methods in Molecular Pathology (2, Sp)** Theory and practice methods useful in experimental pathology; experimental design; statistical analysis; literature analysis; laboratory and radiation safety. (Duplicates credit in former PATH 552b.)

**PATH 555 Biochemical and Molecular Bases of Disease (4, Sp)** (Enroll in INTD 555)

**PATH 561 Molecular Biology (4, Fa)** (Enroll in INTD 561)

**PATH 570abcd Seminar in Pathology (1-1-1-1, FaSp)** Recent advances in the understanding of diseased cells and tissues are reported and discussed using standard seminars, as well as autopsy organ reviews.

**PATH 571 Biochemistry (4, Fa)** (Enroll in INTD 571)

**PATH 572 Systems Physiology and Disease I (4, Fa)** (Enroll in INTD 572)

**PATH 573 Systems Physiology and Disease II (4, Sp)** (Enroll in INTD 573)

**PATH 575 Frontiers of Pathology (2, max 8, Sp)** Weekly research lectures by leading investigators in the field of homeostatic response to injury such as cell death, inflammation, fibrosis and regeneration.

**PATH 581 Essentials of Animal Experimentation (1, Fa)** A course providing basic information on the issues and responsibilities of investigators using animals in biomedical research. *Recommended preparation:* graduate standing.

**PATH 590 Directed Research (1-12, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**PATH 594abz Master's Thesis (2-2-0, FaSpSm)** Credit on acceptance of thesis. Graded IP/CR/NC.

**PATH 599 Special Topics (2-4, max 8, FaSp)**

**PATH 630 Viral Oncology (2, Sp)** Broad aspects of RNA and DNA viral oncology from epidemiology to molecular genetics.

**PATH 650 Stem Cell Biology and Medicine (4, Sp)** (Enroll in INTD 650)

**PATH 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**PATH 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Department of Pediatrics, Division of Medical Education

**Keith Administration Building 211**  
1975 Zonal Avenue  
Los Angeles, CA 90089-9024  
(323) 442-2372  
FAX: (323) 442-2051

### Faculty

*Division Head:* C.C. Fung

*Professors:* J.G. Nyquist; B.P. Wood

*Associate Professors:* C.C. Fung; J. Gates (Family Medicine); R.A. Girard; W. May

*Assistant Professors:* T. Kovin, D. Souder

*Instructor:* D. Poole

*Clinical Faculty:* A.M. Alexander; J. Davis; D.L. Fisher; A. Richards

*Emeritus Professors:* S. Abrahamson; M.A. Hitchcock; K. Hoffman

Established in 1963 as one of the first medical education units in the United States, the division conducts educational programs for four different types of students: medical students; graduate students in education; those teaching in medical and other health professional education settings; and physicians in the postgraduate study of medical education.

The division's primary mission is to enhance the quality of medical education by serving as a resource of educational expertise for planning, developing, and evaluating medical education programs and conducting educational research. Similar activities and programs are conducted with various government and private organizations outside the university.

Major research and training interests of the faculty include the instruction of lay persons to be used as standardized patients for teaching and evaluation, case-based learning, pre-med programs for minority students and interactive video systems.

Administratively, the division is an independent unit in Educational Affairs in the Keck School of Medicine. The faculty hold appointments in the Department of Pediatrics. The division also employs 10 staff and research assistants. All activities of the division are conducted at the USC Health Sciences Campus.

### Fellowship Programs

#### *Teaching and Learning*

A Teaching and Learning Fellowship program is offered to health care professionals who are engaged in teaching. The primary goals of this fellowship are to provide participants with multiple ways to teach and evaluate effectively. Through seminars, fellows will gain increased

understanding of basic principles of teaching and learning and achieve the skills necessary to apply principles effectively.

#### Educational Leadership

An Educational Leadership Fellowship program is available for health care professionals with two primary goals: to prepare participants for understanding and serving in positions of leadership and enhance fellows' personal and professional effectiveness. Seminars will explore transformational change, team and community formation, group dynamics, organizational culture and resources.

#### Health Professions Teachers

From time to time, the division offers special workshops or seminars in various subject areas related to the improvement of instruction. Division staff members are available to plan these special programs on request.

#### Master of Academic Medicine

The program addresses the unique population of medical and health professions faculty who are focused on leading the academic enterprise for health professionals at the undergraduate, graduate and continuing education levels. The six-semester program consists of 32 graduate units and employs a hybrid model, combining on-campus face-to-face sessions, blended with online course work. For more information, see the Master of Academic Medicine page.

#### Postgraduate Program

Individually tailored programs of study in medical education are available to visiting postdoctoral fellows who wish to gain an understanding of principles, problems and practices in medical education. These visiting fellows may spend from a few weeks to a year in residence, participating in ongoing projects, seminars, readings and independent study.

## Department of Physiology and Biophysics

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(323) 442-1145  
FAX: (323) 442-2494  
Email: [janet.stoekert@usc.edu](mailto:janet.stoekert@usc.edu)

Student Adviser: H. Kaslow, Ph.D., [hrkaslow@usc.edu](mailto:hrkaslow@usc.edu)

#### Faculty

Berislav V. Zlokovic, M.D., Ph.D., *Chair of the Department of Physiology and Biophysics and Director of the Center for Neurodegeneration and Regeneration at the USC Zilkha Neurogenic Institute*

Director, USC Research Center for Liver Diseases, Chief, Division of Gastrointestinal and Liver Diseases, USC Associates/Thomas H. Brem Chair in Medicine, and Veronica P. Budnick, M.D., *Chair in Liver Disease*: Neil Kaplowitz, M.D.

Professors: Michael Arbib (*Computer Science/Engineering*); Thomas Buchanan (*Medicine/Obstetrics and Gynecology*); Vito M. Campese; Timothy M. Chan (*Molecular Pharmacology and Toxicology*); Casey Donovan (*Exercise Science*); Robert A. Farley\* (*Biochemistry*); Caleb Finch (*Gerontology and Neurobiology*); Michael Goran (*Preventive Medicine*); Sarah Hamm-Alvarez (*Pharmaceutical Sciences*); Cage S.

Johnson (*Medicine/Hematology*); Neil Kaplowitz (*Medicine/GI Liver/Patient Care*); Kwang Jin Kim (*Medicine, Biomedical Engineering*); Herbert J. Meiselman; Austin K. Mircheff; Janos Peti-Peterdi; Alan G. Watts

Associate Professors: Robert H. Chow; Harvey R. Kaslow; Richard L. Lubman (*Medicine/Pulmonary Patient Care*); Richard Watanabe; Jang-Hyun Youn; Alan S.L. Yu; Li Zhang

Assistant Professors: Steven Mittelman; Joyce Richey; Abhay Sagare

Adjunct Professor: Dwight W. Warren III

\* Recipient of university-wide or school teaching award.

The administrative offices of the Department of Physiology and Biophysics are located on the Health Sciences Campus. Faculty of the department are predominantly located at the Health Science Campus and also at the LAC+USC Medical Center and the University Park Campus.

The graduate program in physiology and biophysics is designed to prepare students for a career in research and teaching in physiology, biophysics and related fields. Faculty of the department guide students toward becoming effective members of today's scientific community by providing an integrated knowledge of physiological systems at several levels of organization. The course of study required of each candidate is planned to meet his or her individual interests and needs.

Faculty guidance and specialized facilities are available for advanced research in the four broad areas of research represented in the department: endocrinology, reproduction and metabolism; neurophysiology; fluid and electrolyte physiology; and cellular and molecular physiology.

#### Graduate Programs

##### Admissions

Applicants should have a bachelor's degree in one of the natural sciences. Undergraduate course work in mathematics (including one and a half years of calculus), physics (one year), organic chemistry (aliphatic and aromatic), and biological sciences (one year) is required. Prospective students should also have completed at least two courses from among the following areas: physical chemistry, advanced physics, electronics, histology, physiology, cell biology, computer science, or biochemistry. Equivalent work will be considered on an individual basis.

Students interested in applying must complete an application for graduate studies and submit official transcripts from all academic institutions previously attended, a personal statement of career objectives, financial statement of support, standardized test scores and three letters of recommendation.

##### Master of Science

Admission requirements are the same as for the Doctor of Philosophy degree.

**Course Requirements** The master's degree in physiology and biophysics requires completion of 33 graduate level units with a minimum grade point average of 3.0. All students are required to take the following: INTD 500, INTD 572, INTD 573, PHBI 608ab and/or PHBI 550, PM 510L, and two of the following: INTD 531, INTD 571, NSCI 524, NSCI 531. Students enroll in additional graduate level classes with prior approval of their graduate student adviser. The Master of Science candidate has the option of either a thesis or non-thesis course of study; the thesis option is usually required if more than 6 research units make up a 33-unit course plan. The specific program

followed by thesis-option students is tailored to suit individual needs and background in consultation with the academic director of the program and the student's qualifying exam committee. There is no foreign language requirement.

Minimum standards for satisfactory performance and continued enrollment in the M.S. program are an average of 3.0 in all non-research courses, an average of 3.0 in all courses and a grade of B or higher in INTD 572, INTD 573 and PHBI 608a.

#### Doctor of Philosophy

(No longer accepting applications)

**Course Requirements** A total of 60 units of graduate study is required for the Ph.D. degree. All students are required to take INTD 500, INTD 572, INTD 573, PHBI 608ab and/or PHBI 550, PM 510L, and two of the following: INTD 531, INTD 571, NSCI 524, NSCI 531. The balance of the 60-unit requirement will be drawn from advanced physiology courses and seminars, courses from other departments, research and the dissertation. The specific program to be followed by each student is determined in consultation with the student's adviser, qualifying exam committee and the department faculty. There is no foreign language requirement.

**Screening Procedure** An overall GPA of 3.0 or better and a minimum grade of B (3.0) in all courses given by the department and also in INTD 531 are the minimum requirements for continuation in the Ph.D. program. After completion of the first two semesters of study, the eligibility of each student for continuation in the program will be reviewed by a departmental graduate screening committee. At the discretion of the graduate committee, successful completion of a screening examination may be required for progression to the third semester of graduate study.

**Qualifying Exam Committee** The qualifying exam committee consists of at least five members, three of whom must be from within the department and at least one of whom must be drawn from the faculty of another department. The chair of the committee will be the student's dissertation adviser.

**Qualifying Examination** The purpose of the qualifying examination is to give the student a formal opportunity to demonstrate to the faculty that he or she is qualified to conduct independent research. Passing this examination is formal recognition that the student has independently developed a research proposal that is significant and can be reasonably accomplished with available resources.

At least 60 days prior to its scheduled date, the student must petition the Graduate School for permission to take the qualifying examination; the examination must be completed by the end of the semester during which application is made. Students must complete this examination no later than the fifth semester of graduate work. If the student fails to take the examination by this time, the qualifying exam committee will report a failure to pass the examination. The student then has one additional chance to take and pass the examination; this may not occur sooner than six months nor later than one year after the first examination. Applications to take the qualifying examination later than the fifth semester may be considered on an individual basis and must be approved by both the qualifying exam committee chair and the department chair.

The qualifying examination consists of a written and an oral portion. For the written portion, the student must prepare a proposal for a research project. The proposal must be submitted to the members of the qualifying exam committee not less than 10 days prior to the oral portion of the examination. For the oral defense, the student should prepare an oral presentation of the proposal of approximately 30 minutes duration and be prepared to

answer questions regarding any topic related to the proposal.

*Dissertation and Oral Defense* Upon completion of the research project, and with the consent of the dissertation committee, the candidate prepares the written dissertation. After the dissertation has been read by the committee, the candidate must make an oral defense of the work.

## Courses of Instruction

### Physiology and Biophysics (PHBI)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**PHBI 524 Advanced Overview of Neurosciences (4, Fa)** (Enroll in NSCI 524)

**PHBI 531 Cell Biology (4)** (Enroll in INTD 531)

**PHBI 550 Seminar in Advanced Cellular, Molecular and Systemic Physiology (1, max 12, FaSp)** Lectures and student presentations on advanced topics in molecular, cellular and systemic physiology. Open to integrative biology of disease program, physiology and biophysics, and pathobiology students only. Graded CR/NC.

**PHBI 561 Molecular Biology (4, Fa)** (Enroll in INTD 561)

**PHBI 571 Biochemistry (4, Fa)** (Enroll in INTD 571)

**PHBI 572 Systems Physiology and Disease I (4)** (Enroll in INTD 572)

**PHBI 573 Systems Physiology and Disease II (4)** (Enroll in INTD 573)

**PHBI 590 Directed Research (1-12, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**PHBI 594abz Master's Thesis (2-2-0, FaSpSm)** Credit upon acceptance of thesis. Graded IP/CR/NC.

**PHBI 599 Special Topics (2-4, max 8, Sp)**

**PHBI 608ab Advanced Cellular, Molecular and Systemic Physiology (a: 2 or 4, Fa; b: 2 or 4, Sp)** Lectures and student presentations on advanced topics in molecular, cellular and systemic physiology.

**PHBI 650 Mechanisms of Ion and Solute Transport Across Cell Membranes (2, Fa)** Biophysical examination of the mechanisms of ion and solute transport across cell membranes; emphasis on the structures of transport proteins and kinetic models of transport. *Recommended preparation:* graduate level course in biochemistry, physical biochemistry, or cell biology.

**PHBI 651 Molecular Modeling and Kinetic Simulations in Membrane Transport (2, Fa)** Introduction to the principles of mathematical modeling of biological systems and molecular dynamics simulations, with emphasis on membrane transport. *Recommended preparation:* graduate level courses in biochemistry or physical biochemistry, and cell biology.

**PHBI 660 Understanding Diseases of Ion Transport (2, Sp)** Examination of the genetics, biochemical mechanisms, and physiological characteristics of diseases caused by inherited mutations in ion channels and ion transport proteins.

**PHBI 790 Research (1-12, FaSpSm)** Research leading to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**PHBI 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Department of Preventive Medicine

### Biostatistics Division

2001 N. Soto Street, Suite 201-A  
Los Angeles, CA 90032-3628  
Director: W. Gauderman, Ph.D.

(323) 442-1810

FAX: (323) 442-2993

Email: [mtrujill@usc.edu](mailto:mtrujill@usc.edu)

[keck.usc.edu/Education/Academic\\_Department\\_and\\_Divisions/Department\\_of\\_Preventive\\_Medicine](http://keck.usc.edu/Education/Academic_Department_and_Divisions/Department_of_Preventive_Medicine)

### Health Behavior Research Division c/o USC/IPR

2001 N. Soto Street, Suite 201-B  
Los Angeles, CA 90032-3628  
Director: Mary Ann Pentz, Ph.D.

(323) 442-8299

Email: [barovich@usc.edu](mailto:barovich@usc.edu)

[phdhr.usc.edu](http://phdhr.usc.edu)

### Environmental Health Division

2001 N. Soto Street, Suite 230  
Los Angeles, CA 90032-3628  
Director: Frank D. Gilliland, M.D., Ph.D.

(323) 442-1096

FAX: (323) 442-3272

[keck.usc.edu/Education/Academic\\_Department\\_and\\_Divisions/Department\\_of\\_Preventive\\_Medicine](http://keck.usc.edu/Education/Academic_Department_and_Divisions/Department_of_Preventive_Medicine)

### Master of Public Health Program

2001 N. Soto Street, Suite 201-D  
Los Angeles, CA 90032-3628  
Director: Louise A. Rohrbach, MPH, Ph.D.

(323) 442-8237

Email: [oraliago@usc.edu](mailto:oraliago@usc.edu)

[mph.usc.edu](http://mph.usc.edu)

### Health Promotion and Disease Prevention Studies Program

3375 South Hoover Street  
University Village, Suite E 210  
Los Angeles, CA 90089-7798

Director: Elahe Nezami, Ph.D.

(213) 740-1060

FAX: (213) 821-1733

Email: [bhealthy@usc.edu](mailto:bhealthy@usc.edu)

[usc.edu/medicine/hp](http://usc.edu/medicine/hp)

### Global Health Studies

3375 South Hoover Street  
University Village, Suite E 210  
Los Angeles, CA 90089-7798

Director: Elahe Nezami, Ph.D.

(213) 740-1060

FAX: (213) 821-1733

Email: [bhealthy@usc.edu](mailto:bhealthy@usc.edu)

[usc.edu/globalhealthprogram](http://usc.edu/globalhealthprogram)

## Faculty

*Distinguished Professor of Preventive Medicine and Flora L. Thornton Chair in Preventive Medicine:* Jonathan M. Samet, M.D.

*AFLAC Chair in Cancer Research:* Christopher Haiman, Sc.D.

*The Dr. Robert C. and Veronica Atkins Chair in Childhood Obesity and Diabetes:* Michael I. Goran, Ph.D.

*Kenneth T. Norris Jr. Chair in Epidemiology:* Brian E. Henderson, M.D.

*Verna R. Richter Chair in Cancer Research:* Duncan Thomas, Ph.D.

*Harry J. Bauer and Dorothy Bauer Rawlins Professor of Cardiology:* Howard N. Hodis, M.D.

*Professors:* S.P. Azen (*Biokinesiology and Physical Therapy, Ophthalmology, Occupational Science*); K. Berhane; R. Bluthenthal; G. Casey, C.-P. Chou (*Social Work*); P. Clarke (*Communication*); G. Coetzee (*Urology, Microbiology*); W. Cozen (*Pathology*); W.J. Gauderman; S. Gayther; F.D. Gilliland; M. Goran (*Physiology/Biophysics and Pediatrics [CHLA]*); S. Gruskin; R. Haile; B.E. Henderson; H. Hodis (*Medicine*); B. Langholz; T.M. Mack (*Pathology*); Wendy Mack; R. McConnell; B. Meyerowitz (*Psychology*); M.A. Pentz; B. Portnoy (*Pediatrics*); J.M. Samet; K. Siegmund; D. Stram; S. Sussman; T. Valente; D.C. Thomas; J. Unger; A. Wu

*Associate Professors:* H. Allayee; L. Baezconde-Garbanati; J.C. Chen; M. Cockburn; D. Conti; S. Ingles; A. Leventhal; L. Rohrbach; T. Seeman (*Gerontology*); P.D. Thomas, Jr.; R. Watanabe (*Physiology/Biophysics*)

*Assistant Professors:* B. Berman; D. Black; C. Breton; C. Curtis; G. Dunton; S. Eckel; M. Franklin; J. Figueiredo; J.P. Lewinger; C.L. Pearce; F. Schumacher; W. Setiawan; A. Valouev; H. Wipfli

*Professor and Clinical Scholar:* R. Bluthenthal

*Professors of Clinical:* E.L. Avol; D. Deapen; A. Hricko

*Associate Professors of Clinical:* E. Nezami; D. Van Den Berg

*Assistant Professors of Clinical:* T. Boley-Cruz; S. Kumar; C. Koprowski; L. Liu; K. Monroe; C. Patino-Sutton

*Clinical Associate Professor:* W.S. Linn

*Professors of Research:* T. Alonzo; J.D. Buckley (*Pediatrics*); S. Groshen; M. Krailo; M.C. Pike; R. Spoto; F. Stanczyk (*Obstetrics and Gynecology*)

*Associate Professors of Research:* A. Hamilton; P. Marjoram; S. Ramus; M. Stern

*Assistant Professors of Research:* D. Barkauskas; H. Besaratinia; G. Chen; V. Cortessis; L. Chen; L. Ferguson; S. Fruin; J. Huh; C. Lane; E. Lee; R. McKean-Cowdin; H. Mi; J. Milam; J. Millsten; L. Park; H. Volk

*Adjunct Professor:* J. Niland; J. Zhang

*Adjunct Associate Professors:* C.N. Bailey-Merz; M.R. Calderon; G. Marks

*Adjunct Assistant Professors:* J. Lawrence; J.A. Longmate; S.V. McKane; S. Montgomery

*Emeritus Professors:* L. Bernstein; J. Casagrande; S. Preston-Martin; J. Richardson

The Department of Preventive Medicine is responsible for training medical, graduate and undergraduate students in the areas of biostatistics, epidemiology, health

behavior research, public health, and preventive medicine. Faculty from the statistical genetics and molecular epidemiology department also perform research in the areas of biostatistics, epidemiology of acute and chronic diseases, and environmental health.

The undergraduate and graduate programs offered by the department are noteworthy for the extensive opportunities offered to the students for involvement in faculty research. It is not uncommon for students to begin working closely with faculty members on research projects as early as their first or second year of study.

#### Degree Programs

The Department of Preventive Medicine offers the following degree programs:

B.S. in Global Health

B.S. in Health Promotion and Disease Prevention Studies

B.S. in Health Promotion and Disease Prevention/Master of Public Health

B.S. in Health Promotion and Disease Prevention/M.S. in Biostatistics

B.S. in Health Promotion and Disease Prevention/M.S. in Molecular Epidemiology

B.S. in Dental Hygiene/Master of Public Health

M.S. in Applied Biostatistics/Epidemiology

M.S. in Clinical and Biomedical Investigations

M.S. in Molecular Epidemiology

M.S. in Biostatistics

Master of Public Health

Master of Public Health (online)

Master of Public Health/Doctor of Medicine

Master of Public Health (Health Promotion)/Ph.D. in Psychology (Clinical)

Master of Public Health/Pharm.D.

Master of Public Health/ Master of Planning

Master of Public Health/Doctor of Physical Therapy

Master of Public Health/Master of Social Work

Ph.D. in Biostatistics

Ph.D. in Epidemiology

Ph.D. in Molecular Epidemiology

Ph.D. in Preventive Medicine (Health Behavior Research)

The Department of Preventive Medicine also offers the following undergraduate minor programs:

Minor in Cinema-Television for the Health Professions

Minor in Cultural Competence in Medicine

Minor in Environmental Health

Minor in Global Health

Minor in Health Communication

Minor in Public Health

Minor in Nutrition and Health Promotion

Minor in Substance Abuse Prevention

## Undergraduate Degrees

### Bachelor of Science in Health Promotion and Disease Prevention Studies

3375 S. Hoover Street  
University Village, Suite E 210  
Los Angeles, CA 90089-7798  
Director: Elahe Nezami, Ph.D.  
(213) 740-1060  
FAX: (213) 821-1733  
Email: [bhealthy@usc.edu](mailto:bhealthy@usc.edu)  
[usc.edu/medicine/hp](http://usc.edu/medicine/hp)

### Bachelor of Science in Health Promotion and Disease Prevention Studies

3375 S. Hoover Street  
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Los Angeles, CA 90089-7798  
Director: Elahe Nezami, Ph.D.  
(213) 740-1060  
FAX: (213) 821-1733  
Email: [bhealthy@usc.edu](mailto:bhealthy@usc.edu)  
[usc.edu/medicine/hp](http://usc.edu/medicine/hp)

The undergraduate program in Health Promotion and Disease Prevention Studies (HP) provides a well-rounded, professionally focused education leading to the Bachelor of Science degree. The program is concerned with the sociocultural, behavioral, psychological, and biological factors contributing to wellness and disease. It is an ideal major for students interested in medicine, pharmacy, dentistry, public health, epidemiology, health psychology and health behavior research. Areas of study include: global health; cultural diversity in medicine; substance abuse prevention and program planning; nutrition and fitness; health promotion of minority and underserved populations; and general public health issues (e.g., HIV/AIDS, violence, health promotion in the workplace and behavioral medicine).

#### Program Requirements

The Bachelor of Science degree is awarded after students successfully complete 128 units, consisting of 66 units for the major and fulfillment of USC general education requirements including third semester equivalency in a foreign language.

#### General Education Requirements

The university's general education program requires six courses plus writing and diversity requirements, which provide a coherent, integrated introduction to the liberal arts and sciences. See The USC Core and the General Education Program for more information.

#### Requirements for the Major (66 units)

The program is divided into core and elective components.

The following core component (42 units) is required of all students.

Non-hp courses (20 units)		Units
BISC 120L	General Biology: Organismal Biology and Evolution, or Advanced General Biology: Organismal Biology and Evolution	4
BISC 220L	General Biology: Cell Biology and Physiology, or	
BISC 221L	Advanced General Biology: Cell Biology and Physiology	4
CHEM 105aL	General Chemistry, or	
CHEM 115aL	Advanced General Chemistry	4

MATH 116	Mathematics for the Social Sciences, or	
MATH 125*	Calculus I	4
PSYC 100	Introduction to Psychology	4

\* MATH 125 allows students who have placed out of MATH 116 to take a higher-level math class; it also satisfies the math requirement for premedical students.

HP Courses (22 units)		Units
HP 200	Introduction to Health Promotion and Disease Prevention	4
HP 300	Theoretical Principles of Health Behavior	4
HP 320	Biological and Behavioral Basis of Disease	4
HP 340L	Health Behavior Statistical Methods	4
HP 350L	Health Behavior Research Methods	4
HP 480	Internship in Health Promotion and Disease Prevention, or	2-4
HP 490x	Directed Research	2-8

#### Advanced HP and Health Profession Preparatory Courses

A total of 24 units of electives are required of all students (at least 12 of the 24 must be HP courses).

Electives (24 units)		Units
BISC 320L	Molecular Biology	4
BISC 330L	Biochemistry	4
CHEM 105bL	General Chemistry, or	
CHEM 115bL	Advanced General Chemistry	4
CHEM 322abL	Organic Chemistry	4-4
EXSC 300L	Physiology of Exercise	4
EXSC 301L	Human Anatomy	4
EXSC 407aL	Advanced Exercise Physiology	4
HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine	4
HP 402	Maternal and Child Health	4
HP 403	Behavioral Medicine	4
HP 404	Religion and Health	4
HP 405	Sexually Transmitted Disease: A Global Public Health Priority	4
HP 408	Environmental Health in the Community	4
HP 410	Issues in Prevention and Cessation of Drug Abuse	4
HP 411	Drug Intervention Program Design and Evaluation	4
HP 412	Health Promotion and Prevention Policy	4
HP 420	Gender and Minority Health Issues	4
HP 421	Violence as a Public Health Issue	4
HP 422	AIDS in Society	4
HP 430	Obesity and Health	4
HP 431	Behavior and Education Strategies for Nutrition and Fitness	4
HP 432	Clinical Nutrition	4
HP 433	Advanced Topics in Nutrition	4
HP 434	Physical Activity and Health	4
HP 441	Health Promotion in the Workplace	4
HP 442	Chronic Disease Epidemiology	4
HP 450	Traditional Eastern Medicine and Modern Health	4
HP 460	Adolescent Health	4
HP 465	Health Status of Indigenous Peoples of America	4
HP 485	Global Health: Obesity and Nutrition	4
PHYS 135abL	Physics for the Life Sciences, or	4-4
PHYS 151L	Fundamentals of Physics I: Mechanics and	4

PHYS 152L	Thermodynamics, and Fundamentals of Physics II: Electricity and Magnetism	4	HP 470	Case Studies in Global Health	4
PPD 325	Fundamentals of Health Policy and Management	4	IR 308	Globalization: Issues and Controversies	4
PPD 330	Introduction to Health Care Systems	4	MATH 125	Calculus I	4
PSYC 336L	Developmental Psychology	4	<b>CORE RESEARCH COURSES (10-16 units)</b>		
PSYC 355	Social Psychology	4	HP 340L	Health Behavior Statistical Methods	4
PSYC 437	Adolescent Development	4	HP 350L	Health Behavior Research Methods	4
SOCI 350	Social Exclusion, Social Power, and Deviance	4	HP 490X	Directed Research	1-8, max 12
SOCI 475	Medical Sociology	4			

PPD 250	Third World Cities	4
PPD 382	International Development	4
SOCI 432	Racial and Ethnic Relations in a Global Society	4
SOCI 460	Key Issues in Contemporary International Migration	4
SOCI 470	Development and Social Change in the Third World	4

## Bachelor of Science in Global Health Studies

3375 S. Hoover Street  
University Village, Suite E 210  
Los Angeles, CA 90089-7798  
Director: Elahe Nezami, Ph.D.  
(213) 740-1060  
FAX: (213) 821-1733  
Email: [bhealthy@usc.edu](mailto:bhealthy@usc.edu)  
[usc.edu/globalhealthprogram](http://usc.edu/globalhealthprogram)

The Bachelor of Science in Global Health is a multidisciplinary degree of the Keck School of Medicine's Department of Preventive Medicine. This undergraduate program offers an examination of public health and policy issues in the context of global affairs. Students complete course work from Health Promotion and Disease Prevention Studies and International Relations in addition to requirements from other schools of the university. The program provides students with a strong background in understanding and evaluating global health issues and prepares students to become health professionals with international competencies. This program is an ideal major for students interested in medicine, pharmacy, dentistry, international relations, public health, epidemiology, health psychology and health behavior research.

### Program Requirements

The Bachelor of Science degree is awarded after students successfully complete 128 units, consisting of 66 units for the major and fulfillment of USC general education requirements including third semester equivalency in a foreign language.

### General Education Requirements

The university's general education program requires six courses plus writing and diversity requirements, which provide a coherent, integrated introduction to the liberal arts and sciences. See The USC Core and the General Education Program for more information.

### Requirements for the Major (66 units)

The program is divided into core and elective components. As part of the core research requirements, students must complete a directed research requirement, HP 490X, with a specific international research focus.

The core component (42-46 units) is required for all students.

CORE COURSES (32 units)		UNITS
BISC 220L	General Biology: Cell Biology and Physiology, or	
BISC 221L	Advanced General Biology: Cell Biology and Physiology	4
CHEM 105aL	General Chemistry, or	
CHEM 115aL	Advanced General Chemistry	4
ECON 203	Principles of Microeconomics	4
HP 270	Introduction to Global Health	4
HP 320	Biological and Behavioral Basis of Disease	4

Students must choose 24 units of elective course work from the following lists. At least 8 units must be from HP and at least 8 units must be from IR.

HP ELECTIVES (Minimum 8 units)		UNITS
HP 300	Theoretical Principles of Health Behavior	4
HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine: Promoting Health in Diverse Communities	4
HP 402	Maternal and Child Health	4
HP 403	Behavioral Medicine	4
HP 404	Religion and Health	4
HP 405	Sexually Transmitted Diseases: A Global Public Health Priority	4
HP 420	Gender and Minority Health Issues	4
HP 422	AIDS in Society	4
HP 450	Traditional Eastern Medicine and Modern Health	4

IR ELECTIVES (Minimum 8 units)		UNITS
IR 305	Managing New Global Challenges	4
IR 306	International Organizations	4
IR 307	Contemporary International Politics	4
IR 308	Globalization: Issues and Controversies	4
IR 315	Ethnicity and Nationalism in World Politics	4
IR 323	Politics of Global Environment	4
IR 325	Rich and Poor States in the World	4
IR 371	Global Civil Society: Non-State Actors in World Politics	4
IR 424	Citizenship and Migration in International Politics	4
IR 444	Issues and Theories in Global Society	4

OTHER ELECTIVES (Maximum 8 units)		UNITS
BISC 120LX	General Biology: Organismal Biology and Evolution, or	
BISC 121L	Advanced General Biology: Organismal Biology and Evolution	4
BISC 320L	Molecular Biology	4
BISC 330L	Biochemistry	4
CHEM 105bL	General Chemistry, or	
CHEM 115bL	Advanced General Chemistry	4
CHEM 322aL	Organic Chemistry	4
CHEM 322bL	Organic Chemistry	4
GERO 483	Global Health and Aging	4
PHYS 135aL	Physics for the Life Sciences, or	
PHYS 151L	Fundamentals of Physics I: Mechanics and Thermodynamics	4
PHYS 135bL	Physics for the Life Sciences, or	
PHYS 152L	Fundamentals of Physics II: Electricity and Magnetism	4
POSC 442	The Politics of Human Differences: Diversity and Discrimination	4
POSC 451	Politics of Resources and Development	4
POSC 456	Women in International Development	4

## Progressive Degree Programs in Preventive Medicine

The Master of Public Health, the Master of Science in Biostatistics and the Master of Science in Molecular Epidemiology programs admit a limited number of undergraduate students to a progressive degree program, which allows them to pursue a master's level degree while completing the bachelor's degree. Applicants to the program must have completed 64 units of course work and must submit their applications prior to the completion of 96 units of course work. Applicants need not submit GRE scores, but are expected to have a minimum GPA of 3.0 at the time of application. The application for admission to a progressive degree program must be accompanied by an approved course plan proposal and two letters of recommendation. The requirements for both the B.S. and the master's degrees must be satisfied, including a minimum of 128 undergraduate units. For further details on progressive degree programs, see the Requirements for Graduation page.

## Minor in Cinema-Television for the Health Professions

This minor introduces pre-health students to the theory and techniques of the cinematic arts and to a set of media practices useful for the implementation of health promotion strategies. This minor is designed for students who plan to enter careers or professional programs in medicine after graduation and are interested in working with film and television producers to disseminate accurate health information to the public. It complements major programs such as biological sciences, chemistry, kinesiology, health promotion and disease prevention studies, and environmental studies.

Required courses (24 units)		Units
CTCS 190	Introduction to Cinema	4
HP 345	Health Issues in Entertainment Media	4
Two of the following:		
HP 370	Introduction to Epidemiology: Methods and Applications	4
HP 401	Cultural Competence in Medicine	4
HP 408	Environmental Health in the Community	4
HP 410	Issues in Prevention and Cessation of Drug Abuse	4
HP 420	Gender and Minority Health Issues	4
HP 421	Violence as a Public Health Issue	4
HP 422	AIDS in Society	4
Eight additional units from the following:		
CTAN 451	History of Animation	2
CTCS 400	Non-Fiction Film and Television	4
CTPR 301	Creating the Non-Fiction Film	4
CTPR 375	Functions of a Director	4
CTPR 385	Colloquium: Motion Picture Production Techniques	4
CTPR 474	Television Documentary Production	4
CTWR 315X	Filmwriting	3
CTWR 412	Introduction to Screenwriting	2
CTWR 416	Motion Picture Script Analysis	2-4

### Minor in Cultural Competence in Medicine

This minor is designed for students who plan to enter careers or professional programs in medicine after graduation and are interested in using cultural knowledge to provide more effective health care. The minor focuses on cultural differences in the understanding of health, disease, health care and risk factors unique to specific populations. The minor provides a foundation for students who want to become effective health care providers in an increasingly diverse society. It complements major programs such as biological sciences, chemistry, kinesiology and environmental studies.

Required courses (20 units)		Units
HP 200	Introduction to Health Promotion and Disease Prevention	4
HP 400	Culture, Lifestyle and Health	4
HP 401	Cultural Competence in Medicine	4
HP 420	Gender and Minority Health Issues	4
One of the following:		
HP 370	Introduction to Epidemiology: Methods and Applications	4
HP 402	Maternal and Child Health	4
HP 408	Environmental Health in the Community	4
HP 410	Issues in Prevention and Cessation of Drug Abuse	4
HP 421	Violence as a Public Health Issue	4
HP 422	AIDS in Society	4
HP 442	Chronic Disease Epidemiology	4
HP 450	Traditional Eastern Medicine and Modern Health	4
HP 460	Adolescent Health	4
PSYC 462	Minority Mental Health	4

### Minor in Environmental Health

This minor provides students with a basic understanding of environmental health and its challenges. Curriculum will focus on global health, epidemiology (as it relates to environmental exposures), toxicology and exposure science. Students will be prepared to address and prevent environmental health hazards, promote public health and contribute to the resolution of various environmental health challenges. This minor is ideal for pre-health majors across the university.

REQUIRED COURSES (20 UNITS)		Units
HP 200	Introduction to Health Promotion and Disease Prevention	4
HP 320*	Biological and Behavioral Basis of Disease	4
HP 408	Environmental Health in the Community	4
HP 446	Poison, People, and Politics	4
HP 448	Global Environmental Changes and Health	4

\* Prerequisite required

### Minor in Global Health

This minor provides students with a basic understanding of the factors that determine the health of populations around the globe. Curriculum focuses on the cultural, environmental and clinical aspects of various health topics such as maternal and child health, aging, obesity, infectious disease and others. By studying these issues, students from majors across the university will be prepared to assess and contribute to the resolution of emerging global health challenges. This minor will appeal to a wide variety of majors, particularly majors centered on international affairs, business and health care.

REQUIRED COURSES (20 UNITS)		UNITS
HP 270	Introduction to Global Health	4
HP 470	Case Studies in Global Health	4

Three of the following:		
GERO 483	Global Health and Aging	4
HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine	4
HP 402	Maternal and Child Health	4
HP 422	AIDS in Society	4

### Minor in Health Communication

This minor is designed to appeal to students with a wide range of interests, including those with a general interest in promoting healthy lifestyle practices through effective communication. These students will be prepared to seek jobs in areas such as the managed care industry, hospitals, wellness programs, broadcast and cable companies, and private and governmental agencies, as well as other organizations looking for experts with demonstrated knowledge in health-related fields.

Required courses (20 units)		Units
COMM 302	Persuasion	4
COMM 385	Survey of Organizational Communication	4
COMM 443	Health Communication Strategies and Evaluation	4
HP 200	Introduction to Health Promotion and Disease Prevention	4
One of the following:		
COMM 304	Interpersonal Communication	4
COMM 308	Communication and Conflict	4
COMM 315	Health Communication	4
COMM 324	Intercultural Communication	4
COMM 375	Business and Professional Communication	4
COMM 402	Public Communication Campaigns	4
COMM 480	Nonverbal Communication	4
COMM 486	Human and Technological Systems in Organizations	4

HP 370	Introduction to Epidemiology: Methods and Applications	4
HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine	4
HP 402	Maternal and Child Health	4
HP 403	Behavioral Medicine	4
HP 408	Environmental Health in the Community	4
HP 412	Health Promotion and Prevention Policy	4
HP 420	Gender and Minority Health Issues	4
HP 421	Violence as a Public Health Issue	4
HP 422	AIDS in Society	4
HP 430	Obesity and Health	4
HP 442	Chronic Disease Epidemiology	4

### Minor in Public Health

This minor is designed for students interested in a broad array of health issues. The focus of the minor is on reducing disability and mortality from avoidable injuries and chronic disease, educating the community about healthy lifestyles, assuring access to health care, and measuring changes using various indicators over time. This minor teaches students to meet the challenges of the changing environment of the health care system. It complements a number of majors including psychology, sociology, American studies and ethnicity, biological sciences, economics, environmental studies, kinesiology, gender studies, international relations, philosophy, religion, gerontology and political science.

Required courses (20-24 units)		Units
HP 200	Introduction to Health Promotion and Disease Prevention	4
PPD 330	Introduction to Health Care Systems	4
Three of the following:		
HP 370	Introduction to Epidemiology: Methods and Applications	4

HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine	4
HP 402	Maternal and Child Health	4
HP 403	Behavioral Medicine	4
HP 408	Environmental Health in the Community	4
HP 410	Issues in Prevention and Cessation of Drug Abuse	4
HP 412	Health Promotion and Prevention Policy	4
HP 420	Gender and Minority Health Issues	4
HP 421	Violence as a Public Health Issue	4
HP 422	AIDS in Society	4
HP 430	Obesity and Health	4
HP 441	Health Promotion in the Workplace	4
HP 442	Chronic Disease Epidemiology	4
HP 460	Adolescent Health	4

### Minor in Nutrition and Health Promotion

This minor is designed to appeal to students interested in nutrition, especially in preparation for graduate study in health-related fields (e.g., medicine, public health) or to enter health-related fields of employment. The focus of the minor is on assessing, planning and evaluating dietary intake of individuals or groups under various conditions of health and disease based upon principles of nutrition and behavioral science. Students in this minor will study factors associated with dietary habits and the development of effective individual and group interventions. It complements majors including psychology, gerontology, biological sciences, chemistry, kinesiology and environmental studies.

Required courses (20 units)		Units
HP 230	Nutrition and Health	4
HP 430	Obesity and Health	4
HP 431	Behavior and Education Strategies for Nutrition and Fitness	4
Two of the following:		
HP 370	Introduction to Epidemiology: Methods and Applications	4
HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine	4
HP 402	Maternal and Child Health	4
HP 403	Behavioral Medicine	4
HP 412	Health Promotion and Prevention Policy	4
HP 420	Gender and Minority Health Issues	4
HP 432	Clinical Nutrition	4
HP 433	Advanced Topics in Nutrition	4
HP 460	Adolescent Health	4
HP 480	Internship in Health Promotion and Disease Prevention	2-4, max 4
HP 490X	Directed Research	1-8, max 12

### Minor in Substance Abuse Prevention

This minor offers students an opportunity to gain an overall understanding of substance abuse as a major modifiable risk factor for illness. It allows students to learn theories of behavior change, to understand the issues in prevention and cessation of drug abuse, and to develop, implement, and evaluate intervention strategies. It complements a number of majors including psychology, sociology, American studies and ethnicity, biological science and gerontology.

Required courses (24 units*)		Units
HP 200	Introduction to Health Promotion and Disease Prevention	4
HP 300*	Theoretical Principles of Health Behavior	4
HP 410	Issues in Prevention and Cessation of	4



	Drug Abuse	
HP 411	Drug Intervention Program Design and Evaluation	4
One of the following:		
HP 370	Introduction to Epidemiology: Methods and Applications	4
HP 400	Culture, Lifestyle, and Health	4
HP 401	Cultural Competence in Medicine	4
HP 402	Maternal and Child Health	4
HP 403	Behavioral Medicine	4
HP 412	Health Promotion and Prevention Policy	4
HP 421	Violence as a Public Health Issue	4

\* Including prerequisite

## Graduate Programs — Admissions

### Master of Science in Applied Biostatistics/Epidemiology

The department encourages applicants with undergraduate degrees in allied health, pharmacology, public health, medicine, biological and clinical sciences or other related fields. Undergraduate preparation should have included applied statistics, college algebra, an introductory course in calculus and basic computer programming. Applicants should also meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a GPA of 3.0 for the first 12 units of graduate study.

### Master of Science in Biostatistics

The department encourages applicants with undergraduate degrees in mathematics, statistics or biostatistics, computer science or other related fields. Undergraduate preparation should have included differential and integral calculus, introduction to mathematical statistics, and basic computer programming. Applicants should also meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a GPA of 3.0 for the first 12 units of graduate study.

### Master of Science, Molecular Epidemiology

Students with a bachelor's degree in quantitative biological sciences will be eligible for admission. In addition, the B.A. students must have completed at least one year of general biology, one semester of biochemistry and one semester of statistics to be admitted into the Graduate School. Under unusual circumstances, conditional acceptance will be offered to students who do not meet these requirements – allowing them to complete the missing undergraduate courses prior to their full admission into the Graduate School. An introductory biochemistry class is also available in the School of Pharmacy, which may satisfy the biochemistry prerequisite. A joint departmental admission committee will review all applicants.

### Master of Public Health

The MPH program is offered in two formats: the traditional format (on-campus) and via distance learning (online). The traditional MPH program allows students to choose from seven tracks: Health Education and Health Promotion, Biostatistics/Epidemiology, Health Communication, Child and Family Health, Global Health Leadership, Public Health Policy and Environmental Health. The distance-learning program allows students to

choose from four tracks: Health Education and Promotion, Biostatistics/Epidemiology, Global Health Leadership, and GeoHealth. The curriculum includes a set of core courses for each track and electives. The program also includes a capstone course and an internship placement that integrates academic and practical experiences and prepares individuals to work in governmental and non-governmental organizations in health-related fields.

The department encourages applicants from the USC undergraduate program in health promotion and disease prevention and throughout the campus, as well as health professionals seeking advanced degrees, medical students who are interested in pursuing an MPH along with their medical degree, nurses who desire a more public health focus, pharmacists and dentists. Applicants should meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a grade point average of 3.0 (A = 4.0) in PM 501, PM 510L and PM 512 (12 units).

### Doctor of Philosophy in Biostatistics

The department encourages applicants with undergraduate degrees in mathematics, statistics or biostatistics, or other related fields. Undergraduate preparation should have included differential and integral calculus, introduction to mathematical statistics and basic computer programming. Applicants should also meet the minimum requirements for admission to the Graduate School. Demonstrated proficiency in the English language is essential. With approval of the Graduate School, applicants not meeting these requirements may be conditionally admitted contingent upon maintaining a GPA of 3.5 for the first 12 units of graduate study.

### Doctor of Philosophy in Epidemiology

The department encourages applicants who have undergraduate degrees in allied health, public health, biological sciences or other related fields. Applicants not meeting these requirements may, with approval of the Graduate School, be conditionally admitted contingent upon maintaining a GPA of 3.5 in the first 12 units of graduate studies. Applicants should also meet the minimum requirements for admission to the Graduate School.

### Doctor of Philosophy in Preventive Medicine (Health Behavior Research)

Applicants must have a bachelor's degree from an accredited institution; students entering with an advanced degree may be eligible to transfer course credit. Applicants should also meet the minimum requirements for admission to the Graduate School.

Applicants must supply a completed application for graduate studies, including transcripts from all institutions previously attended, a curriculum vitae (if available), a statement of interest, and three letters of recommendation. For further information contact: Director for Graduate Studies, USC Institute for Health Promotion and Disease Prevention Research, 2001 N. Soto Street, Suite 201B, Los Angeles, CA 90032-3628, (323) 442-8299, FAX: (323) 442-8297.

### Doctor of Philosophy in Statistical Genetics and Genetic Epidemiology

This program is designed to train students for future independent research careers in an academic, government or private sector setting. The department encourages applicants who have undergraduate or master's degrees in mathematics, statistics or biostatistics; statistical genetics or quantitative biological

sciences; or other related fields. The program will consider applicants who satisfy all requirements for admission to the Graduate School and demonstrate proficiency in the English language.

This Ph.D. program is no longer accepting applicants. It now forms a track within the Doctor of Philosophy in Biostatistics degree program (see above).

## Master of Science in Applied Biostatistics/Epidemiology

### Course Requirements

General requirements include at least 38 units of required courses as follows: 25 units of core courses and at least 9 units of elective courses. In addition, each student must register for four units of 594ab Thesis and write a master's thesis.

Core courses (25 units)		Units
PM 510L	Principles of Biostatistics	4
PM 511aL	Data Analysis	4
PM 512	Principles of Epidemiology	4
PM 517a	Research Methods in Epidemiology	3
PM 518a	Statistical Methods for Epidemiological Studies	3
PM 523	Design of Clinical Studies	3
PM 527	Epidemiology of Infectious Disease	4
Electives (at least 9 units)		Units
PM 511bL	Data Analysis	4
PM 515	Behavioral Epidemiology	3
PM 516ab	Statistical Problem Solving	1-1
PM 517b	Research Methods in Epidemiology	3
PM 529	Environmental Health	3
PM 530	Biological Basis of Disease	4
PM 533	Genetic and Molecular Epidemiology	3
PM 590	Directed Research	1-12
PM 611	Advanced Topics in Epidemiology	3
Thesis (4 units)		Units
PM 594ab	Thesis	2-2

Electives will be determined by the student's needs and interests and will be approved by the student's adviser. When appropriate, courses not listed above may be chosen with approval of the student's adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

### Thesis Requirement

A master's thesis is required of all students. This thesis consists of a research project approved by the faculty and chosen from problems encountered within the department, in other departments of the Keck School of Medicine or university or elsewhere in the community.

## Master of Science in Biostatistics

### Course Requirements

General requirements include at least 36 units of required courses as follows: 25 units of core courses and at least 7 units of elective courses. Each student must also register for four units of 594ab Thesis and write a master's thesis.

Core Courses (25 units)		Units
PM 510L	Principles of Biostatistics	4
PM 511abL	Data Analysis	4-4
PM 512	Principles of Epidemiology	4
PM 513	Experimental Designs	3
PM 518a	Statistical Methods for Epidemiological Studies	3
PM 522a	Introduction to the Theory of	3

Statistics		
Electives (at least 7 units)		Units
PM 516ab	Statistical Problem Solving	1-1
PM 518b	Statistical Methods for Epidemiological Studies	3
PM 520	Advanced Statistical Computing	3
PM 522b	Introduction to the Theory of Statistics	3
PM 523	Design of Clinical Studies	3
PM 534	Statistical Genetics	3
PM 544L	Multivariate Analysis	3
PM 552	Survival Methods in Clinical Trials	3
PM 590	Directed Research	1-12
PM 603	Structural Equation Modeling	4
PM 604	Health Behavior Research Methods (or MATH 506, MATH 542, MATH 543, MATH 545L, MATH 547, MATH 548, MATH 549, MATH 550)	4
Thesis (4 units)		Units
PM 594ab	Thesis	2-2

The student's choice of elective courses will be directed by needs and interests and must be approved by the student's graduate adviser. When appropriate, elective courses not listed above may be substituted with approval of the adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

#### Thesis Requirement

A master's thesis is required of all students. This thesis consists of a research project approved by the faculty and chosen from problems encountered within the department, in other departments of the Keck School of Medicine or university or elsewhere in the community.

#### Master of Science in Molecular Epidemiology

##### Course Requirements

The M.S. program requires 37 graduate-level units with a minimum grade point average of 3.0 including epidemiology core courses, 14 units; molecular biology core courses, 12 units; at least 3 elective units; laboratory research plus thesis, 8 units. Students must also complete a master's thesis.

*Prerequisite:* PM 510 Principles of Biostatistics

Epidemiology Core courses (14 units)		
		Units
PM 511aL	Data Analysis	4
PM 512	Principles of Epidemiology	4
PM 518a	Statistical Methods for Epidemiological Studies	3
PM 533	Genetic and Molecular Epidemiology	3
Molecular Biology Core Courses (12 units)		
BIOC 543	Human Molecular Genetics	4
INTD 504	Molecular Biology of Cancer, or	
INTD 555	Biochemical and Molecular Basis of Disease	4
INTD 571	Biochemistry	4
Electives (at least 3 units)		
INTD 561	Molecular Biology	4
PM 517a	Research Methods in Epidemiology	3
PM 523	Design of Clinical Studies	3
Laboratory research + thesis (8 units)		
DPT 590abcd	Directed Research	1-1
		1-1
DPT 594ab	Thesis	2-2

(1) DPT refers to the department offering the laboratory/directed research experience and thesis supervision. DPT is one of the following departments (but not restricted to): PM, BIOC, PATH.

(2) Laboratories should expose students to: statistical and epidemiological methods, molecular techniques, human genetics, population-based studies.

#### Master of Public Health

##### Course Requirements

The master's degree program in public health (MPH) requires a minimum of 47 semester units of required and elective graduate study. The MPH is also available online.

Core Requirements		Units
PM 501	Foundations in Health Education and Promotion	4
PM 508	Health Service Delivery in the U.S., or	
PM 509	Comparative Health Care Systems	4
PM 510L	Principles of Biostatistics	4
PM 512	Principles of Epidemiology	4
PM 529	Environmental Health: An Epidemiological Approach	4
PM 564	Public Health Leadership and Management	3

In addition, at least another 20 to 24 units including the practicum and capstone, must be completed in their selected track of study.

##### Track 1: Health Education and Health Promotion

Required Courses (12 units)		
		Units
PM 526*	Communications in Public Health, or	
PM 562*	Intervention Approaches for Health Promotion and Disease Prevention	4
PM 528	Program Design and Evaluation	4
PM 563	Organizing and Mobilizing Communities for Public Health	4

At least 4 units from the following\*\*: PM 505, PM 514, PM 525, PM 526\*, PM 530, PM 536, PM 542, PM 562\*, PM 564, PM 587 (4 unit courses)

At least 4 units from any 500- or 600-level course\*\*

2 units of a practicum (PM 596) and 2 units of the capstone (PM 597), ending in a final report.

\* May not receive credit for both track core and track elective category.

\*\* Distance learning track elective and elective options are limited. Students should consult their adviser for guidance about available options.

##### Track 2: Biostatistics/Epidemiology

Required Courses (at least 12 units)		
		Units
PM 511aL	Data Analysis (SAS)	4
PM 511bL	Data Analysis (STATA)	4
Select one course from the following:		
PM 527*	Epidemiology of Infectious Disease	4
PM 536*	Program Evaluation and Research	4
PM 537*	Chronic Disease Epidemiology	4

At least 4 units from the following\*\*: PM 514, PM 517ab, PM 518ab, PM 527\*, PM 530, PM 532, PM 536\*, PM 537\*, PM 542, PM 546, PM 558, PM 587 (4 unit courses); PM 515, PM 523, PM 538, PM 586 (3 unit courses)

At least 4 units from any 500- or 600-level course\*\*

2 units of a practicum (PM 596) and 2 units of the

capstone (PM 597), ending in a final report.

\* May not receive credit for both track core and track elective category.

\*\* Distance learning track elective and elective options are limited. Students should consult their adviser for guidance about available options.

The elective courses will be directed by the student's needs and interests and must be approved by the student's graduate adviser. Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

##### Track 3: Health Communication

Required Courses (8 units)		
		Units
PM 526	Communications in Public Health	4
PM 536	Program Evaluation and Research	4

At least 8 units from: CMGT 510, CMGT 511, CMGT 528, CMGT 583, CMGT 587 (4 unit courses); PM 530, PM 542, PM 562, PM 587 (4 unit courses); JOUR 508, JOUR 536 (3 unit courses)

At least 4 units from any 500- or 600-level course 2 units of a practicum (PM 596) and 2 units of the capstone (PM 597), ending in a final report.

##### Track 4: Child and Family Health

Required Courses (12 units)		
		Units
PM 528	Program Design and Evaluation	4
PM 580	Foundations of Child Health	4
PM 585	Child Health Policy	4

At least 4 units from: PM 530, PM 540, PM 581, PM 582, PM 583, PM 584, PM 585, PM 587 (4 unit courses)

At least 4 units from any 500- or 600-level course 2 units of a practicum (PM 596) and 2 units of the capstone (PM 597), ending in a final report.

##### Track 5: Global Health Leadership

REQUIRED COURSES (12 UNITS)		
		UNITS
PM 525	Culture and Health: Global Perspectives	4
PM 565	Introduction to Global Health	4
PM 576	Global Health Research and Programs	4

At least 4 units from the following\*\*: PM 530, PM 557, PM 563, PM 567, PM 568, PM 577, PM 578, PM 587 (4 unit courses)

At least 4 units from any 500- or 600-level course\*\*

2 units of a practicum (PM 596) and 2 units of the capstone (PM 597), ending in a final report.

\*\* Distance learning track elective and elective options are limited. Students should consult their adviser for guidance about available options.

##### Track 6: Public Health Policy

Required Courses (12 units)		
		Units
PM 547	Public Health Policy and Politics	4
PPD 501ab	Economics for Policy, Planning and Development	2-2
PPD 560	Methods for Policy Analysis	4

At least 4 units from: PM 514, PM 528, PM 530, PM 536, PM 542, PM 548, PM 555, PM 577, PM 578, PM 585, PPD 513, PPD 514, PPD 542, or PPD 560

At least 4 units from any 500- or 600-level course  
2 units of a practicum (PM 596) and 2 units of the capstone (PM 597), ending in a final report

#### Track 7: Environmental Health

Required Courses (12 units)		Units
PM 553	Human Exposure Assessment for Public Health	4
PM 554	Biological Effects of Environmental Toxins	4
PM 555	Environmental Health, Policy and Practice	4

At least 4 units from: PM 530, PM 556, PM 557, PM 558

At least 4 units from any 500- or 600-level course

2 units of a practicum (PM 596) and 2 units of the capstone (PM 597), ending in a final report.

#### Track 8: GeoHealth (Online Option Only)

Required Courses (8 units)		Units
SSCI 581	Concepts for Spatial Thinking	4
SSCI 583	Spatial Analysis	4

At least 8 units from: SSCI 584, SSCI 588, SSCI 589

At least 4 units from any 500- or 600- level course

And, 2 units of a practicum (PM 596) and 2 units of Capstone (PM 597), ending in a final report

The elective courses will be directed by the student's needs and interests and must be approved by the student's graduate adviser.

#### Practicum Requirement

A practicum (PM 596) is required of all students. The practicum is provided by an internship rotation through an area of public health practice in a county, state, federal or community-based agency. The practicum offers students the opportunity to observe as well as participate in applying their newly acquired skills and tools. All students are expected to participate in at least one internship and attend a corresponding seminar. An electronic portfolio describing the project and evaluating the outcomes completes the course requirement.

#### Capstone Requirement

Completion of the capstone course (PM 597) is required of all MPH students during their last semester prior to graduation and is the culminating experience for the master's program. The course draws on students' prior training in the five core areas of public health; their additional required course work in their selected track of study; and their "real world" experience gained in the field prior to their graduation. The capstone class is closely linked to the MPH practicum and is designed to challenge students to reflect and integrate their training and experience with the goal of developing their own individual point of view regarding the role of public health in contributing to the improvement of the health and well-being of populations in the United States, as well as abroad.

#### Criteria

Students enrolled in one of the MPH professional dual degree programs (e.g., M.D./MPH, Pharm.D./MPH, DPT/MPH, and Ph.D. (Clinical Psychology)/MPH, MPI/MPH) may waive 4 units of the elective requirement and thus are required a minimum of 43 units to graduate. All other

students must complete a minimum of 47 units to graduate.

#### Doctor of Philosophy in Psychology (Clinical)/Master of Public Health (Health Promotion)

The Ph.D./MPH dual degree combines knowledge of clinical psychology research and practice with an understanding of health from a population perspective. The student enrolls primarily in the clinical psychology doctoral program and may apply to the MPH program during the first year. During the second and subsequent years, course work is taken in both programs. The dissertation is undertaken through the Department of Psychology.

#### Pharm.D./Master of Public Health

The School of Pharmacy and the Master of Public Health program, in recognition of the rapidly changing health care environment and in response to the growing demand for pharmacists who are knowledgeable in both pharmacy and population-based health care issues, have developed a dual degree program. The joint Pharm.D./MPH degree will enable graduates to be more responsive to today's health care needs and will provide training for pharmacists who seek to be agents of change within the profession and to assume leadership roles in the pharmacy field and in public health at the local, state and national levels.

The Pharm.D./MPH program spans five years (four years of pharmacy school courses and one year of public health courses). Students begin the core MPH courses following the successful completion of the first year of pharmacy school. The last three years of the program are devoted to the clinical rotations of the School of Pharmacy and to the completion of the elective courses and practicum (field experience) of the MPH program.

All students in the Pharm.D./MPH program must meet course requirements, grade point average requirements and program residency requirements of both programs. Students must have a cumulative GPA of 3.0 in the Pharm.D. curriculum and a 3.0 in the MPH curriculum to meet graduation requirements.

The Pharm.D. and the MPH degrees are awarded simultaneously upon completion of the School of Pharmacy and the Master of Public Health requirements.

#### Application and Admissions Requirements

Students may apply to the dual Pharm.D./MPH degree program in two ways. First, they may apply at the time they submit their Pharm.D. application by concurrently submitting applications to both programs. Students who elect this approach must identify themselves on both applications as potential dual degree students. Students admitted to both programs will be offered admission to the Pharm.D. and will be offered admission to the dual degree program contingent on passing all courses in their first year of the Pharm.D. with a minimum 3.0 G.P.A. Students who are accepted only by one program may choose to attend that program but will not be eligible for the dual degree. Second, students can apply to the dual degree by submitting an application to the MPH program during their first year of enrollment in the Pharm.D. prior to the MPH published application deadline. Students who elect this approach must apply through the School of Pharmacy. Students admitted to the MPH program using this approach will be offered admission to the dual degree contingent on passing all courses in their first year of the Pharm.D. with a minimum 3.0 G.P.A. Students accepted to the dual degree program must maintain a minimum 3.0 G.P.A. in Public Health and Pharm.D. courses.

#### Master of Planning/Master of Public Health

The Master of Planning/Master of Public Health (MPI/MPH) dual degree is designed for individuals who envision a career that combines urban planning and public health disciplines. This dual degree combines the knowledge of urban planning with an understanding of health from a population perspective. It will provide training for planning, evaluating and guiding healthy community and urban development, and will enable graduates who seek to be agents of change within the profession to assume leadership roles in planning and in public health at the local, state and national levels. A total of 79 units are required for the dual degree. For further information about dual degree requirements, see the USC Price School of Public Policy.

#### Master of Social Work/Master of Public Health

The Master of Social Work/Master of Public Health (MSW/MPH) dual degree offers the student interdisciplinary preparation in the fields of public health and social work leading to the Master of Social Work (MSW) and Master of Public Health (MPH) degrees.

The dual degree program is a collaborative effort between the USC School of Social Work and the Department of Preventive Medicine in the Keck School of Medicine. The objectives of the program are to provide students with the knowledge and skills necessary to promote health, prevent disease, and enhance the delivery of health and social services in the community. Students will build interdisciplinary skills and an interdisciplinary professional identity by developing an understanding of the breadth of each field and their interface, while permitting concentration in particular specialization areas. The program prepares graduates for work in a variety of interdisciplinary settings; and for some, it will provide the basis for doctoral study.

Students must complete a minimum of 81 units: 45 units in social work and 36 units in preventive medicine; 16 of these units fulfill requirements for both degrees. Depending on specific social work concentration and public health track requirements, there may be additional courses and an increase in the total number of units. Most students complete both program requirements over three years for full-time students; however, the program can be completed in two years if the student takes a full course load during the two summer sessions. Dual degree students in this program complete the standard foundation year courses during the first year in the School of Social Work with the exception of SOWK 562 Social Work Research. Students may select only the health concentration in social work and either of two public health tracks: health education and promotion; or child and family health.

#### M.D./Master of Public Health

The joint M.D./MPH program at the Keck School of Medicine is designed for individuals who envision a medical career that combines public health and medical disciplines. For further information about the joint program, refer to the program page.

#### Doctor of Physical Therapy/Master of Public Health

The Post Professional Doctor of Physical Therapy (DPT) and the Master of Public Health (MPH) dual degree program offers the opportunity for physical therapy clinicians to pursue a doctoral-level education in combination with an integrated approach to health care. The program spans four years. Students begin the first one to two years completing MPH core and elective course work in the Department of Preventive Medicine. The remaining two years are devoted to program requirements in physical therapy.

## Doctor of Philosophy in Biostatistics

The department offers a degree program leading to the Ph.D. in biostatistics. The program is designed to produce biostatisticians who will have in-depth knowledge of statistical theory and methodology and the ability to apply this knowledge creatively to statistical problems in the biological and health sciences. All students will enroll in a set of core courses that cover both biostatistical theory and applications. Students will then choose from one of four tracks that will allow them to develop expertise in a specific area. The available tracks are: (1) biostatistics theory; (2) statistical genetics; (3) environmental statistics; (4) clinical trials.

### Course Requirements

A minimum of 60 units of graduate study is required for the Ph.D. degree; a maximum of 19 of these units may be from research and dissertation. In preparation for the qualifying examination, students are required to take all remaining core and track-specific courses.

### Screening Procedure

In preparation for the screening examination, all students must take four core courses: PM 511ab and PM 522ab. A student failing the screening examination will either terminate or will terminate with the M.S. degree upon completion of an acceptable thesis.

### Qualifying Exam Committee

A formal qualifying exam committee will consist of at least five faculty members. The committee chair and at least two additional members must be affiliated with the student's program. At least three members of the committee must be tenured or tenure track.

### Qualifying Examination

The written portion of the qualifying examination will comprise testing on track-specific course content and focus on the student's dissertation topic. An oral examination will ascertain the student's competence in orally communicating this knowledge. Students must pass the written portions and the oral portions in order to pass the qualifying examination.

### Annual Research Appraisal (ARA)

Beginning in the second year, each student must register for PM 610 (1 unit) and present an annual progress report to the program oversight committee. Once a dissertation topic has been selected, the annual progress report is presented to the student's qualifying exam committee. Once the student has passed the qualifying examination and is appointed to candidacy, the annual progress report is presented to the student's dissertation committee. The student will meet annually with the dissertation committee, until he or she graduates from the program. The oral portion of the screening examination as well as the qualifying examination and the defense examination will count as ARAs.

### Dissertation and Oral Defense

Upon passing the qualifying examination the Ph.D. candidate and his or her chair will recommend a three-member dissertation committee. The dissertation should be completed within two years and should be oriented toward a theoretical-methodological application to a problem area in the biological or health sciences. The oral defense is based on a rough draft or final version of the dissertation. The defense is administered by the dissertation committee, with other faculty invited to attend.

Prerequisite		Units
PM 510L	Principles of Biostatistics	4

Required Courses for all tracks (Screening exam courses)		Units
PM 511ab	Data Analysis	4-4
PM 522ab	Introduction to the Theory of Statistics	3-3

Recommended Courses: All tracks		Units
PM 511c	Data Analysis	4
PM 520	Advanced Statistical Computing	3
PM 610	Seminar in Biostatistics and Epidemiology	1

Recommended Courses: Biostatistics Theory Track		Units
PM 513	Experimental Designs	3
PM 518ab	Statistical Methods for Epidemiological Studies I, II	3-3

Recommended Courses: Statistical Genetics Track		Units
PM 534	Statistical Genetics	4
PM 570	Introduction to Statistical Genetics	4

Recommended Courses: Environmental Statistics Track		Units
PM 518ab	Statistical Methods for Epidemiological Studies I, II	3-3
PM 558	Environmental Epidemiology: Concepts, Methods and Practice	4
PM 575	Statistical Methods in Environmental Epidemiology	3

Recommended Courses: Clinical Trials Track		Units
PM 513	Experimental Designs	3
PM 518a	Statistical Methods for Epidemiological Studies I	3
PM 523	Design of Clinical Studies	3
PM 552	Statistical Methods in Clinical Trials	3

### Elective Courses

BIOC 543, BISC 478, BISC 502ab, BISC 505, BISC 577ab, CSCI 570, CSCI 653, INTD 561, INTD 572, INTD 573, MATH 505ab, MATH 507ab, MATH 509, MATH 520, MATH 541ab, MATH 542L, MATH 543L, MATH 545L, MATH 547, MATH 548, MATH 550, MATH 578ab, PM 511c, PM 513, PM 516ab, PM 517ab, PM 518ab, PM 520L, PM 523, PM 533, PM 538, PM 544L, PM 552, PM 558, PM 565, PM 575, PM 579, PM 599, PM 603, SSCI 581, SSCI 582, SSCI 583, SSCI 585, SSCI 586, SSCI 587, SSCI 589

## Doctor of Philosophy in Epidemiology

The department offers a degree leading to the Ph.D. in epidemiology. This program may be an extension of the applied biostatistics and epidemiology M.S. program and is especially aimed at persons with a strong background in medicine: in particular, students enrolled in the M.D. program of the Keck School of Medicine who wish to interrupt their M.D. studies after two years to complete a Ph.D. degree. This program is designed to produce an epidemiologist with in-depth statistical skills. The program requires a solid core of courses in methodological aspects of statistics and in statistical thinking as applied to medicine, as well as a solid grounding in epidemiological methods and in certain medical disciplines.

### Course Requirements

A minimum of 60 course units with a maximum of 20 units of research and dissertation; passing of screening

and qualifying examinations; and completion of dissertation and final oral are required. In preparation for the screening examination the student must take the required core course and elective 33 units of master's level applied biostatistics and epidemiology courses. A student failing the screening examination will either terminate or terminate with the M.S. degree upon satisfactory completion of a master's thesis. In preparation for the qualifying examination, the student is required to join an on-going research project under the direction of the chair of the qualifying exam committee and directly participate in the conduct of that project. Credit will be given as PM 790 (4 units, two semesters). In addition, it is recommended that the student take PM 610 (at least two semesters). Electives may be selected with the approval of the chair of the qualifying exam committee from courses in the biological sciences or from the medical school. For students in the M.D./Ph.D. program in epidemiology, satisfactory completion of the first two years of the M.D. program will be considered to provide 20 units toward the Ph.D. degree.

### Qualifying Exam Committee

A formal qualifying exam committee will consist of at least five faculty members. The committee chair and at least two additional members must be affiliated with student's program. At least three members of the committee must be tenured or tenure track.

### Qualifying Examination

The written portion of the qualifying examination will test the student's integration of knowledge in biostatistics and medicine. In general, the qualifying examination will present plans for implementation and completion of three components: an independent and complete data analysis arising from ongoing epidemiological study, a "review" paper on an area of epidemiological research, and a grant application for a new epidemiological study.

### Dissertation

Upon passing the qualifying examination, the Ph.D. candidate and his or her chair will recommend a three-member dissertation committee. The dissertation should be completed within two years and should be oriented toward a methodological application to a problem area in the biological or health sciences.

### The Oral Defense

This examination is based on a draft or final version of the dissertation and will be administered by the dissertation committee with other faculty invited to attend.

### Language and Other Requirements

Proficiency in the English language is essential.

### Course Requirements

Students must complete a minimum of 60 units, with a maximum of 20 units of research and dissertation; pass screening and qualifying examinations; complete the dissertation and the dissertation defense examination. In addition the student is required to join a research project under the direction of one or both of the chairs of the qualifying exam committee and directly participate in the conduct of that project. Credit will be given by the department (DPT) conducting the research project DPT 790 Research (4 units, 2 semesters). In addition, at least two semesters of PM 610 is recommended.

**Prerequisites:** PM 510 Principles of Biostatistics or the equivalent. INTD 571 Biochemistry or the equivalent.

**Biochemistry and Molecular Biology Core Courses (16 units):** BIOC 543, INTD 531, INTD 561, INTD 504 or INTD 555.

**Preventive Medicine Core Courses (17 units):** PM 522aL, PM 512, PM 517a, PM 518a, PM 533.

**Suggested Electives (at least 7 units) from:** MICB 551, PM 511bL, PM 517b, PM 523, PM 527, PM 529 and PM 534.

#### Preparation for Screening Examination

The screening examination will be taken after two years in the program. Prior to the screening examination a mentor who will serve on the qualifying exam committee must be identified. The screening examination will consist of a written component and an oral component. The written component will be drawn from the core courses. A student failing the screening examination may be given a second opportunity to retake either one or both portions. Students failing the examination for the second time will terminate with the M.S. degree upon satisfactory completion of 37 units and an acceptable master's thesis.

#### Annual Research Appraisal (ARA)

Beginning in the second year, each student must register for PM 610 (1 unit) and present an annual progress report to the program oversight committee. Once a dissertation topic has been selected, the annual progress report is presented to the student's qualifying exam committee. Once the student has passed the qualifying examination and is appointed to candidacy, the annual progress report is presented to the student's dissertation committee. The student will meet annually with the dissertation committee, until he or she graduates from the program. The oral portion of the screening examination as well as the qualifying examination and the defense examination will count as ARAs.

#### Doctor of Philosophy in Preventive Medicine (Health Behavior Research)

The Department of Preventive Medicine, Division of Health Behavior Research, offers a degree program in preventive medicine (health behavior), leading to attainment of the Ph.D. The program is designed to train exceptional researchers and scholars in the multidisciplinary field of health behavior research. Students receive a thorough grounding in academic and research experience, encompassing theoretical and methodological training in such allied fields as communication, psychology, preventive medicine, biostatistics, public health and epidemiology. Students receive research experience by participating in projects conducted through the USC Institute for Health Promotion and Disease Prevention Research (IPR). The doctoral program is full-time: students are expected to enroll for fall, spring and summer semesters.

#### Assistantships

Financial and educational support is provided to qualified doctoral students in health behavior research. Graduate (research and/or teaching) assistantships are half-time (20 hours per week) and provide tuition remission as well as a monthly stipend.

#### Computer Language Requirement

Sufficient familiarity in computer languages to operate major software packages for data management and analysis is required.

#### Course Requirements

The doctoral program in health behavior research is structured as a four to five year course of study for students entering with a bachelor's degree. Time

requirements are subject to review and approval by the division's Graduate Program Committee and the Graduate School.

A total of 60 units of graduate study is required for the Ph.D. in health behavior research. Students are required to complete nine core courses: PM 500, PM 511aL, PM 515, PM 530, PM 601, PM 602, PM 604 and PM 756 (total of 37 units). Other requirements include: two elective PM courses, one not offered by health behavior faculty (minimum of 7 units); and a minimum of 4 units each in PM 590, PM 690abcdz, PM 790 and PM 794abcdz.

For students entering with a bachelor's degree, one of the directed research projects will be equivalent in scope to a master's thesis. All research experiences/projects must be completed before registering for 794abcdz Doctoral Dissertation.

#### Screening Procedure

The progress of each student is reviewed at the end of every academic year. At the end of the second year of study, students who have not made satisfactory progress are advised that they will be dropped from the program unless their progress improves during their second year.

#### Qualifying Exam Committee

Each student's qualifying exam committee consists of five members, including: no more than three health behavior faculty members; one other member from the Department of Preventive Medicine; and one member from a doctorate-granting program outside the Department of Preventive Medicine, representing the student's minor field.

#### Qualifying Examination

Following course work and prior to beginning the dissertation, students must demonstrate written and oral mastery of the general field of health behavior research as well as of their chosen area of specialization. The qualifying process includes a written examination on theory and literature relevant to a selected content area. The examination is administered by the student's qualifying exam committee.

In addition to the qualifying examination, each student is expected to produce the following as evidence of qualification to conduct dissertation research: an academic dossier consisting of a summary of the student's academic record, teaching and research experience, and professional presentations and publications; at least one original empirical research paper of publishable quality, produced in connection with one of the student's courses or research experiences or developed independently; a dissertation proposal; and an oral defense of all the preceding materials.

## Courses of Instruction

### Health Promotion and Disease Prevention Studies (HP)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**HP 101 Current Issues in Medical Education and Healthcare (2, Sp)** Current critical issues in healthcare delivery; strategies to succeed in medical school and as physicians.

**HP 200 Introduction to Health Promotion and Disease Prevention (4, Fa)** Introduction to strategies for

promoting health and wellness. Includes self monitoring of health risk behavior, goal setting, and behavior changes.

**HP 230 Nutrition and Health (4, FaSp)** Nutrition as it relates to health promotion across the lifespan and disease prevention. Discussion of nutrients, factors affecting food choices, food safety and global nutrition issues.

**HP 270 Introduction to Global Health (4, Fa)** Introduction to concepts of global health and disease control. Issues of globalization, global governance, emerging diseases, infectious disease treatment, and outbreak challenges.

**HP 290 Introduction to Research Apprenticeship (2, max 8, FaSp)** Individual research apprenticeship in health related fields under supervision of a departmental faculty member. Graded CR/NC.

**HP 300 Theoretical Principles of Health Behavior (4, FaSp)** Overview and analysis of predictors and consequences of health-related behaviors; theoretical viewpoints and strategies for behavior change. *Recommended preparation:* HP 200; *prerequisite:* PSYC 100.

**HP 320 Biological and Behavioral Basis of Disease (4, FaSp)** Examination of the major systems of the human body; disease processes and behavioral risk factors. *Prerequisite:* BISC 220L or BISC 221L.

**HP 340L Health Behavior Statistical Methods (4, FaSp)** Intermediate statistics for health behavior studies; topics include descriptive statistics, hypothesis testing, correlation and regression, and use of computer software in data analysis.

**HP 345 Health Issues in Entertainment Media (4, FaSpSm)** Study of major chronic illnesses and their risk factors as a foundation for discussions about the portrayal of health and illness in entertainment media. (Duplicates credit in the former CNTV 345.)

**HP 350L Health Behavior Research Methods (4, FaSp)** Introduction to the design, conduct and evaluation of health behavior research studies; quantitative and qualitative approaches to research and analysis. *Recommended preparation:* HP 340L.

**HP 370 Introduction to Epidemiology: Methods and Applications (4)** Examines the primary goals and methods of epidemiology, the study of factors that influence health and disease in individuals and populations.

**HP 400m Culture, Lifestyle, and Health (4, Sp)** Comparison of national and international differences in health status as influenced by cultural practices and lifestyles within geographic, economic and political environments.

**HP 401 Cultural Competence in Medicine (4, Fa)** Systematic development of specific professional skills for providing effective, culturally sensitive health services to diverse populations. *Recommended preparation:* ANTH 101.

**HP 402 Maternal and Child Health (4, Sp)** Health issues of women of childbearing age from pre-pregnancy through the postpartum period, and of children from their development in utero through early adolescence. *Recommended preparation:* PSYC 100.

**HP 403 Behavioral Medicine (4, Sp)** Examines behavioral risk factors for illness, health-enhancing and health-compromising behaviors, stress/coping in promoting health and preventing illness, and behavioral management of chronic illness. *Prerequisite:* PSYC 100.

**HP 404 Religion and Health (4, Fa)** Differential relationships of religiosity and spirituality with health and

risk behaviors, physical and mental health outcomes, coping skills and well-being across cultures and religions.

**HP 405 Sexually Transmitted Diseases: A Global Public Health Priority (4)** An overview of the magnitude and impact of STDs including prevention, diagnosis, and treatment of common STDs, STD/HIV inter-relationship, global burden, trends, public health challenges, and STD/HIV prevention and control strategies and programs worldwide.

**HP 408 Environmental Health in the Community (4)** Survey of occupational and environmental health. Introduction to epidemiology, exposure assessment, toxicology, policy development, risk assessment, and effects of urban development on health.

**HP 410 Issues in Prevention and Cessation of Drug Abuse (4, Sp)** Examination of factors related to drug abuse behaviors; overview and assessment of drug abuse prevention and cessation programs; relapse prevention programs. *Recommended preparation:* HP 300.

**HP 411 Drug Intervention Program Design and Evaluation (4, Sp)** Strategies for drug abuse prevention and intervention; introduction to techniques and research methods used in designing, conducting, and evaluating drug abuse prevention programs. *Recommended preparation:* HP 410.

**HP 412 Health Promotion and Prevention Policy (4, Sp)** Overview of health promotion and drug prevention policy at local, state, and federal levels; methods for evaluating policy effectiveness and cost effectiveness.

**HP 420m Gender and Minority Health Issues (4, Fa)** Examines the nature and roots of health disparities among women, men, and different ethnic and age groups; methods for reducing such disparities; strategies for prevention services.

**HP 421 Violence as a Public Health Issue (4, Fa)** Patterns and prevalence of violence; psychosocial, environmental, and biological influences on violent behavior; youth gangs; drugs and violence; family violence; and prevention and intervention strategies.

**HP 422 AIDS in Society (4, Sp)** Provides a broad examination of issues in HIV/AIDS, including behavioral, social, biological, clinical and ethical dimensions of the pandemic in the U.S. and elsewhere.

**HP 430 Obesity and Health (4, Fa)** *Examination of causes and consequences of obesity, with emphasis on health risks of type II diabetes and cardiovascular disease.* *Recommended preparation:* HP 230.

**HP 431 Behavior and Education Strategies for Nutrition and Fitness (4, Sp)** Examination of dietary intake and exercise behaviors as they relate to health and illness; methods for measuring diet and exercise. *Recommended preparation:* HP 430.

**HP 432 Clinical Nutrition (4, Irregular)** Metabolism of carbohydrates, fats and protein; introduction to vitamins, minerals and dietary modifications in various pathological conditions. *Prerequisite:* CHEM 105a; *recommended preparation:* HP 230.

**HP 433 Advanced Topics in Nutrition (4, Sp)** In-depth discussion of vitamins and minerals and their role in human nutrition; introduction to the role of vitamins and minerals in selected pathological conditions. *Prerequisite:* HP 432.

**HP 434 Physical Activity and Health (4, FaSpSm)** Examination of the health impacts of physical inactivity; participation rates across subgroups; physical activity determinants; and interventions, programs, and policies to promote physical activity. *Recommended preparation:* HP 200.

**HP 440 Happiness, Well-Being, and Health (4, Sp)** Explores human strengths that promote happiness/well-being and whether they influence physical health; mind-body relationships; and strategies for promoting hope, resilience, and quality of life. *Recommended preparation:* HP 200, PSYC 100.

**HP 441 Health Promotion in the Workplace (4, Fa)** Covers phases of worksite health promotion; research, design, implementation and evaluation; concerns regarding escalating medical costs and the role of health promotion in offering solutions.

**HP 442 Chronic Disease Epidemiology (4, Sp)** Overview of causative factors and demographic distributions of the major chronic diseases in the western world; epidemiologic concepts and research designs. *Recommended preparation:* HP 320.

**HP 443 Communicating Health Messages and Medical Issues (4)** (Enroll in COMM 443)

**HP 446 Poisons, People, and Politics (4, Fa)** Case studies of toxic exposures and investigation of the role of government, scientists, labor and industry in protecting against health threats caused by toxic exposures.

**HP 448 Global Environmental Changes and Health (4, FaSpSm)** Discussion of global environmental changes, including climate change, air pollution, water pollution, radiation, and their impacts on human health.

**HP 450 Traditional Eastern Medicine and Modern Health (4, Fa)** Overview of traditional Eastern approaches toward health and disease; relevance to modern health issues, emphasizing a comparison between traditional Chinese and modern Western medicine. *Recommended preparation:* fundamentals of medicine.

**HP 460 Adolescent Health (4, Fa)** Survey of the development of healthy and the prevention of health-risk behaviors during adolescence. Prevention and promotion techniques will be explored emphasizing cultural differences.

**HP 465 Health Status of Indigenous Peoples of America (4, FaSpSm)** Survey of indigenous people's health, including health conditions, special cultural and ethical considerations, the Indian health system, and the politics of indigenous health.

**HP 470 Case Studies in Global Health (4, Sp)** Case study examination of programs and organizational structure underlying current international efforts addressing problems related to infection disease, chronic disease, global environmental change, emergencies and emerging disease epidemics. *Prerequisite:* HP 270.

**HP 480 Internship in Health Promotion and Disease Prevention (2-4, max 4, FaSpSm)** Field placement in a community agency such as a county health services agency, a not for profit voluntary agency or a health care setting. Open to majors only. Graded CR/NC. *Prerequisite:* completion or concurrent registration in required core courses.

**HP 483 Global Health and Aging (4, Fa)** (Enroll in GERO 483)

**HP 485 Global Health: Obesity and Nutrition (4, FaSpSm)** Overview of the epidemiology of obesity and related diseases and the etiology of obesity, including genetic, biological, behavioral, environmental and socio-cultural correlations.

**HP 490x Directed Research (1-8, max 12, FaSpSm)** Individual research and readings. Not available for graduate credit. Open to HP majors only. *Corequisite:* HP 340L; *recommended preparation:* HP 350L.

**HP 499 Special Topics (2-4, max 8)** Lecture and discussion focused on specific topics within health promotion and disease prevention. Course topic will vary from semester to semester.

## Preventive Medicine (PM)

**PM 500 Foundations of Health Behavior (4, Fa)** Overview of behavioral theory and research in disease prevention and health promotion and in adaptation of chronic disease, including an introduction to measures of outcomes. *Prerequisite:* admission to Ph.D. in Preventive Medicine.

**PM 501 Foundations in Health Education and Promotion (4, FaSpSm)** Overview and application of behavioral theories to the field of health education and promotion. Examines the determinants of health behavior and strategies for change at the individual, group and community level.

**PM 505 Training and Curriculum Design in Public Health (4, Sm)** Curriculum writing and training skills applied to public health needs and settings. Covers adult learning theories, assessment of learning needs, curriculum design, training design, conduct and evaluation. *Recommended preparation:* PM 500.

**PM 508 Health Service Delivery in the U.S. (4, FaSpSm)** Historical development of the American health care system; determinants of health care utilization; role of health care providers; health policy; public health services; and health care finance.

**PM 509 Comparative Health Care Systems (4, Sp)** Macro-level analysis of the structure and delivery of health care services around the world, including an examination and comparison of health system performance.

**PM 510L Principles of Biostatistics (4, FaSp)** Concepts of biostatistics; appropriate uses and common misuses of health statistics; practice in the application of statistical procedures; introduction to statistical software including EXCEL, SPSS, nQuery. Laboratory.

**PM 511abcL Data Analysis (4-4-4, a: FaSp, b: Sp, c: FaSpSm)** *a:* Major parametric and nonparametric statistical tools used in biomedical research, computer packages including SAS. Includes laboratory. Lecture, 3 hours; laboratory, 1 hour. *Prerequisite:* PM 510L. *b:* Exploratory data analysis, detection of outliers, robust methods, fitting data with linear and nonlinear regression models, computer packages including BMDP. Includes laboratory. Lecture, 3 hours; laboratory, 1 hour. *c:* Methods and applications for modeling longitudinal, time-to-event and multi-level data. Includes laboratory using R package. Lecture, 2 hours; laboratory, 2 hours.

**PM 512 Principles of Epidemiology (4, FaSp)** Terminology/uses of epidemiology and demography; sources/uses of population data; types of epidemiologic studies; risk assessment; common sources of bias in population studies; principles of screening. *Recommended preparation:* algebra.

**PM 513 Experimental Designs (3, Sp)** Statistical methods for analysis of various experimental designs. Parametric analysis of variance (ANOVA), repeated measures methods, crossover designs, non-parametric ANOVA. *Prerequisite:* PM 510L.

**PM 514 Detection and Control of Sexually Transmitted Infections (4, Sm)** Overview of issues concerning the design and implementation of STI prevention and control programs. Epidemiology, diagnosis, treatment and partner management strategies for common STIs in the U.S. *Recommended preparation:* PM 501, PM 512.

**PM 515 Behavioral Epidemiology (3, 2 years, Sp)** Basic understanding of behavioral risk factors in chronic disease and premature mortality; epidemiological methods for studying behavioral risk factors. *Recommended preparation:* PM 511ab, PM 512.

**PM 516ab Statistical Problem Solving (1-1, FaSpSm)** *An overview of the tools used by statisticians for solving statistical problems. Prerequisite:* PM 510L.

**PM 517ab Research Methods in Epidemiology (a: 3, Fa, b: 3, Sp)** *a:* Study design, ascertainment of study objects, questionnaire development, various methodological issues in data analysis and interpretation including bias, measurement error, confounding and effect modification. *Prerequisite:* PM 511aL, PM 518a. *b:* Overview of epidemiologic research in cancer. Selected cancer sites will be covered to highlight study design and conduct, exposure assessment, data analysis and interpretation. *Prerequisite:* PM 517a.

**PM 518ab Statistical Methods for Epidemiological Studies I, II (3-3, Sp)** *a:* Principles and methods used in epidemiology for comparing disease frequencies between groups. Restricted to the analysis of binary outcome variables. *Prerequisite:* PM 512. *b:* Statistical methods for binary outcomes by introducing techniques for cross classified risks and rates and regression models for individual data. *Prerequisite:* PM 518a.

**PM 519 Introduction to Human Nutrition (4, Sp)** Dietary role of carbohydrates, proteins, lipids, vitamins, and minerals in metabolism; nutritional assessment; nutritional deficiencies. Focus on the role of nutrition in the prevention and treatment of chronic disease. (Duplicates credit in former PHNU 527.) *Recommended preparation:* PM 530.

**PM 520L Advanced Statistical Computing (3, SpSm)** Techniques for the solution of statistical problems through intensive computing; iterative techniques, randomization tests, the bootstrap, Monte Carlo methods.

**PM 521ab Seminar in Nutrition (2-2, FaSp)** (Duplicates credit in former PHNU 520ab.)

**PM 522ab Introduction to the Theory of Statistics (3-3, FaSp)** *a:* Density distribution and hazard functions; normal, chi-square, student's t and F distributions; and sampling procedures for single factor and multiple factor designs, distributions. *Recommended preparation:* working knowledge of multivariable calculus and familiarity with linear algebra. *b:* Theory of estimation and testing, inference, analysis of variance, theory of regression. *Recommended preparation:* college-level calculus and linear algebra.

**PM 523 Design of Clinical Studies (3, Sp)** *Design, conduct, and interpretation of results of clinical trials; emphasis on principles affecting structure, size, duration of a trial, and the impact of ethical and practical considerations. Prerequisite:* PM 511abL, PM 513.

**PM 524abc Practicum in Health Behavior (2-2-2, FaSpSm)** Practical experience in a variety of field settings to gain a certain type of skill such as curriculum development, media production, and patient education. *a:* Practicum in prevention; *b:* practicum in compliance; *c:* practicum in health behavior topics. *Recommended preparation:* PM 500.

**PM 525 Culture and Health: Global Perspectives (4, FaSpSm)** International variations in health status with a focus on the impact of socioeconomic status, politics, environment, education and gender in etiology of illness, access to health care, progression of disease, and recovery.

**PM 526 Communications in Public Health (4, Sp)** Application of communication theories and methods to community health problems. Includes background

assessment, program design, evaluation, social marketing, media advocacy, review of major health campaigns. *Recommended preparation:* PM 500.

**PM 527 Epidemiology of Infectious Disease (4, FaSpSm)** Survey of natural history of infectious disease, methods of disease control and outbreak investigation, and an overview of the epidemiology of injury. *Prerequisite:* PM 512.

**PM 528 Program Design and Evaluation (4, Sp)** Core concepts, methods and values of public health program planning and evaluation, including community needs assessment, writing objectives, designing health promotion programs, process and outcome evaluation. *Recommended preparation:* PM 500.

**PM 529 Environmental Health: An Epidemiological Approach (4, FaSpSm)** An overview of environmental health, identifying issues in assessing effects of exposure on health and potential interventions for reducing adverse health risks. *Prerequisite:* PM 512.

**PM 530 Biological Basis of Disease (4, 2 years, Sp)** With a physiological overview, differentiates genetic and environmental disease; emphasis on the relationships between lifestyle, behavior, and health. *Prerequisite:* admission to Ph.D. in Preventive Medicine, Health Behavior Research or basic biology.

**PM 531 Research Methods in Nutrition (4, Fa)** In-depth discussion of nutrition research including nutrition assessment, measurement of dietary intake, study design, statistical issues, critical appraisal, and translation into practice. Open to M.P.H. nutrition track students only. *Prerequisite:* PM 510, PM 512.

**PM 532 Genetics in Public Health and Preventive Medicine (4, Sm)** History and philosophy of public health genetics and mechanisms of genetic diseases. Epidemiologic methods used to identify genetic diseases in individuals, families, and populations. Emphasis on prevention and relevant ethical issues. *Recommended preparation:* PM 512.

**PM 533 Genetic and Molecular Epidemiology (3, 2 year, Fa)** Genetic principles; design and analysis of family studies; introduction to likelihood estimation; segregation and linkage analysis; biomarkers of exposure, susceptibility, and disease; laboratory methods; susceptibility genes; association and linkage disequilibrium. *Prerequisite:* PM 510L, PM 511a, PM 512, PM 518a.

**PM 534 Statistical Genetics (4, Sp)** Familial aggregation, segregation analysis, linkage analysis, association, regressive models, gene-environment interactions, genetic heterogeneity and linkage disequilibrium. *Prerequisite:* PM 518a, PM 522a.

**PM 535 Nutrition in Public Health (4, Fa)** Principles related to developing effective programs and services to improve the health and nutrition within a community. Attaining and maintaining nutritional health related to biology, lifestyle choices, environments, and health care delivery systems. (Duplicates credit in former PHNU 523.) *Recommended preparation:* PM 530.

**PM 536 Program Evaluation and Research (4, Fa)** Overview of concepts, tools, data collection, analysis methods and designs used to evaluate health promotion programs. Examples from substance abuse prevention, family planning and reproductive health programs.

**PM 537 Chronic Disease Epidemiology (4, FaSpSm)** Overview of causative factors and demographic distribution of major chronic diseases in the western world. Epidemiologic concepts, methods and research design as applied to chronic disease prevention will be emphasized. *Prerequisite:* PM 512.

**PM 538 Introduction to Biomedical Informatics (3, Sm)** Overview of current topics, enabling technologies, research initiatives, and practical considerations in biomedical informatics.

**PM 539 Nutrient-Drug Interactions (2, Sm)** Examines the various ways foods, and the nutrients contained in them, interact with medications used to treat chronic health conditions.

**PM 540 Maternal and Child Nutrition: Practice and Policy (4)** Physiological basis for good nutrition during pregnancy and childhood through adolescence. Design, implementation and evaluation of public health nutrition programs and policies serving women and children. *Recommended preparation:* PM 530.

**PM 541 Obesity, Metabolism and Health (4, Fa)** Overview of the epidemiology of obesity, related health conditions and mechanisms related to energy balance, food intake and genetics. Discussion of prevention and treatment strategies. *Recommended preparation:* PM 530.

**PM 542 Social Network Analysis (4, Sp)** Theory, methods and procedures of network analysis with emphasis on applications to public health programs.

**PM 543L Nonparametric Statistics (3)** (Enroll in MATH 543L)

**PM 544L Multivariate Analysis (3, 2 years, SpSm)** Exploratory and inferential techniques for multivariate data, Hotelling's  $T^2$ , multivariate analysis of variance, classification analysis, principle components, cluster analysis, factor analysis. Involves computer use. *Prerequisite:* PM 510L, PM 522a.

**PM 545L Introduction to Time Series (3)** (Enroll in MATH 545L)

**PM 546 Biological Threats and Terrorism (4, Fa)** History of biowarfare and bioterrorism; proper surveillance techniques, capacity building for public health and medical communities, and the importance of effective communications. Methods of preparedness, prevention and response are examined. *Recommended preparation:* PM 512.

**PM 547 Public Health Policy and Politics (4, FaSp)** Examination of major policy issues in the U.S. health care delivery system to understand policy options in reforming health care and reducing health care disparities. *Prerequisite:* PM 508.

**PM 548 Prevention and Public Policy (2, FaSp)** *Introduction to prevention policy framework; examination of how the application of epidemiology and behavioral aspects of diseases shapes the development of public health policy. Prerequisite:* PM 508, PM 512.

**PM 549 Human Molecular Genetics (4, FaSpSm)** (Enroll in BIOC 543)

**PM 550 Sample Surveys (3)** (Enroll in MATH 550)

**PM 552 Statistical Methods in Clinical Trials (3, 2 years, Sp)** Stochastic failure process; parametric models for survival data; sample size estimation procedures for clinical trials; multivariate regression models for binary outcome and censored survival data; computer programs; multiple failure modes and competing risks. *Prerequisite:* PM 518a, MATH 408.

**PM 553 Human Exposure Assessment for Public Health (4, FaSpSm)** Examination of important routes of exposure to toxic materials; how to measure exposure; strengths and weaknesses of different measurement techniques; design of exposure assessment studies. *Recommended preparation:* PM 510 or one semester of statistics and background in science or engineering for graduate students not in MPH.

**PM 554 Biological Effects of Environmental Toxins (4, FaSp)** Overview of how environmental exposures affect various biological systems and lead to observed health outcomes in populations. *Recommended preparation:* PM 529.

**PM 555 Environmental Health, Policy and Practice (4, FaSp)** Examination of environmental public health policies/regulations, the role of science in assessment and policy initiatives, barriers to change, and competing interests that influence policy adoption. *Recommended preparation:* PM 529.

**PM 556 Environment and the Brain (4, FaSpSm)** An examination of the effects of environmental exposures on the brain, addressing both human health and neurobiologic correlates throughout the lifespan.

**PM 557 Global Environmental Health (4, Sp)** Examination of the health effects of global environmental changes, including climate change, globalization, food safety, air pollution, water pollution, and radiation.

**PM 558 Environmental Epidemiology: Concepts, Methods, and Practice (4, FaSp)** Examine epidemiologic methods, concepts, and statistical approaches; case-study seminars with structured critiques of current literature on human-environment interactions affecting public health. *Recommended preparation:* PM 510 and PM 512.

**PM 561 Promoting Dietary Change (3, Sp)** Development, implementation, and evaluation of dietary interventions at community and individual levels. Discussion of lifespan, culture, socioeconomic, and environmental factors. Open to M.P.H. nutrition track students only. *Prerequisite:* PM 501.

**PM 562 Intervention Approaches for Health Promotion and Disease Prevention (4, Sp)** Approaches for modifying health behavior in various settings and within diverse populations. Emphasis on practical considerations necessary to design and implement interventions with demonstrated effectiveness.

**PM 563 Organizing and Mobilizing Communities for Public Health (4, Fa)** Survey of effective community organizing and mobilization efforts in the U.S. and abroad, using participatory, organizational, community empowerment and public-private partnership models.

**PM 564 Public Health Leadership and Management (3, FaSpSm)** Introduction to business and management concepts, tools, and practices in the context of domestic and global healthcare delivery, public health, and allied health industries.

**PM 565 Introduction to Global Health (4, Sp)** Current public health issues and research topics relating to 21st century challenges and threats. Lessons learned and best practices to strengthen public health systems and enhance public health readiness and preparedness.

**PM 566 Public Health in China: A System and Country in Transition (4, Fa)** Scientific, political, economic, social, and historical influences affecting Chinese public health policy and practice. *Prerequisite:* PM 501, PM 510L; *recommended preparation:* PM 512.

**PM 567 Disasters, Conflict and Global Health (4, FaSpSm)** Definition and chronology of natural and man-made disasters and their effects on the global community. Structure and organization of disaster management systems and the role of humanitarian organizations. *Recommended preparation:* PM 501, PM 512.

**PM 568 Ethical Issues in Global Health (4, Fa)** Ethical principles in the distribution of health resources, conduct of global public health research, and implementation of public health initiatives across different nations, cultures, religions. *Recommended preparation:* PM 501.

**PM 570 Statistical Methods in Human Genetics (4, Sp)** An introductory course in the statistical methods used in the analysis of human genetic data. *Prerequisite:* PM 533.

**PM 571 Applied Logistic Regression (3, Sm)** An introduction to the logistic regression model, emphasizing practical data analysis techniques. *Prerequisite:* PM 510L; PM 512; and PM 511aL or PM 518a.

**PM 572 Systems Physiology and Disease I (4, Fa)** (Enroll in INTD 572)

**PM 573 Systems Physiology and Disease II (4, Sp)** (Enroll in INTD 573)

**PM 574 Programming In Modern Statistical Software (2, FaSpSm)** Programming using SAS Software, including branching, sub-setting, PDV, looping, by-group processing, array, combining data functions, ODS, and macros.

**PM 575 Statistical Methods in Environmental Epidemiology (3, FaSpSm)** Study designs, exposure-time response, longitudinal, spatial, ecologic correlation and mechanistic models, measurement error interactions, measurement error, public policy implications. *Prerequisite:* PM 511b and PM 518a.

**PM 576 Global Health Research and Programs (4, FaSpSm)** Introduction to the core concepts and methods of planning and implementing health-related programs and research in resource-constrained settings.

**PM 577 Global Health, Law and Human Rights (1-4, FaSp)** Highlights the complex interactions between global health, law and human rights, emphasizing the use of human rights in public health thinking and practice. Duplicates credit in LAW 707. *Recommended preparation:* MPH core course work.

**PM 578 Global Health Governance and Diplomacy (4, FaSp)** Investigates the way health is organized and administered at the global level, emphasizing the role of international diplomacy and law in governing health.

**PM 579 Statistical Analysis of High-Dimensional Data (4, FaSpSm)** Overview of statistical issues and solutions to high dimensional data analysis. Use of Bioconductor and R, with applications in molecular biology. *Recommended preparation:* PM 511a.

**PM 580 Foundations of Child Health (4, Sp)** Overview of issues related to infant, child and adolescent health, including special health considerations at different points in the developmental cycle, health care systems and policies and health disparities.

**PM 581 Quality and Inequality in Health Care: Examination of Health Services (4, Fa)** Social inequalities, including racial/ethnic disparities and income related inequalities are examined in the context of access and delivery of health care in the U.S.

**PM 582 Epidemiology and Prevention of Pediatric Injuries (4, Fa)** Examines the incidence and causes of injuries to children from birth to adolescence, risk factor distributions and approaches to prevention.

**PM 583 Foundations of Early Childhood Mental Health (4, Fa)** Overview of major infant and early childhood mental health issues, relating to the status of child mental health and the importance of comprehensive systems of care for children that support resilience and respond to biological and psychosocial mental health risks.

**PM 584 Systems of Care for Children with Special Needs (4, Sm)** Examines and evaluates principles, policies, programs and practices (systems) that have evolved to identify, assess and meet the special needs of

children and families. Includes both historical and current perspectives.

**PM 585 Child Health Policy (4, Sp)** History of child health and social welfare programs during the past century. Issues examining health status and health service delivery, the role of health care financing and health policy.

**PM 586 Reproductive and Perinatal Epidemiology (3, FaSpSm)** Introduction to reproductive health, from preconception to the neonatal and early period of human development. Heavy emphasis on the methods and public health implications. *Prerequisite:* PM 510L and PM 512.

**PM 590 Directed Research (1-12, FaSpSm)** Research leading to the master's degree. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**PM 593 Public Health Practicum (4 or 8, FaSpSm)** Field placement in a community agency, such as a county health department or community-based organization. Open to MPH candidates only. Graded CR/NC. *Recommended preparation:* completion of all course work.

**PM 594abz Master's Thesis (2-2-0, FaSpSm)** Credit on acceptance of thesis. Graded IP/CR/NC.

**PM 596 Practicum in Public Health (2, FaSpSm)** Field placement in a public health agency, such as a county hospital department or community-based organization. Graded CR/NC. *Recommended preparation:* completion of all MPH course work.

**PM 597 Capstone in Public Health (2, FaSpSm)** Provides the culminating, integrative curricular experience for students enrolled in the Master of Public Health program. *Recommended preparation:* completion of all MPH course work.

**PM 599 Special Topics (2-4, max 8, Irregular)** Special topics relevant to the study of selected issues and areas of health behavior research or other aspects of preventive medicine.

**PM 601 Basic Theory and Strategies in Prevention (4, 2 years, Fa)** Psychosocial basis of health-hazardous lifestyle behaviors and preventive strategies. *Recommended preparation:* PM 500, PM 515.

**PM 602 Basic Theory and Strategies for Compliance/Adaptation (4, 2 years, Fa)** Behavioral and psychosocial demands of acute and chronic diseases. Comparison of theoretical models of compliance and adaptation with intervention methods to improve compliance and adaptation. *Recommended preparation:* PM 500, PM 515.

**PM 603 Structural Equation Modeling (4, 2 years, Fa)** Factor analytic and structural equation modeling approaches to health behavior research - conceptual, practical and mathematical. *Prerequisite:* PM 511b.

**PM 604 Health Behavior Research Methods (4, Sp)** Health research/evaluation philosophies, approaches, and development of skills for development and critique of health behavior research projects/studies. *Recommended preparation:* PM 511.

**PM 610 Seminar in Biostatistics and Epidemiology (1, max 4, FaSpSm)** Special topics of current interest to provide background for research in biostatistics and epidemiology. Based largely on student dissertation research. Graded CR/NC. *Prerequisite:* Ph.D. level.

**PM 611 Advanced Topics in Epidemiology (3, Irregular)** Review of current epidemiologic research contained in recent medical literature; emphasis on critique of studies and interpretation of findings.



**PM 612abc Clinical Translational Research (CTR) (4-4-4, FaSpSm)** *a:* First of three courses in CTR, a discipline that fosters multidirectional integration of basic, patient-oriented and population-based research with the long-term goal of improving public health. Recommended preparation: PM 510. *b:* Analysis and interpretation of data to test clinical translational hypotheses. *c:* Multidisciplinary approach to clinical and translational research.

**PM 690abcdz Directed Research in Health Behavior (2-2-2-2-0, FaSpSm)** Independent research at an advanced level on a problem in the field of Health Behavior. Graded CR/NC. *Recommended preparation:* PM 604.

**PM 756 Research Seminar in Health Behavior (1, max 6, FaSp)** Short seminar presentations and discussions on issues accompanying the development of the field of health behavior and implementation of research in this field. Graded CR/NC.

**PM 790 Research (1-12, FaSpSm)** Research applicable to the doctorate. Maximum units which may be applied to the degree to be determined by the department. Graded CR/NC.

**PM 794abcdz Doctoral Dissertation (2-2-2-2-0, FaSpSm)** Credit on acceptance of dissertation. Graded IP/CR/NC.

## Master of Science in Stem Cell Biology and Regenerative Medicine

**Eli and Edythe Broad CIRM Center for Regenerative Medicine and Stem Cell Research at USC**  
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*Program Director:* Henry Sucov, PhD

Stem cell biology is one of the newest and most powerful approaches in biomedical science; it offers the opportunity to experimentally approach previously intractable biological questions, create models of human disease and develop cell-based therapeutics.

This intensive one-year program (with an optional second year) will give students a deep understanding of the scientific and clinical underpinnings of stem cell biology and regenerative medicine. The program includes three didactic lecture courses that address developmental cell biology and human embryology, stem cell biology and regenerative medicine, and translational and therapeutic aspects of stem cell technology; the program also includes two laboratory modules that provide guided hands-on experience with stem cells and stem cell laboratory approaches, and several different faculty-led discussion-based courses that allow detailed investigation of specific aspects of stem cell biology and regenerative medicine.

Students completing this program will be well-positioned to proceed to medical or Ph.D. programs, find laboratory or administrative employment in the growing stem cell pharmaceutical domain, or engage in public policy or regulatory administration of academic, clinical or business efforts in this expanding discipline.

California is globally recognized as the worldwide center of stem cell science, and USC has invested significantly in building the new Department of Stem Cell Biology and Regenerative Medicine at the Keck School of

Medicine of USC, within which this M.S. program is based and administered.

### Admissions Requirements

Applicants must supply a completed application for graduate studies including: transcripts from all institutions previously attended, standardized test scores, a personal statement describing scientific and career interests, and two letters of recommendation. Applications are generally anticipated for fall enrollment, but applications for spring enrollment will also be considered. Applicants to the program must apply to the USC Graduate School and must meet the minimum requirements for admission to the Graduate School. Students are required to have a 3.0 or better overall GPA (or equivalent) and have achieved graduation with a B.S. or B.A. degree (or equivalent) before matriculation. Students are expected to have taken the general portion of the GRE exam before application and to have met or exceeded university score requirements. (MCAT scores that are less than five years old may be submitted in lieu of GRE scores by physicians and MD students with a 3.0 LCME-accredited medical school GPA or higher, or by medical school-bound students with a 3.0 undergraduate GPA or higher. DAT scores that are no more than three years old and that reflect a minimum score of 15 in each area may also be submitted in lieu of GRE scores.) Applicants not meeting Graduate School requirements for regular standing may, with the approval of the Graduate School, be conditionally admitted. International students from non-English speaking home countries are expected to demonstrate English language proficiency or take remedial English language courses, according to Graduate School policy. Specific prerequisites for this program include completed course work with a B or better grade (or equivalent) in Cell Biology and in Molecular Biology.

### Advisement

The program recommends that students meet with the program director each semester prior to registration.

### Satisfactory Academic Progress

A graduate GPA of at least 3.0 is required at all times. Any student whose graduate GPA falls below 3.0 will be given written notification that they have been placed on academic probation. Students who do not raise their GPA to 3.0 after two semesters on academic probation will be academically disqualified.

### Degree Requirements

Graduation requires completion of 25 units, according to the required Year 1 course schedule outlined below. None of these courses may be substituted or waived.

This program is intended to be completed within one academic year, and does not include a requirement for independent laboratory research or a thesis. Students may request approval to undertake laboratory research and continuing course work during a second year research option; students must already be matriculated into the program before making this request, and not all students will be granted this opportunity (selection will be based on academic performance and student research interests, and on availability of laboratory space). During this optional second year, students must enroll in the required Year 2 courses listed below; none of these courses may be substituted or waived.

Required Courses - Year 1, Fall Semester		UNITS
DSR 574	Stem Cell and Developmental Biology Seminar Series	1
DSR 620	Current Topics in Stem Cell Biology and Organogenesis	1
SCRM 511	Developmental Biology and Human Embryology	4
SCRM 513	Stem Cells and Regenerative	4

SCRM 580	Medicine SCRM External Speaker Seminar Series	2
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Required Courses - Year 1, Spring Semester		UNITS
DSR 574	Stem Cell and Developmental Biology Seminar Series	1
DSR 610	Current Topics in Regenerative Medicine	1
SCRM 515	Bringing Stem Cells to the Clinic	4
SCRM 522L	Biological Imaging in Stem Cell Research	2
SCRM 524L	Culture and Differentiation of Human Pluripotent Stem Cells	2
SCRM 555	Writing About Stem Cell Biology and Regenerative Medicine	1
SCRM 580	SCRM External Speaker Seminar Series	2

Required Courses - Optional Research Year 2, Fall Semester		UNITS
DSR 574	Stem Cell and Developmental Biology Seminar Series	1
DSR 620	Current Topics in Stem Cell Biology and Organogenesis	1
SCRM 580	SCRM External Speaker Seminar Series	2
SCRM 590	Independent Research	1-4

Required Courses - Optional Research Year 2, Spring Semester		UNITS
DSR 574	Stem Cell and Developmental Biology Seminar Series	1
DSR 610	Current Topics in Regenerative Medicine	1
SCRM 580	SCRM External Speaker Seminar Series	2
SCRM 590	Independent Research	1-4

## Department of Stem Cell Biology and Regenerative Medicine

### Courses of Instruction

#### Stem Cell Biology and Regenerative Medicine (SCRM)

*The terms indicated are expected but are not guaranteed. For the courses offered during any given term, consult the Schedule of Classes.*

**SCRM 511 Developmental Biology and Human Embryology (4, Fa)** Survey of anatomical, cellular and molecular processes that underlie human development and congenital malformations, with discussion of other species for comparison. Open only to Stem Cell Biology and Regenerative Medicine majors.

**SCRM 513 Stem Cells and Regenerative Medicine (4, Fa)** A comprehensive investigation of embryonic, fetal and adult stem cells and the application of stem cell biology to treat disease. Open only to Stem Cell Biology and Regenerative Medicine majors.

**SCRM 515 Bringing Stem Cells to the Clinic (4, Sp)** Lectures addressing the business, legal, ethical, manufacturing and regulatory aspects involved in moving stem cells or related product into clinical practice. *Prerequisite:* SCRM 513. Open only to Stem Cell Biology and Regenerative Medicine.

**SCRM 522L Biological Imaging in Stem Cell Research (2, Sp)** Theory and practice of using microscopy and flow

cytometry in stem cell biology, including sample preparation, digital processing and data analysis.

*Concurrent enrollment:* SCRM 524L. Open only to Stem Cell Biology and Regenerative Medicine.

**SCRM 524L Culture and Differentiation of Human Pluripotent Stem Cells (2, Sp)** Classroom and laboratory experience in the techniques for deriving, culturing and differentiating human pluripotent stem cells (hPSCs) and related cell types. *Concurrent enrollment:* SCRM 522L. Open only to Stem Cell Biology and Regenerative Medicine majors.

**SCRM 555 Writing About Stem Cell Biology and Regenerative Medicine (1, Sp)** Instruction in writing for various audiences on topics related to stem cell biology and regenerative medicine. Open only to Stem Cell Biology and Regenerative Medicine majors.

**SCRM 580 SCRM External Speaker Seminar Series (2, max 8, FaSp)** Reading and discussion of recent papers by the SCRM speaker of the week, and attendance at the speaker's seminar. Open only to Stem Cell Biology and Regenerative Medicine majors.

**SCRM 590 Independent Research (1-4, max 16)** Independent research conducted under the guidance of faculty in the Department of Stem Cell Biology and Regenerative Medicine. *Prerequisite:* SCRM 511, SCRM 513, SCRM 515, SCRM 522L, SCRM 524L, SCRM 555, SCRM 580. Open only to Stem Cell Biology and Regenerative Medicine majors. Graded CR/NC.