Doctor of Philosophy in Systems Biology and Disease

Physiology and Biophysics
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Director: Alicia A. McDonough

Participating Faculty: School of Medicine faculty from both basic and clinical departments perform research. Interested faculty from other schools including Pharmacy, Dentistry, Engineering and USC College are encouraged to petition to join participating faculty.

The goal of the Ph.D. program in Systems Biology and Disease is to train investigators to develop strategies to implement and integrate the detailed information gained from cellular, molecular and genetic advances into studies of normal system function as well as studies of how and why systems are disrupted in disease.

The program applies a multidisciplinary approach to understanding the human organism as a whole. Breadth of 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 the Ph.D. track.

Admission Requirements
A baccalaureate degree in life sciences or sufficient courses in mathematics and the life sciences is required to provide a strong background for studies in biomedical research. Appropriate undergraduate degrees would be biology, physiology, engineering, chemistry or computer science. Successful applicants must have satisfactory performance on the general and advanced portions of the GREs and three letters of recommendation. Previous research experience in a related field is expected but not required. Applicants who are accepted with minor deficiencies are expected to correct these during the first year.

Pre-applications forms can be obtained from the PIBBS program, Office of the Associate Dean for Research, University of Southern California Keck School of Medicine, KAM 110, 1975 Zonal Ave., Los Angeles, CA 90089-9023; email pibbs@usc.edu.

Degree Requirements
These degrees are awarded under the jurisdiction of the Graduate School. Refer to the Requirements for Graduation section, page 81, and the Graduate School section, page 91, of this catalogue for general regulations. All courses applied toward the degrees must be courses accepted by the Graduate School.

Advisory Committee
The student will be advised during the first year by the systems biology and disease executive committee. The purpose of the executive committee is to help the student in the selection of courses, selection of research rotations and, ultimately, a mentor and laboratory, to monitor the student's progress, and to ensure preparation for the screening procedure at the end of the first year.

Course Requirements
A minimum of 60 units is required, consisting of formal courses, seminars and research credits. At least 24 of the 60 units are to be formal graduate course work (lecture or seminar courses). Students must complete 16 units of course work before they are considered for the screening procedure. Additional course work relevant to the research interests of the student may be required by the student's guidance committee or by the student's academic advisor in addition to the required 24 units.

Lab Rotations
During the first year, students sign up for BIOC 790 Research (4 units each semester), and rotate through the labs of three mentor members of the program (potential research advisors). By the first summer of graduate study, but no later than after 18 months in the program, each student is expected to have selected a research advisor.

In the first year students are also required to take two four-unit graduate level courses each semester including one in each of the following areas: Biochemistry: either INTD 571 Biochemistry (4) or BISC 502a Molecular Genetics and Biochemistry (4); Cell Biology: INTD 531 Cell Biology (4) or BISC 411 Cell Physiology (4); Molecular Genetics: INTD 561 Eukaryotic Molecular Genetics (4) or BISC 502b Molecular Genetics and Biochemistry (4); and Physiology/Pathology: PHBI 562 Systems and Integrative Physiology (4) or BISC 510a Integrative and Evolutionary Biology (4). During summer term all students take an ethics class: INTD 500 Ethics of Scientific Research (4). For these required courses, opting out, delaying or substituting a class requires the approval of the Advisory Committee of the program.

In the second year, courses are selected with the approval of the student's guidance committee with reference to the research area in which the student is working. In the second and subsequent years, students are required to take PHBI 550 Seminar in Systems Biology and Disease (4). Participation in an organized journal club or working group recognized by the executive committee is required each year. Within the first two years, each student must take a statistics course, PM 510L Principles of Biostatistics (4) or the equivalent.

Screening Procedures
At the end of the first year, each student is required to pass a screening procedure based on the first year's required courses submitted by reports from the Systems Biology and Disease faculty to the executive committee. This is intended to expose any weaknesses in the student's abilities. Progress must be judged satisfactory in two areas: maintain satisfactory performance in course work, and satisfactory completion of all research rotations.

Qualifying Examination
The qualifying examination, administered by the guidance committee, should demonstrate a conceptual grasp of the major area of interest chosen and an understanding of the general framework and approaches of hypothesis-driven research.

Annual Research Appraisal
After advancing to candidacy, progress on dissertation research by each student is evaluated annually with an Annual Research Appraisal (ARA).

Dissertation
At the last ARA before the defense of the dissertation, the student submits an outline draft to the dissertation committee.

Defense
An acceptable dissertation based upon completion of an original investigation is required. The candidate must defend an approved draft of the dissertation in a public oral defense. The dissertation committee will then meet with the student in a closed session and complete the oral examination.

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*.

462 Physiology for the Health Professions (4, Sp) (Enroll in PHBI 462)

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.

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.

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. *Prerequisite:* MICB 501.

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.

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.

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 reentry in clinical rotations in the Year III medical curriculum. Open only to medical students who have completed Years I and II. Graded CR/NC.

549 Protein Chemistry – Structure and Function (4, Sp) Chemistry of peptides and proteins; protein structure and folding; molecular basis of protein action. (Duplicates credit in former BIOC 549.) *Prerequisite:* general biochemistry.

550 Introduction to Pathology (6, Fa) Three separate series of lectures: one on normal histology, one on basic principles of microbiology, and the other on basic principles of immunology. Emphasis on normal aspects of biological processes important in disease pathogenesis. (Duplicates credit in former PATH 550*aL*.)

551 Advanced Pathology (6, Sp) Mechanisms of disease processes including inflammation, tissue injury and cell death, atherosclerosis, infectious diseases, diseases of the immune system, cancer, diseases of aging, and pollution. (Duplicates credit in former PATH 550*bL*.) *Prerequisite:* INTD 550.

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

561 Molecular Genetics (4, Sp) Prokaryotic and eukaryotic molecular genetics: DNA and RNA structure and function; biochemistry and molecular biology of replication, transcription, RNA processing, translation, and regulation of gene expression. (Duplicates credit in former BIOC 561.) *Prerequisite:* INTD 571.

562 Systems and Integrative Physiology (4) (Enroll in PHBI 562)

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.

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.

Department of Anesthesiology

Nurse Anesthesia Program
1540 Alcazar Street
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Los Angeles 90089-9012
(323) 442-2037
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Email: uscnap@usc.edu
www.usc.edu/medicine/anesthesia

Program Director: Michele E. Gold

Assistant Program Director: Teresa Norris

Faculty
Chair and Professor: Philip Lumb

Professor of Pediatrics and Anesthesiology: Randall Wetzel

Professors of Clinical Anesthesiology: Mary Joseph; Ronald Katz; Vladmir Zelman

Associate Professor: Wynne Waugaman

Associate Professors of Clinical Anesthesiology: Jeffrey Lee; Rajesh Patel; David Raphael; Earl Strum

Assistant Professors of Clinical Anesthesiology: Rudolfo Amaya; Dimiter Arnaudov; Armin Azad; Jack Berger; Maxim Benbassat; Kari Cole; James Daniel; Gligor Gucev; Ralph Harding; William Loskota; Jana Planner

Instructors of Clinical Anesthesiology: Gabriel Aron; Roberta Ashley; James Carey; Jennilyn Casalme; Nancy Christiano; Charlotte Garcia; Monique Jabbour; Rory Keenan; Kim Tang; Heather Wilson; Chris Winckler; Jennifer Wooley; Casie Zahirsky; 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.