Physiology and Biophysics

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The Department of Physiology and Biophysics offers research opportunities in the molecular biophysics of membranes and proteins, ion channels and signal transduction, molecular and cell biology, structural biology, proteomics, physiological genomics, neuroscience, developmental neurobiology, stem cell biology, endocrinology, cardiac and exercise physiology, GI pathophysiology, immunology, viruses, cancer biology, and vision science.

The Department offers graduate study under the auspices of the School of Medicine and in conjunction with the graduate program in Cellular and Molecular Biosciences (CMB) and the Interdepartmental Neuroscience Program (INP), which are described in the School of Biological Sciences section (http://catalogue.uci.edu/schoolofbiologicalsciences/#graduatetext). Students are eligible to enter the Department program after meeting the specific requirements of the CMB or INP gateway curriculum or by direct application to the Department. Students in the M.D./Ph.D. program are eligible to enter the Department program. The Department program leads to an M.S. or Ph.D. in Biomedical Sciences, awarded after successful completion of all requirements. Students admitted through either gateway program who select a research advisor in the Department begin following the departmental requirements for the Ph.D. at the beginning of their second year.

The faculty conducts quarterly reviews of all continuing students to ensure that they maintain satisfactory progress within their particular academic program. Students participate in a literature review course designed to strengthen research techniques and presentation skills, and attend the monthly Department Colloquium. Students advance to candidacy during the third year; each student presents a seminar on their research projects in preparation for their Ph.D. dissertation. The candidacy committee examines the student's qualifications for the successful conduct of doctoral dissertation research. The students submit a written dissertation on an original research project and defend it in an oral final exam. The normative time for completion of the Ph.D. is five years. Students who make exceptional progress on their thesis projects are encouraged to complete the Ph.D. sooner. The maximum time permitted is seven years.

Faculty

Geoffrey W. Abbott, Ph.D. University of London, *Senior Associate Dean for Academic Personnel and Vice Dean for Basic Science Research and Professor of Physiology and Biophysics* (Ion channel, KCNE, molecular pharmacology, epithelial biology, cardiac arrhythmia)

Tallie Z. Baram, M.D., Ph.D. University of Miami, *Weizmann Institute of Science and Danette "Dee Dee" Shepard Endowed Chair in Neurological Studies and Donald Bren Professor of Pediatrics; Anatomy and Neurobiology; Neurology; Physiology and Biophysics* (neuroscience, neurobiology, psychiatric disorders, epigenetics, epilepsy, epileptogenesis, learning and memory, stress, corticotropin-releasing hormone, hippocampus, development, programming)

Kevin T. Beier, Ph.D. Harvard University, *Assistant Professor of Physiology and Biophysics; Biomedical Engineering; Neurobiology and Behavior; Pharmaceutical Sciences* (neuroscience, neural circuits, neural plasticity, molecular neuroscience, behavior, technique development, viral-genetic)

Michael D. Cahalan, Ph.D. University of Washington, *Department Chair and Distinguished Professor of Physiology and Biophysics* (ion channels, calcium signaling, cell interaction dynamics in the immune system)

D. Huw Davies, Ph.D. University College London, *Assistant Adjunct Professor of Physiology and Biophysics* (vaccines, adjuvants, influenza, poxviruses, preclinical studies)

Philip Felgner, Ph.D. Michigan State University, *Professor in Residence of Physiology and Biophysics* (vaccines, gene therapy, drug delivery, liposomes, biophysics, protein microarray, epidemiology)

John Jay Gargus, M.D. Ph.D. Yale University, *Professor Emeritus of Physiology and Biophysics; Genetic Counseling; Pediatrics* (functional genomics; molecular pathophysiology of ion pumps, channels, and signaling)

Alan L. Goldin, M.D. Ph.D. University of Michigan, *Professor of Microbiology and Molecular Genetics; Anatomy and Neurobiology; Physiology and Biophysics* (ion channels and central nervous system disease)

Steven A.N. Goldstein, M.D., Ph.D. Harvard University, *Vice Chancellor for Health Affairs and Distinguished Professor of Physiology and Biophysics; Pharmaceutical Sciences* (ion channels, cardiac arrhythmia, sudden death, stroke, neurotoxins, hypoxia, single-molecule spectroscopy)

Milton Greenberg, Ph.D. University of California, Irvine, *Assistant Adjunct Professor of Physiology and Biophysics* (medical physiology instruction)

James E. Hall, Ph.D. University of California, Riverside, *Professor Emeritus of Physiology and Biophysics* (aquaporins in the lens; amyloid oligomers in Alzheimer's disease)

Michael R. Hicks, Ph.D. Arizona State University, *Assistant Professor of Physiology and Biophysics* (human pluripotent stem cells, skeletal muscle, stem cell niche, regeneration, self-renewal, transplantation, single cell biology, Duchenne Muscular Dystrophy)

Todd C. Holmes, Ph.D. Massachusetts Institute of Technology, *Co-Director for the Center for Neural Circuit Mapping and Professor of Physiology and Biophysics* (cellular physiology and imaging, neural circuits and behavior; non-image forming visual mechanisms)

Naoto Hoshi, Ph.D. Kanazawa University, *Associate Professor of Pharmaceutical Sciences; Physiology and Biophysics*

Lan Huang, Ph.D. University of Florida, *Professor of Physiology and Biophysics; Biological Chemistry; Biomedical Engineering; Pharmaceutical Sciences* (proteomics, mass spectrometry, structural biology, chemical biology, proteasome biology, protein-protein interactions, protein complexes)

Autumn S. Ivy, M.D., Ph.D. University of California, Irvine, *Assistant Professor of Pediatrics; Anatomy and Neurobiology; Neurobiology and Behavior; Neurology; Physiology and Biophysics* (early-life exercise, epigenetics, neurology, learning and memory, developmental disorders)

Rongsheng Jin, Ph.D. Columbia University, *Professor of Physiology and Biophysics* (structure and function of synaptic proteins, neurotoxins and receptors, protein complexes)

Barbara Jusiak, Ph.D. Baylor College, *Assistant Professor of Physiology and Biophysics* (synthetic biology, gene circuits, macrophages, cancer, Drosophila)

Vladimir J. Kefalov, Ph.D. Boston University, *Professor of Ophthalmology; Physiology and Biophysics* (photoreceptor physiology, Visual cycle and dark adaptation, Photoreceptor degeneration, Gene-independent therapy for retinitis pigmentosa)

Philip D. Kiser, Pharm.D. Ph.D. Case Western Reserve University, *Assistant Professor of Physiology and Biophysics; Clinical Pharmacy Practice; Ophthalmology* (vision science, retinoid biochemistry, structural biology, metalloenzymes)

Devon A. Lawson, Ph.D. University of California, Los Angeles, *Associate Professor of Physiology and Biophysics* (cancer, stem cells, genomics, intra-tumor heterogeneity, metastasis, systems biology)

Kenneth J. Longmuir, Ph.D. University of Oregon, *Professor Emeritus of Physiology and Biophysics*

Francesco Marangoni, Ph.D. Vita-Salute San Raffaele University, *Assistant Professor of Physiology and Biophysics* (immunology, intravital multiphoton microscopy, signal transduction, bioinformatics, lentiviral and retroviral vectors, gene therapy)

Krzysztof Palczewski, Ph.D. Wroclaw University of Science and Technology, *Irving H. Leopold Endowed Chair of Ophthalmology and Donald Bren and Distinguished Professor of Ophthalmology; Chemistry; Physiology and Biophysics*

Mitradas M. Panicker, Ph.D. Carnegie-Mellon University, *Associate Adjunct Professor of Physiology and Biophysics* (role of Piezo1 in neural stem cell differentiation)

Medha Pathak, Ph.D. University of California, Berkeley, *Assistant Professor of Physiology and Biophysics; Biomedical Engineering* (piezo1, ion channels, stem cells, neural stem cells, differentiation, development, mechanical forces, matrix, environment)

Eric Pearlman, Ph.D. University of Texas Health Sciences Center at San Antonio, *Director of the Institute for Immunology and Chancellor's Professor of Physiology and Biophysics; Ophthalmology* (innate immunity, bacterial infections, fungal infections, neutrophils, cornea, eye)

Hamid M. Said, Pharm.D., Ph.D. Baghdad University, Aston University, *Distinguished Professor of Medicine; Physiology and Biophysics* (physiology/pathophysiology; Membrane transport and intracellular trafficking mechanisms; vitamin transport)

Harinder Singh, Ph.D. Temple University, *Director, Graduate Professional Success in STEM (GPS-STEM) and Assistant Adjunct Professor of Physiology and Biophysics* (medical physiology instruction)

Dorota Skowronska-Krawczyk, Ph.D. University of Geneva, *Assistant Professor of Physiology and Biophysics* (mechanism of aging, age-related macular degeneration, molecular mechanisms of glaucoma, Vision Science)

Francesco Tombola, Ph.D. University of Padua, *Associate Professor of Physiology and Biophysics* (mechanisms of electrical and mechanical sensing in health and disease, pH homeostasis, ion channels and receptor enzymes)

S. Armando Villalta, Ph.D. University of California, Los Angeles, *Assistant Professor of Physiology and Biophysics; Neurology* (immune cell and organ system interactions that promote tissue injury and repair)

Lisa Wagar, Ph.D. University of Toronto, *Assistant Professor of Physiology and Biophysics* (human immunology, organoids, infectious diseases, vaccine development, immune microenvironments, adaptive immunity)

Ping H. Wang, M.D. Harvard University, *Professor of Medicine; Physiology and Biophysics*

Stephen H. White, Ph.D. University of Washington, *Professor Emeritus of Physiology and Biophysics* (structure of membranes and lipid bilayers; peptide-bilayer interactions; protein folding)

Qin Yang, M.D. Ph.D. Nanjing University of Chinese Medicine, Osaka University, *Associate Professor of Medicine; Physiology and Biophysics* (epigenetic regulation of insulin resistance and energy expenditure in obesity and type 2 diabetes)

Courses

PHYSIO 200. Research in Physiology and Biophysics. 2-12 Units.
Individual research directed toward doctoral dissertation and supervised by a particular professor.

Repeatability: May be repeated for credit unlimited times.

PHYSIO 200R. Research in Physiology and Biophysics for First-Year Students. 2-12 Units.
Independent research within the laboratories of graduate training faculty in the Department of Physiology and Biophysics for first-year Ph.D. students.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be taken for credit 3 times.

PHYSIO 201. Introduction to Physiology Research. 1-4 Units.
Introduction to research in physiology and related sciences. Concentrates on techniques emphasized in the various laboratories of the Department of Physiology and Biophysics.

Repeatability: May be repeated for credit unlimited times.

PHYSIO 204. Concepts of Biophysics. 3 Units.
Principles of crystallography; introduction to time-resolved absorption and fluorescence spectroscopy; the concepts of kinetic order and kinetic rate theory.

Restriction: Graduate students only.

PHYSIO 205. Electronics for Biologists. 4 Units.
Basic principles of electricity; properties and use of discrete components and integrated circuits; circuit analysis and design. Intended for advanced students in the life sciences.

Same as NEURBIO 249.

PHYSIO 206A. Introduction to Medical Physiology. 5 Units.
Vertebrate physiology with emphasis on humans and on the relationship between the function of normal tissues and the processes of disease. Fundamental principles of physiology and the interrelationships which control organ function.

Prerequisite: A biochemistry course.

Restriction: Graduate students only.

PHYSIO 206B. Introduction to Medical Physiology. 6 Units.
Vertebrate physiology with emphasis on humans and on the relationship between the function of normal tissues and the processes of disease. Fundamental principles of physiology and the interrelationships which control organ function.

Prerequisite: PHYSIO 206A. PHYSIO 206A with a grade of B- or better

Restriction: Graduate students only.

PHYSIO 208. Approaches in Circuit Neuroscience. 3 Units.
Introduces modern methods in circuit neuroscience and how they are used to explore questions relating to the neurological basis of animal behavior. Emphasis is on rodent models but other model systems are incorporated where relevant.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

PHYSIO 212. Medical Immunology. 1.5 Unit.
One of the cornerstones of the MS1 Molecular Basis of Medicine block. Includes temporal coordination of lecture material, regular course director meetings, and combined exams with PHYSIO 544: Medical Immunology.

Restriction: Graduate students only.

PHYSIO 215. Integrative Immunology . 4 Units.
Provides an introduction to immunology, but focuses on providing in-depth analysis of selected topics within the broader field of immunology, including relevant research techniques, while improving critical thinking skills.

Restriction: Graduate students only.

PHYSIO 215B. Integrative Immunology II. 4 Units.
Lectures and student presentations of primary literature. Focuses on advanced topics and cutting edge technologies in modern immunology. Combination of didactic lectures and student-led journal article discussion.

Prerequisite: PHYSIO 215. PHYSIO 215 with a grade of B+ or better

Same as M&MG 215B, MOL BIO 215B.

Restriction: Graduate students only.

PHYSIO 232. The Physiology of Ion Channels. 4 Units.
Discusses how ion channels work (molecular/structural biophysics level) and what ion channels do in diverse cell types (cell physiology level).

Restriction: Graduate students only.

PHYSIO 252. Introduction to Proteomics. 4 Units.
Introduces students to concepts and methods of proteomics including protein identification, expression proteomics, and protein-protein interactions.

Repeatability: May be taken for credit 2 times.

PHYSIO 272. Eye: Health and Disease. 3 Units.
Introduces the anatomic and physiological basis of vertebrate vision and disease states in which the structure and function of the eye is disrupted with emphasis on current and developing research areas.

Restriction: Graduate students only.

PHYSIO 273. Practical Structural Biology: How to Use High-Resolution Structures to Guide Research. 3 Units.
Geared toward students who want to gain a better understanding of how to use the vast quantity of structural biology information available in publicly accessible databases to help guide their research.

Prerequisite: BIOCHEM 210A or BIO SCI 98 or BIO SCI M114 or BIO SCI M133 or MOL BIO 211 or MOL BIO 204. BIOCHEM 210A with a grade of B- or better. MOL BIO 211 with a grade of B- or better. MOL BIO 204 with a grade of B- or better

Restriction: Graduate students only. Seniors only.

PHYSIO 290. Topics in Physiology. 3 Units.
Contemporary research problems in physiology. Students review research articles in current literature and present ideas contained therein, focusing on groundbreaking discoveries and methodologies. Students present results of their own research and attend presentations given by other students and departmental researchers.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

PHYSIO 292A. Scientific Communication. 2 Units.
Small group meetings for graduate students to practice scientific writing, debate, and presentation skills.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

PHYSIO 292B. Scientific Communication. 2 Units.
Small group meetings for graduate students to practice scientific writing, debate, and presentation skills.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

PHYSIO 292C. Scientific Communication. 2 Units.
Small group meetings for graduate students to practice scientific writing, debate, and presentation skills.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

PHYSIO 299. Dissertation in Physiology and Biophysics. 2-12 Units.
Preparation and completion of the dissertation required for the Ph.D.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.