CELL REGULATION • biological chemistry • cancer biology • genetics and development • immunology • integrative biology • molecular biophysics • molecular microbiology • neuroscience

Cell Regulation

Chair, Graduate Program

Paul C. Sternweis, Ph.D.

Degree Offered

Doctor of Philosophy

Faculty and Research Interests

Joseph P. Albanesi, Professor
Ph.D., Duke University, 1980
Mechanisms of membrane fusion; role of lipids in membrane trafficking; membrane vesiculation of dynamin.

Neal Alto, Assistant Professor
Ph.D., Oregon Health & Science University, 2003
The intersection between human signal transduction and bacterial pathogenesis; use of biochemical and cell biological analysis to define molecular mechanisms of microbial infectious disease.

Steven J. Altshuler, Associate Professor
Ph.D., University of California, San Diego, 1990
Design principles underlying the spatial-temporal organization of molecular networks.

Richard G.W. Anderson, Professor
Ph.D., University of Oregon Medical School, 1970
Compartmentalization of signal transduction by caveolae and coated pits.

James A. Bibb, Associate Professor
Ph.D., State University of New York at Stony Brook, 1994
Protein phosphorylation/dephosphorylation related to neural function.

Kathlynn Brown, Assistant Professor
Ph.D., University of Texas at Austin, 1994
Cell-specific targeting; receptor-ligand interactions; cancer targeting; drug delivery; cancer biomarker identification.

Michael S. Brown, Professor
M.D., University of Pennsylvania, 1966
Regulation of gene expression; cell-surface receptor function; genetics and biochemistry of lipoprotein and cholesterol metabolism.

David J. Chen, Professor
Ph.D., University of Missouri, Columbia, 1978
Role of DNA double-strand break repair; Ku, telomere maintenance and cellular senescence; transgenic mouse models for DNA damage sensing and signaling; DNA damage responses induced by HZE particles in human cells.

Cheng-Ming Chiang, Professor
Ph.D., University of Rochester, 1991
Mechanisms of transcriptional regulation and epigenetic control; chromatin remodeling and histone tail modification; sumoylation and ubiquitination; functional interplay between oncoproteins and tumor-suppressor proteins; general transcription factors and co-factors.

Melanie H. Cobb, Professor
Ph.D., Washington University, St. Louis, 1976
Protein kinase cascades; MAP kinases; signal-transduction mechanisms.

Russell DeBose-Boyd, Associate Professor
Ph.D., University of Oklahoma Health Science Center, 1998
Regulation of HMG-CoA reductase and sterol metabolism.

J. Russell Falck, Professor
Ph.D., Imperial College, London, 1974
Total synthesis of natural products; synthetic methodology; organometallics; eicosanoids; medicinal chemistry.

Beatriz M.A. Fontoura, Associate Professor
Ph.D., New York University School of Medicine, 1996
Role of nuclear transport factors in interphase and mitosis, from viral pathogenesis to cell division.

Joseph L. Goldstein, Professor
M.D., UT Southwestern Medical Center, 1966
Genetics and biochemistry of lipoprotein and cholesterol metabolism; cell-surface receptor function; regulation of gene expression.

Joel M. Goodman, Professor
Ph.D., University of Southern California, 1980
Intracellular sorting of newly synthesized proteins; organelle biogenesis and membrane structure and function; the yeast peroxisome as a model of organellar assembly.

Jer-Tsong "J.T." Hsieh, Professor
Ph.D., University of Wisconsin, Madison, 1989
Human cancer gene therapy; signaling defects in urogenital cancers.

Jun-Shen "Lily" Huang, Assistant Professor
Ph.D., University of California, San Diego, 1997
Cytokine receptor; signal transduction; hematopoiesis; structure-function analysis of protein; cancer.

Michele Hutchison, Assistant Professor
M.D., Ph.D., UT Southwestern Medical Center, 1999
Regulation of cell growth and differentiation affecting bone growth; action of IGF-I at the growth plate; skeletal dysplasias.

Steven Kliewer, Professor
Ph.D., University of California, Los Angeles, 1990
Physiology of nuclear receptors.

Mark A. Lehrman, Professor
Ph.D., Duke University, 1982
Informational carbohydrates in the endoplasmic reticulum: roles in protein folding, stress responses and human disease.

David J. Mangelsdorf, Professor
Ph.D., University of Arizona, 1987
Mechanism of nuclear hormone receptor action; role of retinoids in cancer; transcriptional regulation of lipid metabolism.

Carole R. Mendelson, Professor
Ph.D., Rutgers University, 1970
Molecular mechanisms in tissue-specific, developmental and hormonal regulation of eukaryotic gene expression.

John D. Minna, Professor
M.D., Stanford University, 1967
Molecular genetics of human cancer; growth factors and signal transduction in human tumors.

Marc C. Mumby, Professor
Ph.D., University of California, Riverside, 1978
Signaling pathways controlling cell growth and transformation.

Katherine Phelps, Associate Professor
Ph.D., University of Colorado at Boulder, 1981
Light-microscope imaging of structure and function in living cells and tissues.

Matthew Porteus, Assistant Professor
M.D., Ph.D., Stanford University, 1994
Regulation of DNA double-stranded break repair; regulation of homologous recombination.

Elliott M. Ross, Professor
Ph.D., Cornell University, 1975
Mechanisms and regulatory behavior of G-protein signaling; regulated protein-protein interactions in signal transduction.

Michael G. Roth, Professor
Ph.D., University of Alabama at Birmingham, 1982
Recognition and sorting of cell-surface glycoproteins.

David W. Russell, Professor
Ph.D., University of North Carolina at Chapel Hill, 1980
Steroid and bile-acid metabolism; molecular genetics; gene regulation; protein structure-function.

Philipp E. Scherer, Professor
Ph.D., University of Basel, Switzerland, 1992
Identification and physiological characterization of novel secretory proteins that serve as potential links between the adipocyte and the processes of whole-body energy homeostasis, inflammation and cancer; beta-cell biology.

Joachim Seemann, Assistant Professor
Ph.D., Max-Planck Institute for Biochemistry, Germany, 1996
Biogenesis of the Golgi apparatus.

Dean P. Smith, Associate Professor
M.D., University of Utah, 1986; Ph.D., University of California, San Diego, 1992
Sensory transduction in Drosophila melanogaster.

William J. Snell, Professor
Ph.D., Yale University, 1975
Cell-cell interactions and signal transduction during fertilization in Chlamydomonas; cellular and molecular mechanisms of cell-cell fusion.

Paul C. Sternweis, Professor
Ph.D., Cornell University, 1977
Regulation of intracellular events by cell-surface receptors; structure and function of GTP-dependent regulatory proteins and their effectors.

Ron Taussig, Associate Professor
Ph.D., Stanford University, 1988
G protein-mediated signaling.

Lance Terada, Professor
Ph.D., University of Hawaii, Honolulu, 1983
Vascular biology; oxidant biochemistry; signal transduction; acute lung injury.

Philip E. Thorpe, Professor
Ph.D., Clinical Research Centre, London, 1976
Development of novel angiogenesis inhibitors and agents for inducing thrombosis of tumor blood vessels for cancer treatment.

Xiaodong Wang, Professor
Ph.D., UT Southwestern Medical Center, 1991
Biochemistry of mammalian apoptosis; chemical synthesis of inhibitors of apoptosis.

Michael A. White, Professor
Ph.D., University of North Carolina at Chapel Hill, 1992
Molecular mechanisms for control of cell growth and differentiation.

Thomas M. Wilkie, Associate Professor
Ph.D., University of Washington, Seattle, 1986
Signal-transduction pathways in mammalian development and energy homeostasis.

Lani Wu, Associate Professor
Ph.D., University of California, San Diego, 1990
Design principles underlying the formation of cellular polarity.

Christoph Wuelfing, Associate Professor
Ph.D., Max-Planck Institute for Biochemistry, Germany, 1994
Regulation of cytoskeletal rearrangements during T-lymphocyte activation.

Masashi Yanagisawa, Professor
M.D., Ph.D., University of Tsukuba, Japan, 1985, 1988
Identification and characterization of new signaling molecules that regulate vital functions such as sleep, appetite and blood pressure.

Helen L. Yin, Professor
Ph.D., Harvard University, 1976
Mechanisms for signal transduction through the actin cytoskeleton.

Gang Yu, Associate Professor
Ph.D., University of Calgary, Canada, 1996
Biochemistry of signal transduction, gene regulation and membrane-protein complexes; molecular and cellular mechanisms of neurogenesis, neuroplasticity and neurodegeneration.

Hongtao Yu, Professor
Ph.D., Harvard University, 1995
Study of cell division cycle.

Hui Zou, Assistant Professor
Ph.D., Columbia University, 1997
Molecular circuitries that ensure a timely and equal separation of chromosomes in daughter cells; vertebrate mechanisms of chromatid cohesion and separation; unequal division of cytoplasmic content during asymmetic cell divisions.

Description of the Discipline

The faculty of the Cell Regulation Graduate Program is interested in mechanisms of intracellular and intercellular communication. These include the mechanisms by which cells interpret and respond to signals generated by nutrients, hormones, neurotransmitters, physical stimuli and specialized cell-to-cell contact systems. Specifically, what are the cell-surface receptors that receive information, and how do they relay stimuli to the interior of the cell via second messenger systems? What are the intracellular responses elicited in the cytoskeleton, nucleus, membrane and other compartments of the recipient cell? How are these systems disrupted in certain genetic and pathophysiological states?

Integrated responses require the correct positions and functions of cellular organelles to receive and process incoming information. Thus, cellular architecture and intracellular protein transport are examined to elucidate the determinants for proper localization of proteins within the cell. The influx of information ultimately brings about changes in the catalytic properties of enzymes and receptors, as well as in the expression of genes. We study the transcription factors that control mRNA synthesis, their ligands and modifiers, the DNA sequences recognized by these proteins, and the way nuclear and cytoplasmic components interact to mediate cellular responses. A battery of modern methods derived from the disciplines of biochemistry, cell biology, endocrinology, genetics, medicine, molecular biology, pharmacology and physiology are brought to bear on these fundamental questions.

OBJECTIVES

The program strives to offer the highest quality training for students who wish to pursue a Ph.D. and maintain active careers in research and teaching. In addition to course work, intensive training in the development of independent research projects is stressed.

SPECIAL REQUIREMENTS FOR ADMISSION

Students wishing to join the Cell Regulation Graduate Program must be enrolled in the Division of Basic Science and be in good standing academically. Usually students seek enrollment in the program toward the end of the first year of study, following completion of a set of research rotations and selection of a mentor who will assist in the development of the research project for the Ph.D. While most students do their doctoral research with a faculty member of the program, Cell Regulation students may do their doctoral research with suitable mentors from other programs. Prior to formal entry, the graduate program chair will sometimes encourage a student to consult with faculty members to ensure that the Cell Regulation Graduate Program is the most appropriate for the student's interests.

CURRICULUM

All students in the Cell Regulation Graduate Program must have satisfactorily completed the core curriculum offered in the fall term of the first year and three laboratory rotations. In the spring term, students begin nine credit hours of advanced course work, which require a grade of B or better. Four and one-half credit hours consist of three required courses; the additional courses may be selected from offerings by other programs within the Division of Basic Science. Course descriptions are located in the Division of Basic Science section. For exceptional reasons, these course requirements may be altered with permission of the program chair. In addition, students participate in a student seminar and journal club each semester.

Near the end of the second year, students take a qualifying examination that consists of an oral defense of an original written proposal. Admission to candidacy for the Ph.D. degree requires satisfactory performance in the core and advanced courses and on the qualifying examination.

REQUIRED COURSES

Regulation of Cellular Architecture and Dynamics
Signal Transduction I
Signal Transduction II

ELECTIVES

In addition, students take 4.5 hours of electives that may include the following program course offerings:
Advances in Germ and Stem-Cell Biology (1.5 hours)
Quantitative Modeling of Biochemical Signaling Systems (1.5 hours)
Mechanisms of Drug Action (3 hours)
Optical Microscopy for Biomedical Research (1.5 hours)