Department of Cell Biology and Physiology

Cell biology is one of the primary disciplines in medical research, influencing all areas of basic and clinical investigation. The future holds great opportunities in cell biology research due to inventories of the genes and proteins from which cells are built, new experimental techniques and various model organisms. Further discoveries about the cell biology of human genes will continue to translate into therapeutics. Also on the horizon is a better understanding of how proteins and sets of proteins (e.g., macromolecular complexes) are assembled and integrated to produce function.

The Department of Cell Biology and Physiology (http://cellbiology.wustl.edu) is ranked among the top 10 cell biology departments in the country, and the research carried out by its faculty covers a broad range of fields within cellular physiology and molecular cell biology. A unifying theme is the study of fundamental processes and their regulation. These cellular processes include genome maintenance, apoptosis, cell cycle control, dynamic cell motility, angiogenesis, signal transduction and membrane trafficking, presynaptic processes, prion protein misfolding, RNA metabolism, and the structure and function of ion channels. The department’s research activities provide a foundation for studies in cancer biology, immunobiology, developmental biology, neurobiology and vascular biology. Its faculty use model organisms as well as human stem cells and a variety of techniques such as deep-etch electron and confocal microscopy to carry out their research. Cellular imaging is a particular strength of the department.

The Department of Cell Biology and Physiology oversees the course Physiology (CellBio 501), which is designed to provide first-year medical students with a foundation for their further study of clinical and applied physiology. The Molecular Cell Biology course for first-year graduate students conveys an understanding of fundamental cell biology research strategies and principles. In addition, advanced courses open to medical and graduate students provide for more detailed study of specific areas of cell biology, physiology and cellular biophysics.

Website: http://cellbiology.wustl.edu

Degrees & Requirements

More information about Department of Cell Biology and Physiology degrees (http://bulletin.wustl.edu/grad/gsas/dbbs) and requirements can be found in the Graduate School Bulletin.

Research

M75 CellBio 900
Cross-listed with L41 Biol 590
Kendall J. Blumer, PhD
506 McDonnell Sciences Building
Phone: 314-362-1668
Signaling mechanisms in cardiovascular and neurological disorders.

Sergej Djuranovic, PhD
514 McDonnell Sciences Building
Phone: 314-362-9706
Molecular mechanisms of translational control. Research examines the cellular processes that are regulated by changes in RNA metabolism.

Phyllis I. Hanson, MD, PhD
4625 Cancer Research Building
Phone: 314-747-4233
Study of protein-protein and protein-membrane interactions involved in neuronal and synaptic membrane trafficking using biochemical, biophysical, and cell biological techniques.

James E. Huettner, PhD
4929 South Building
Phone: 314-362-6628
Excitatory amino acid receptors and synaptic transmission in the central nervous system; neural differentiation of embryonic stem cells.

Silvia Jansen, PhD
4900 South Building
Phone: 314-273-1853
Focus is on elucidating the molecular mechanisms that regulate the architecture, dimensions and dynamics of actin filament networks, and tune them to support essential cellular functions ranging from cell migration and cytokinesis to neurogenesis.

David J. Kast, PhD
4900 South Building
Phone: 314-273-1852
Long-term goal of research is to understand fundamental cellular and molecular mechanisms that drive the biogenesis and dynamics of intracellular membrane compartments, including endocytic vesicles, the endoplasmic reticulum, the Golgi apparatus, and mitochondria.

Vitaly Klyachko, PhD
9610 BJC Institute of Health
Phone: 314-362-5517
The mechanisms and regulation of neurotransmitter release at individual synapses; the functional roles of presynaptic processes in synaptic plasticity and information processing.

Robert P. Mecham, PhD
4606 Cancer Research Building
Understanding the complex process of extracellular matrix assembly and organization, including studying the intracellular pathways used to transport matrix components to the cell surface and identifying helper or accessory proteins that facilitate trafficking and matrix assembly. Cell-matrix interactions in development and cellular mechanisms associated with connective tissue remodeling in vascular disease and heritable diseases of connective tissues.

Michael M. Mueckler, PhD
416 McDonnell Sciences Building
Phone: 314-362-4160

Colin G. Nichols, PhD
9611 BJC Institute of Health
Phone: 314-362-6630
Ion channel biology. Multiple levels of analysis from the molecular basis of channel function to in vivo physiology and disease.

David W. Piston, PhD
4912 South Building
Phone: 314-362-9121
The intracellular and intercellular dynamics of cells within the islet of Langerhans play a key role in the regulation of blood glucose levels. The islet is made up of different cell types, but very little is known about the interplay between the different cell types and how this affects their secretion of various hormones. The islet a-cells secrete insulin in response to increased blood sugar, and also in response to neurotransmitters and hormones. Glucagon also plays a key role in blood glucose homeostasis, and it is secreted by the islet a-cells. High glucose levels inhibit glucagon secretion from a-cells within the islet, but not from dispersed a-cells, but the mechanism underlying this phenomenon has not been defined. We use quantitative live cell microscopy to measure single cell parameters within intact islets held within microfluidic devices in order to expose them to spatially heterogeneous levels of various stimuli. The resulting data are fit using mathematical models of islet functional dynamics, which we are continually modifying to better fit the observed islet physiology.

Paul H. Schlesinger, MD, PhD
401 McDonnell Sciences Building
Phone: 314-362-2223
Molecular mechanism of BCR-2 family protein function, intracellular channels, biophysics of lipids, proteins and their interaction in cells and nanotechnology.

Sheila A. Stewart, PhD
7610 BJC Institute of Health
Phone: 314-362-7437
Delineation of the molecular mechanisms by which aged stromal cells contribute to tumorigenesis and the molecular mechanisms that ensure high fidelity telomere replication and genomic stability.

Heather L. True-Krob, PhD
413 McDonnell Sciences Building
Phone: 314-362-3934
Biological consequences of yeast prions — in both their capacity to function as novel epigenetic elements, and in their utility to serve as a tractable model for the analysis of protein misfolding and aggregation that occurs in several neurodegenerative disorders.

Zhongsheng You, PhD
514 McDonnell Sciences Building
Phone: 314-362-9893
Studies of the cellular responses to DNA damage and their cancer relevance, focusing on the functional interplays between the DNA damage checkpoint, DNA repair and chromatin structure.

Peng Yuan, PhD
9608 BJC Institute of Health
Phone: 314-747-3793
Structure and function of ion channels and transporters. Ion channels and transporters play essential roles in human physiology and disease. How do channels and transporters recognize their specific substrate ions? How do they respond to various stimuli including chemical ligand, temperature, membrane voltage, and mechanical force? How do they interact with the lipid membrane where they reside? To answer these fundamental questions, we use multidisciplinary approaches including X-ray crystallography, biochemistry, biophysics and electrophysiology. Dysfunction of these membrane proteins could lead to a variety of diseases such as asthma, hypertension, cancer, heart failure, diabetes, chronic pain, and many more. The long-term goal is to provide detailed mechanistic understanding of ion channels and transporters, which will offer novel strategies for drug development and better treatment of diseases.

Faculty

Department Head
David W. Piston, PhD
Visit our website for more information about our faculty (http://www.cellbiology.wustl.edu/faculty) and their appointments.

Kendall Jay Blumer, PHD
Professor of Cell Biology and Physiology (primary appointment)
PHD Duke University 1986
BA Rice University 1977

Thomas J Broekelmann, MS
Instructor in Cell Biology and Physiology (primary appointment)
BA University of MO St Louis 1977
MS University of MO St Louis 1982

D

Panyue Deng, PHD, MS, MD
Assistant Professor of Cell Biology and Physiology (primary appointment)
PHD CENTRAL SOUTH UNIVERSITY 2004
MS CENTRAL SOUTH UNIVERSITY 2001
MD Hunan Medical University 1995

Sergej Djuranovic, PHD
Assistant Professor of Cell Biology and Physiology (primary appointment)
PHD University of Tubingen 2007

G

Subhadra C Gunawardana, PHD, MS
Associate Professor of Cell Biology and Physiology (primary appointment)
PHD Cornell University 2002
MS Iowa State University 1995

H

Phyllis I Hanson, PHD, MD
Professor of Cell Biology and Physiology (primary appointment)
Gerty T Cori Professor
BA Yale University 1985
PHD Stanford University 1993
MD Stanford University 1993

James E Huettner, PHD
Professor of Cell Biology and Physiology (primary appointment)
Professor of Biomedical Engineering
PHD Harvard University 1987
BA Indiana University 1981
BS Indiana University 1980

J

Silvia Jansen, MS, PHD
Assistant Professor of Cell Biology and Physiology (primary appointment)
MS Katholieke Universiteit 2003
PHD Katholieke Universiteit 2007

K

David John Edward Kast, MS, PHD
Assistant Professor of Cell Biology and Physiology (primary appointment)
MS University of Minnesota 2004
PHD University of Minnesota 2018

BS University of Minnesota 2000

Vitaly A Klyachko, PHD, MS
Associate Professor of Cell Biology and Physiology (primary appointment)
Associate Professor of Biomedical Engineering
Associate Professor of Neuroscience
PHD Univ of Wisconsin Madison 2002
BS Moscow State University 1997
MS Moscow State University 1998

M

Grigory Maksaeo, MS, PHD
Assistant Professor of Cell Biology and Physiology (primary appointment)
MS Moscow Inst of Physics & Techn 1998
PHD Moscow State University 2002

Robert Paul Mecham, PHD
Alumni Endowed Professor of Cell Biology and Physiology (primary appointment)
Professor of Biomedical Engineering
Professor of Medicine
Professor of Pediatrics
BS University of Utah 1973
PHD Boston University 1977

Robert W Mercer, PHD
Professor of Cell Biology and Physiology (primary appointment)
PHD Syracuse University 1980
BA San Jose State University 1974

Mike Max Mueckler, PHD
Professor of Cell Biology and Physiology (primary appointment)
Professor of Biomedical Engineering
Professor of Medicine
BA Univ of Wisconsin Madison 1976
PHD Univ of Wisconsin Madison 1982

N

Colin G Nichols, PHD
Professor of Cell Biology and Physiology (primary appointment)
Carl F Cori Professor
PHD University of Leeds 1985
BA University of Leeds 1982

P

Slavica Pavlovic Djuranovic, DIP, PHD
Assistant Professor of Cell Biology and Physiology (primary appointment)
BS UNIVERSITY OF BELGRADE 1999
DIP UNIVERSITY OF BELGRADE 2001
PHD University of Tubingen 2006

David William Piston, MS, PHD
Professor of Cell Biology and Physiology (primary appointment)
Head of the Department of Cell Biology and Physiology
MS University of Illinois 1985
BS Grinnell College 1984
Courses

The Department of Cell Biology and Physiology also offers courses through the Graduate School. For a full listing of courses, please visit the university online course catalog (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L41&crsLv=5:9).


M75 CellBio 501 Physiology
The structures of cells, tissues, and major organ systems are studied in relationship to their functions. Lectures integrate histology with cell biology and physiology. The laboratories consist of the study of prepared slides and electron micrographs using an iBook or eBook (ePub) guide. An extensive online digital annotated atlas (https://slide-atlas.org) and a video library are used to supplement the slides and electron micrographs. Presentations of case studies provide examples of clinical relevance. A dual-view microscope and slide set will be issued for each pair of students. Limited space is available for non-medical students, who must have permission from the course director to enroll.
Credit 125 units.

M75 CellBio 900 Research Elective - Cell Biology and Physiology
Research opportunities may be available. If interested, please contact the Department of Cell Biology & Physiology.