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 and requirements (http://bulletin.wustl.edu/grad/gsas/dbbs) 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; cellular processes regulated by changes in RNA metabolism.

**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
This lab’s focus is on elucidating the molecular mechanisms that regulate the architecture, dimensions and dynamics of actin filament networks and then tuning them to support essential cellular functions that range from cell migration and cytokinesis to neurogenesis.

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

**Vitaly Klyachko, PhD**
9610 BJC Institute of Health
Phone: 314-362-5517
Mechanisms and regulation of neurotransmitter release at individual synapses; functional roles of presynaptic processes in synaptic plasticity and information processing.
Robert P. Mecham, PhD
4606 Cancer Research Building
Phone: 314-362-2254

This lab strives to understand 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. We also study cell-matrix interactions in development and cellular mechanisms associated with connective tissue remodeling in vascular disease and heritable diseases of the connective tissues.

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 islets of Langerhans play a key role in the regulation of blood glucose levels. The islets are made up of different cell types, but very little is known about the interplay between these cell types and how this affects their secretion of various hormones. The islets’ 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 islets’ a-cells. High glucose levels inhibit glucagon secretion from a-cells within the islets but not from dispersed a-cells, and 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.

Amber N. Stratman, PhD
416 McDonnell Sciences Building
Phone: 314-273-7928

Mechanisms regulating blood vessel formation, stabilization, and blood flow sensing during development and disease.

Shelia 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 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

The focus of this lab is on the structure and function of ion channels and transporters, which 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 a 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.

**B**

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

**Zengqin Deng, PHD**  
Instructor in Cell Biology and Physiology (primary appointment)  
PHD China Agriculture University 2014

**Lai Kuan Dionne, PHD**  
Instructor in Cell Biology and Physiology (primary appointment)  
PHD University of Colorado 2010 2010

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

**G**

**Denis Goldfarb**  
Assistant Professor of Cell Biology and Physiology (primary appointment)  
Assistant Professor of Medicine

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

**H**

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

**James E Huettner, PHD**  
Professor of Cell Biology and Physiology (primary appointment)

**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)  
BS University of Minnesota 2000  
MS University of Minnesota 2004  
PHD University of Minnesota 2018

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

**L**

**Sun Joo Lee, MS, PHD**  
Instructor in Cell Biology and Physiology (primary appointment)  
BS Handong Global University 2000  
MS Kwang-Ju Inst. Of Sci & Tech 2002  
PHD Washington Univ in St. Louis 2010

**M**

**Michael Benjamin Major**  
Professor of Cell Biology and Physiology (primary appointment)

**Grigory Maksaev, PHD, MS**  
Instructor in Cell Biology and Physiology (primary appointment)  
PHD Moscow State University 2002  
MS Moscow Inst of Physics & Techn 1998

**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
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&crslvl=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.