Graduate Programs and Faculty Research Interests at Yale for MD-PhD Students

**Cellular & Molecular Physiology** The Graduate Program in Cellular and Molecular Physiology at the Yale University School of Medicine is an intensive course of study leading to the Ph.D. degree. The Program is intended to prepare individuals for productive careers in research and teaching. There is a broad range of research interests with particular emphasis on membrane transport processes and on cellular and molecular aspects of cellular regulation and neurobiology. Individual laboratories specialize in the biophysics, biochemistry and/or molecular biology of ion channels; active transport in epithelia and isolated cells; membrane protein targeting; muscle activation; hormone-receptor interaction and second messenger pathways; developmental neurobiology; organ physiology; and the neurophysiology of learning. Among the techniques currently in use are a wide range of electrophysiologic methods including single channel recording; molecular cloning and DNA transfection; transgenic mouse production; light, electron and confocal microscopy; dynamic fluorescent imaging; renal tubule perfusion; and membrane biochemistry. Resources include core facilities for tissue culture, molecular biology and biochemistry, light and electron microscopy, as well as a professionally staffed electronics and machine shop.

**Faculty Research Interests:** [http://info.med.yale.edu/cmphysiol/](http://info.med.yale.edu/cmphysiol/)

- **Sviatoslav Bagriantsev**, Sensory physiology; Biophysics; Biochemistry; Neuroscience; Electrophysiology; Polymodal ion channels; Temperature-sensitive ion channels; Mechanosensitive ion channels; Two-pore potassium channels; Ion channel pharmacology.
- **Cecilia Canessa**, Structure-function and Regulation of Ion Channels from the ENaC/Degenerin Family.
- **Michael Caplan**, Ion pumps in polarized epithelia: Sorting and function; Polycystic Kidney Disease.
- **Jean-Ju Chung**, Ion Channels and Membrane Receptors in Mammalian Fertilization and Reproduction
- **Lawrence B. Cohen**, Protein Sensors of Voltage and Calcium; Multi-cell Optical Monitoring of Action Potential Activity during Simple Behaviors.
- **Guillaume De Lartigue**, We are studying the role of gut-brain signaling in the control of food intake. Specifically we are looking at the cellular mechanisms that get dysregulated in this sensory neural pathway in obesity, and developing novel electrical, pharmacological, and genetic methods to target these peripheral gut-brain neurons to reverse obesity.
- **Biff Forbush**, Epithelial Ion Transport; Molecular Physiology of Na-K-Cl Cotransporter.
- **Elena Gracheva**, Sensory physiology, molecular adaptations, hibernation, thermoregulation, ion channels, neuroscience.
- **Erdem Karatekin**, Membrane fusion, exocytosis, secretory vesicle dynamics, fluorescence microscopy, image analysis, microfluidics, supported bilayers, proteoliposomes.
- **Michael N. Nitabach**, Genes, Clocks, and Neurons: Molecular Genetics and Systems Physiology of Animal Behavior.
- **Vincent A. Pieribone**, Physiological, Structural and Molecular Analyses of the Pre-Synaptic Vesicle Release Machinery in Individual Synapses.
Jesse J. Rinehart, Kinase/Kinome Interactions and Targeted Phosphoproteomics in Physiological Systems.
Fred J. Sigworth, Single-Particle Imaging in Electron Cryo-Microscopy and Patch-Clamp Recording to Study Ion Channel Function.
Satinder K. Singh, Structural Biology of Neurotransmitter Transporters.
Clifford L. Slayman, Proton Pumps, Proton-coupled Potassium Transporters and Potassium Channels.
Carson Thoreen, Our lab studies how the translation of mRNAs adapts to changes in the cellular environment (e.g. nutrient deprivation) and seeks to understand how these mechanisms contribute to normal and disease physiology.
Susumu Tomita, Revealing Molecular Mechanisms for Synaptic Strength Regulation.
David Zenisek, Physiology and Cell Biology of the Presynaptic Terminal.

Secondary Appointees:
Nii A. Addy, Neurobiology of addiction; In vivo electrochemistry; Behavioral pharmacology; Systems neuroscience; Neurotransmission; Signal transduction.
Nadia Ameen, Apical endocytosis and exocytosis; Protein traffic; Secretory diarrhea; Cystic fibrosis.
Peter S. Aronson, Molecular Mechanisms of Sodium Chloride and Bicarbonate Transport in the Kidney.
Angelique Bordey, Function of Glial Transporters at GABAergic Synapses.
Thomas Brown, Synaptic Transmission, Neuronal Plasticity and Mechanisms of Memory.
Stuart Campbell, Biophysics, cell biology, tissue engineering and computational modeling.
Lloyd G. Cantley, Epithelial Morphogenesis.
Ivan De Araujo, We investigate the identity of the neural pathways mediating nutrient sensing within brain reward circuitries.
Marie Egan, Regulation of Ion Transport across The Airway Epithelia.
Barbara Ehrlich, Mechanisms of Intracellular Calcium Release.
Anne Eichmann, Vascular development and angiogenesis; guidance of vascular patterning; tip cells; axonal growth cones; vascular growth factors in the nervous system.
John P. Geibel, Optical Monitoring of Ion Transport Mechanisms in Epithelia.
Shuta Ishibe, Our laboratory is interested in defining the mechanism of proteinuria by studying podocytes, which are specialized cells that line the capillary loops and play a key role in maintenance of the glomerular filtration barrier.
Leonard K. Kaczmarek, Long-Lasting Changes in Neural Activity.
Richard G. Kibbey, Diabetes Mellitus Type 1 and Type 2.
George Lister, Study of factors affecting risk of infants for SIDS.
Pramod Mistry, Molecular mechanisms, phenotypic diversity and therapies of Gaucher disease in large patients populations and mouse models.
Patricia Preisig, Acid-Activated Signaling Pathway that Mediates the Physiological Response of the Renal Proximal Tubule to the Kidney's Need to Excrete Acid.
Mark Saltzman, CNS Drug Delivery and Tissue Engineering.
Joseph Santos-Sacchi, Auditory Physiology.
Gerald I. Shulman, Intermediary Metabolism in Humans.
Carolyn W. Slayman, Molecular Genetics of Cation Transporters.
Eid Tore, My laboratory uses a translational research approach to investigate the role of astrocytes, brain metabolism and gut microbiota in the causation of epilepsy.

Alda Tufro, podocyte biology, glomerular development and disease, specifically, molecular mechanisms in nephrotic syndrome and diabetic nephropathy.

Fred S. Wright, Ion Transport in Single Renal Tubules.

Xiaoyong Yang, Nutrient Sensing; Circadian Rhythms; Metabolism; O-GlcNAc Modification; Nuclear Receptors; Diabetes; Cancer; Aging; Systems Biology.

Lawrence Young, Cellular and Molecular Mechanisms of Metabolic Adaptation to Myocardial Ischemia.

Z. Jimmy Zhou, Visual System Physiology and Development; Synaptic Physiology of the Mammalian Retina; Neural Network Computation.