

discover

AREAS OF RESEARCH

- Cardiac & Muscle Physiology
- Developmental Biology of the Cardiovascular System
- Magnetic Resonance Imaging (MRI)
- Structure and Function of Ion Channels and Transport Proteins
- Cell Cycle Control
- Neuronal Morphology and Synaptic Plasticity
- Neural Development
- Alzheimer's Disease
- Signal Transduction
- Cellular Electrophysiology
- Cell Migration
- Control of Cell Growth and Development by micro RNA
- Cardiovascular Imaging
- Cancer
- Conditional Chemical Regulation of Transcription Factors
- Immunology and Autoimmune Diseases
- Myotonic Dystrophies type 1 and 2
- Genetics of Cardiac Disease
- Stem Cell Biology
- Energy Metabolism
- Tissue Engineering

BCM[®]
Baylor College of Medicine

CO-DIRECTORS

Graduate Studies in Molecular Physiology and Biophysics

ROBIA G. PAUTLER, PH.D.

ASSOCIATE PROFESSOR

Department of Molecular Physiology and Biophysics
rpautler@bcm.edu 713-798-3892

STEEN E. PEDERSEN, PH.D.

ASSOCIATE PROFESSOR

Department of Molecular Physiology and Biophysics
pedersen@bcm.edu 713-798-3888

CHERRIE McGLORY

GRADUATE PROGRAM ADMINISTRATOR

www.bcm.edu/physio

molphysgrad@bcm.edu

Molecular Physiology and Biophysics

The Department of Molecular Physiology and Biophysics utilizes the most advanced technologies to understand basic biological mechanisms and determine how their aberration leads to disease. The world-class investigators are highly interactive and bring a wide range of expertise to study the impact of diseases from the molecular level to the whole organism. This collaborative approach extends to the graduate program with the goal of offering the broadest base possible for students to approach their thesis research. The department occupies 33,500 square feet of space with recently constructed and very well equipped laboratories. The Department has a goal to translate basic research breakthroughs into actual applications to improve human health, and thereby the graduate program offers an opportunity for students to train in translational research.

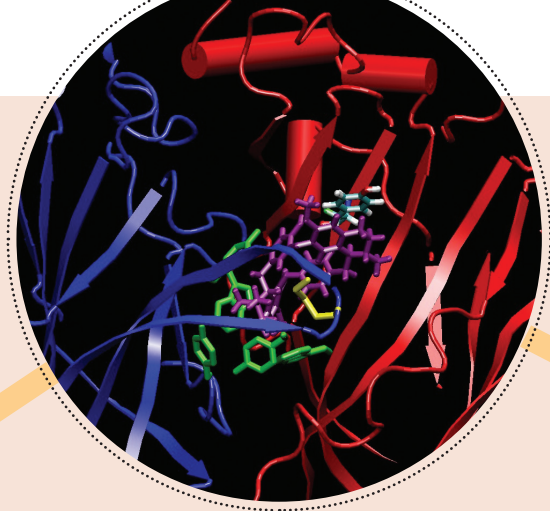
DEBAKEY HEART CENTER CARDIOVASCULAR SCIENCES TRACK

A track of the Molecular Physiology graduate program operates with the DeBakey Heart Center to focus on the cellular and molecular mechanisms of cardiovascular function, development, injury and disease. The DeBakey Heart Center brings together faculty with a cardiovascular focus from departments throughout the College. Research funding for graduate faculty and students comes from a training grant funded for 20 years by the NHLBI and individual, multi-investigator grants, and pharmaceutical companies. Dr. Sean Marrelli will direct and oversee students in this track.



Department of
**Molecular Physiology
and Biophysics**

The Graduate School of Biomedical Sciences
One Baylor Plaza, Room N204, Houston, TX 77030



PROGRAM DESCRIPTION

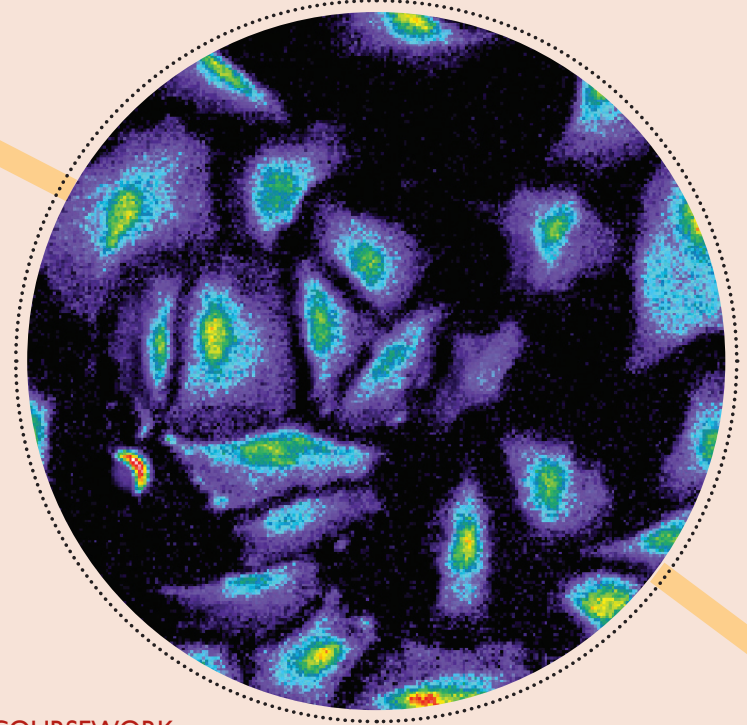
The department participates in the Graduate School for Biomedical Sciences granting a Ph.D. degree to qualified candidates. The department also participates in Baylor College of Medicine's M.D./Ph.D. Program.

Students are encouraged to take advantage of the reciprocity that Baylor College of Medicine maintains with Rice University, The University of Texas Graduate School of Biomedical Sciences at Houston, The University of Texas Medical School at Houston, and MD Anderson Cancer Center, all of which are within easy walking distance, and the University of Houston, also nearby. These institutions provide a broader base of course selections, particularly in mathematics, chemistry, computer science, and physics.

To introduce entering graduate students to the research options available and to facilitate the selection of a major thesis advisor, the department offers faculty research discussions, reading tutorials, and laboratory rotations.

APPLICATION TO THE GRADUATE PROGRAM

Free online applications can be found at <http://www.bcm.edu/gradschool>. When applying, applicants interested in the Physiology program should choose Molecular Physiology and Biophysics as their program choice. Applicants interested in the Cardiovascular Sciences Track program should choose Cardiovascular Sciences as their program choice. Applicants should have or be in the final stages of a program leading to a bachelor's degree or equivalent. Applicants should have a sound knowledge of biology and biochemistry and a background in chemistry and physics is useful. Prior laboratory research experience in a summer program or part-time during school is important to prepare for graduate school. The application deadline is 1 January, and early applications are encouraged. The academic year for accepted students begins in the first week of August. All graduate students will receive a \$29,000 stipend, paid tuition and health insurance.



COURSEWORK

After the first year in the program, students must complete the required 60 term hours, including all required courses. Graduate students must make a grade of "B" or better in all required course work.

LAB ROTATIONS

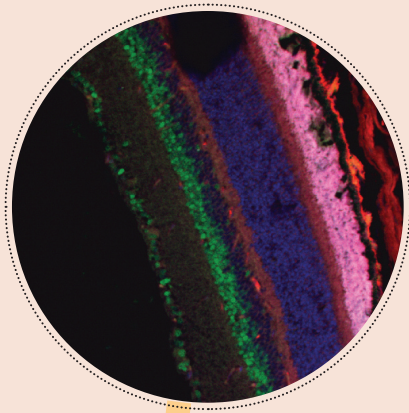
During the first year, each student rotates through at least three different laboratories in the department. This time should be used to identify the student's mentor for the dissertation research, to learn a variety of techniques, and to become familiar with the research work in the department.

QUALIFYING EXAM

Within two years following entry into the program, students must have taken their qualifying exam. Upon satisfactory completion of the qualifying examination, the student is formally recommended to candidacy for the Ph.D. degree.

GRANT WRITING PROGRAM

Over the past two years, we have incorporated two grant-writing courses into our curriculum for first and second year graduate students. The first year students are paired with a faculty member and are guided on how to write a NIH-style specific aims page. The second year students receive more advanced training on grantsmanship in an eight-week course. In this course, the students again are guided through the formulation of specific aims on a specified theme. The students then devise a hypothesis, structure specific aims and provide background information and a rationale for the proposed work. Both courses are highly interactive and are structured to prepare the students for the qualifying exam as well as future grant writing endeavors.



DISSERTATION

After the completion of the first year, each student must choose his/her major dissertation advisor and Dissertation Advisory Committee. The advisor guides the student in a research project as well as in effective and maximal use of resources within the department. Upon written consent from the student's advisory committee, the student should begin to write the dissertation.

PROGRAM ACTIVITIES

Students have access to a varied curriculum that includes physiology, biophysics, cell and molecular biology, genetics, microbiology, pharmacology, mathematics, computer sciences, physics, and neuroscience. The department conducts courses in medical physiology for medical and graduate students. Eighteen of 30 credits are taken from a core Molecular Physiology curriculum while students in the Cardiovascular Science track are offered additional courses from the DeBakey Heart Center. A vigorous program of seminars, workshops, and journal clubs provides students with cutting edge knowledge of specialized fields of research and career development. Students also present their research at the annual departmental retreat.

Additionally, the department takes a proactive role in career development for its students and postdoctoral fellows. Workshops, seminars, and personalized assistance are available for investigation of individual career options, career development, and career preparation. Students are encouraged to recognize their interests and develop skills necessary for their career goals.

OUTCOMES

Publications

The students in the Physiology Department actively publish. On average, each graduate student publishes three research papers, two of which are first author publications.

Awards

The Faculty actively promotes the students by identifying opportunities that will help facilitate the career paths and interests of the students. Our students have received numerous travel awards to meetings, awards from the National Science Foundation, as well as awards from the Howard Hughes Medical Institute.

Alumni

We like to keep in touch with our students after graduation. The department keeps a current list of our alumni and their activities on our website.

www.bcm.edu/physio/graduateprg/alumni.html

TRAINING FACULTY/RESEARCH FOCUS

Kjersti Aagaard-Tillery, M.D., Ph.D.

Assistant Professor
Genomics and epigenomics of human fetal and child health; the roles of common perinatal exposures.

Christie Ballantyne, M.D.**

Professor
Inflammation, vascular disease, and atherosclerosis.

J. Henri Bayle, Ph.D.*

Assistant Professor
Development of drug-inducible protein allele technology to study neural and eye development.

Christine Beeton, Ph.D.*

Assistant Professor
Potassium channels in the immune system; autoimmune diseases; allergic diseases.

John Belmont, M.D., Ph.D.

Professor
Cardiovascular development, complex trait genetics

Penelope Bonnen, Ph.D.

Assistant Professor
The intersection of genomics, population genetics, and disease.

Aladin M. Boriek, Ph.D.

Professor
Respiratory system mechanics; mechanotransduction in skeletal, smooth, and cardiac muscles; chronic obstructive pulmonary disease.

Biykem Bozkurt, M.D.

Professor
Mechanisms to improve cardiac function; cardiac metabolism and insulin resistance; cardiovascular disease biomarkers.

Malcolm Brenner, M.D., Ph.D.

Professor
Tumor immunology; anti-tumor vaccine development.

Robert Bryan, Ph.D.**

Professor
Control of cerebral circulation by potassium channels and endothelium-dependent hyperpolarizations.

Wah Chiu, Ph.D.

Alvin Romansky Professor
Structural studies of membrane proteins and nanomachines by electron cryomicroscopy and modeling.

Thomas Cooper, M.D.**

Professor
Regulation of RNA processing during heart development.

William Craigen, M.D., Ph.D.

Professor
Mitochondrial function, mechanisms of apoptosis, inborn errors of metabolism.

Miguel Cruz, Ph.D.**

Associate Professor
von Willebrand factor (VWF) in cardiovascular disease, inflammation and atherosclerosis.

Mary E. Dickinson, Ph.D.*

Associate Professor
Imaging the role of fluid mechanics in early cardiovascular development.

N. Tony Eissa, M.D.**

Professor
Signaling pathways for autophagy associated with innate immunity; cellular regulation of misfolded proteins.

Mark L. Entman, M.D.**

Professor
Cell and Molecular Mechanisms of Cardiac Injury and Repair—Regulation and Dysregulation.

Xin-Hua Feng, Ph.D.**

Professor
Protein modifications and TGF- β signaling in cell-growth control, tumorigenesis, and development.

Marta Fiorotto, Ph.D.

Associate Professor
Regulation of skeletal muscle growth by nutrition, and hormones, with specific interest in the perinatal period.

Kathryn Grande-Allen, Ph.D.

Adjunct Associate Professor
Heart valves, soft tissue mechanobiology.

Susan L. Hamilton, Ph.D.**

Professor and Chair
L.F. McCollum Chair in Molecular Physiology
Department of Molecular Physiology and Biophysics
Baylor College of Medicine
Skeletal muscle excitation-contraction coupling; ryanodine receptors L-type Ca²⁺ channels and diseases of skeletal muscle.

Yadollah Harati, M.D.

Professor
Neuromuscular therapy, peripheral neuropathies, ALS, neuromuscular pathology, myasthenia gravis

Craig Hartley, Ph.D.**

Professor
Ultrasonic instrumentation for cardiovascular research.

Sandra Haudek, Ph.D.**

Assistant Professor
Fibrosis, fibroblast precursor cells, inflammation, ischemia, hypertension

Frank Horrigan, Ph.D.*

Associate Professor
Molecular and biophysical mechanisms of ion channel gating.

Jeffrey Jacot, Ph.D.**

Adjunct Assistant Professor
Cardiac Tissue Engineering.

Amit Joshi, Ph.D.

Assistant Professor
Molecular Imaging.

Monica J. Justice, Ph.D.

Professor
Human disease modeling using mouse mutagenesis; hematopoiesis and lineage commitment.

Scott Lemaire, M.D.

Professor
Molecular mechanisms for development of aortic aneurysms and dissections

Ali Jalilian Marian, M.D.**

Associate Professor
Genetics, Cardiomyopathy, Heart Failure

Sean P. Marrelli, Ph.D.**

Assistant Professor
Regulation of vascular tone by endothelial cell ion channels; TRP channels and Ca²⁺ regulation.

James Martin, M.D., Ph.D.*

Professor
Hippo, Wnt, and Bmp-signaling pathways for developmental and regenerative capabilities

Lloyd Michael, Ph.D.**

Professor
Physiological genomics and multiple model systems in myocardial biology.

Joel Neilson, Ph.D.*

Assistant Professor
Genomic and biochemical analysis of messenger RNA transcript variation and function.

Jeffrey Neul, M.D., Ph.D.

Assistant Professor
Translating knowledge acquired from basic science research into potential therapies for Rett syndrome.

Robia G. Pautler, Ph.D.**

Associate Professor
Small animal MRI; nanotechnology, mechanisms governing Alzheimer's disease pathology.

Steen E. Pedersen, Ph.D.**

Associate Professor
Functional aspects of ion channel gating, ion selectivity, and ligand binding.

Paul J. Pfaffinger, Ph.D.

Associate Professor
Molecular biology and biophysics of potassium channels.

Cecile Locchi Phan, M.D.

Assistant Professor
Exercise induced rhabdomyolysis, metabolomics in ALS, plasma exchange in myasthenia gravis

Henry Pownall, Ph.D.**

Professor
HDL therapeutics and biosynthesis, apolipoprotein structure-function, chemical kinetics, thermodynamics, mouse models of atherosclerosis

Florante A. Quiocho, Ph.D.

Professor
Structural biology with emphasis on protein structure and function and structure-based drug discovery.

Amina Qutub, Ph.D.

Assistant Professor
Microvasculature and Hypoxic Response Computational Systems Biology.

Arun Rajan, M.B.B.S.

Associate Professor
Diabetes, islet biology, stimulus-secretion coupling.

George G. Rodney, Ph.D. *

Assistant Professor
Free radical signaling, Ca²⁺ signaling, skeletal muscle excitation-contraction coupling

Peter Saggau, Ph.D.

Professor
Biophysical and optical imaging approaches to understanding dendritic integration and excitability.

Daryl Scott, M.D., Ph.D.

Assistant Professor
Identifying genes that affect cardiac development.

Richard Sifers, Ph.D.

Associate Professor
Cellular glycolysis, ER stress response, and conformational disease.

George Taffet, M.D.**

Associate Professor
Heart Failure: Calcium and Aging.

Addison Taylor, M.D., Ph.D.**

Professor
Hypertension, orthostatic hypotension, syncope, and clinical pharmacology.

Lubov Timchenko, Ph.D.*

Associate Professor
Molecular mechanisms of myotonic dystrophies type 1 and 2.

Qiang Tong, Ph.D.

Assistant Professor
Function of adipose tissue, muscle, heart, and liver, in metabolic diseases and aging.

Vinod Vijayan, Ph.D.**

Assistant Professor
Serine/Threonine phosphatases in platelet and endothelial activation.

Richard Wainerdi, Ph.D.

Professor
Biomedical engineering, microanalytical chemistry, human performance

Xander H. Wehrens, M.D., Ph.D.*

Associate Professor
Regulation of cardiac ion channels in normal and diseased hearts.

Jennifer West, M.D.

Isabel C. Cameron Professor
Department Chair Bioactive and biomimetic biomaterials, tissue engineering, nanotechnology.

Samuel M. Wu, Ph.D.

Professor
Retinal neurophysiology; membrane biophysics and synaptic transmission; information processing in the retina.

Pumin Zhang, Ph.D.*

Associate Professor
Molecular genetics of cell-cycle control; cell-cycle control in development and disease.

*Primary appointment is in the Department of Molecular Physiology and Biophysics.

**Cardiovascular Sciences Faculty