Areas of Research

Neurodegenerative Diseases: Alzheimer's, Parkinson's Creutzfeldt-Jakob disease, amyotrophic lateral sclerosis, and dementia are associated with the accumulation of abnormal, toxic proteins in the brain. An important contributing factor is mitochondrial dysfunction. Our goal is to develop effective therapeutics.

Cardiovascular diseases: Cardiac myopathy is one of the leading causes of death. We know the proteins involved, but not how they interact or how defects disrupt function. Our goal is to correct the defects and normalize heart/cardiovascular function.

High blood pressure afflicts nearly 30% of Americans. The kidneys play a key role in blood pressure regulation. Our goal is to understand how renal defects lead to high blood pressure.

Stroke is a devastating consequence of hypertension. Our goals are to understand brain metabolism, why some cells are able to survive after a stroke, and to develop agents that mitigate the consequences of stroke.

Acid-base disturbances: Acid-base imbalances are associated with a wide range of physiological problems, from seizures and suicidal ideation at the level of the CNS, to arrhythmias in the heart. We study the proteins that sense and regulate acid-base balance, with the goal of developing therapeutics to treat CNS and heart disease.

Inflammatory Diseases: Inflammation occurs in many pathological processes and often leads to programmed cell death. Because the understanding of how inflammation causes cell death is poor, we study these processes to develop better therapies to regulate inflammation, and prevent the consequent death of cells in critical organs.

Opportunities to support the Department of Physiology & Biophysics

Unrestricted research and educational gifts do the greatest good. However, the following opportunities exist to support a specific piece of equipment or cause.

Gifts of $1 million or more
Named endowed chair
Named graduate student fellowship
Cryo-electron microscope
Magnetic Resonance Spectrometer

Gifts of $500,000 to $1 million
Mass spectrometer
Bruker ELEXSYS E580 spectrometer

Gifts of $100,000 to $500,000
Named endowed lectureship
Thor optical trap/laser tweezers
Sponsorship of a PhD Student

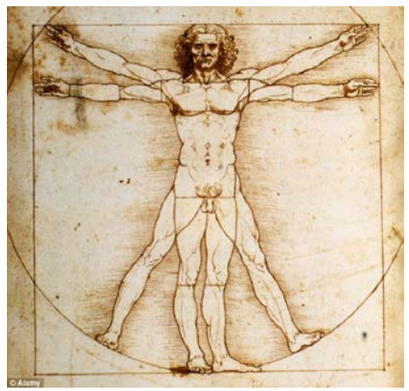
Gifts of $50,000 to $100,000
Inverted fluorescent microscope
AKTA pure M FPLC
Mutitron-ATR three deck shaker
Seahorse Bioscience QO2 instrument
XFp extracellular flux analyzer

Gifts of $20,000 to $50,000
Spectramax Plus 384 plate reader
Leica upright fluorescence microscope

Gifts of $10,000 to $20,000
Millar cardiac P-V system
Shaking refrigerated incubator
Beckman Allegra X-30 centrifuge
SpeedVac Concentrator

Gifts of $1 to $10,000
Aurora miniature force transducer
EKG telemetry radio transmitters
BioRad electrophoresis
FST microsurgery apparatus
TIRF microscope objective

Department of Physiology and Biophysics



School of Medicine

From Molecule to Bedside

Our Vision

To advance knowledge of the basic physiology and biophysics of the nervous, cardiovascular, renal and immune systems, and thus their diseases through excellence in research.

Our Mission

To create and disseminate new knowledge in physiology, biophysics and pathophysiology through research and education.

Accomplishing the Mission

We receive more than $8 million in research grants annually from the National Institutes of Health, the National Science Foundation, Department of Defense, national and local foundations and pharmaceutical companies. In the past 10 years we published nearly 600 research articles in major scientific journals.

Recognition

We will recognize your donation by offering you a personal tour of the facility and an opportunity to meet the faculty, an acknowledgement plaque on or near equipment, an acknowledgement of your gift in each scientific publication made possible by your support, and a copy of the publications.

Why we need your support

Although we have been successful in obtaining grants from funding agencies, support for biomedical science has fallen. The National Institutes of Health now funds less than 13% of proposals. Even when successful, these grants do not provide for major equipment and other critical needs. We can only continue our ground breaking research with your support.

Unrestricted gifts do the greatest good. However, alternatively/in addition, there are opportunities to support specific pieces of equipment and causes. Any sized gift will advance the mission! For additional information contact:

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The Department of Physiology and Biophysics Primary Faculty

Walter F. Boron, MD, PhD, Chair. Prof. Boron received his MD and PhD from Washington University. He then went to Yale where he became Chair of Physiology before coming to CWRU where he is now the Myers/Scarpa Chair. His research deals with acid-base diseases of the brain and kidney, as well as the role of oxygen and carbon dioxide channels in performance and pathology.

Matthias Buck, DPhil. Prof. Buck received his DPhil at Oxford. He then trained at Harvard and the Sloan Kettering Cancer Center before joining CWRU. His research focuses on protein-protein and protein-lipid interactions in cell signaling and migration in organ development, cancer, and macular degeneration.

Sudha Chakrapani, PhD. Prof. Chakrapani received her PhD from the University of Buffalo. She then did postdoctoral fellowships at the Universities of Virginia and Chicago before coming to CWRU. Her research focuses on the atomic structure and function of ion channels that play critical roles in the brain and heart.

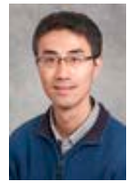
Michael J. Decker, PhD. Prof. decker received his PhD from CWRU, followed by faculty appointments at Emory University and the Centers for Disease Control & Prevention. His research focuses on defining the neurochemical, neuroanatomical and cognitive sequelae of hypoxia induced by pathologic or environmental conditions

George R. Dubyak, PhD. Prof. Dubyak received his PhD and post-doctoral training at the University of Pennsylvania before joining the faculty at CWRU. His research focuses on the cell physiology of inflammation and regulated cell death processes that contribute to diseases such as septic shock, atherosclerosis, and diabetes.

Jeffrey Garvin, PhD. Prof. Garvin received his PhD from Duke University. He then did postdoctoral training at the National Institutes of Health. He was Division Head of Hypertyension & Vascular Research at Henry Ford Hospital before coming to CWRU. His research focuses on the molecular mechanisms of salt and water transport by the kidney, and renal causes of hypertension.

Stephen W. Jones, PhD. Prof. Jones received his PhD at Cornell. He then did postdoctoral training at Cornell and the State University of New York at Stony Brook before becoming a faculty member at CWRU. His research involves the molecular mechanisms underlying the electrical activity of neurons, specifically how ion channels turn on and off.

Joseph C. LaManna, PhD. Prof. LaManna received his PhD and did post-doctoral training at Duke University. Dr. LaManna was faculty at the University of Miami before coming to CWRU. His research focuses on factors that regulate brain blood flow and metabolism, and how a ketogenic diet protects against stroke and dementia.



Tingwei Mu, PhD. Prof. Mu received his PhD from the California Institute of Technology, He then trained at the Scripps Research Institute before joining CWRU. His research focuses on correcting defects that otherwise prevent certain proteins from reaching the cell membrane. His goal is to develop approaches to treat a variety of neurological and neurodegenerative diseases, such as epilepsy.

Xin Qi, PhD. Prof. Qi received her PhD from Hokkaido University. She then did a postdoctoral fellowship at Stanford University before coming to CWRU. Her research focuses on the role of mitochondrial dysfunction in the pathogenesis of neurological disorders such as Parkinson's and Huntington's diseases, and has led to new molecules that may be treatments for these incurable diseases.

Rajesh Ramachandran, PhD. Prof. Ramachandran received his PhD from Texas Agriculture and Mining University. He then did a postdoctoral fellowship at the Scripps Research Institute before joining CWRU. His research focuses on how membranes within a cell join together or split apart. His work is important for understanding mitochondrial physiology and disease, and for treating Alzheimer's and Parkinson's diseases.

Andrea Romani, MD, PhD. Prof. Romani received his MD and PhD from the University of Siena. He did postdoctoral training in the Department of Physiology and Biophysics at CWRU. His research focuses on liver metabolism, and inflammatory changes caused by obesity and exposure to alcohol.

William Schilling, PhD. Prof. Schilling received his PhD from the Medical University of South Carolina. His research focuses on the cellular and molecular events associated with cardiac and respiratory changes leading to the sudden unexpected death in epilepsy.

Corey Smith, PhD. Prof. Smith received his PhD from the University of Colorado. He did postdoctoral training at the Max Planck Institute in Germany before joining CWRU. He studies the release of adrenaline as part of the fight or flight stress response and cardiovascular disease.

Julian E. Stelzer, PhD. Prof. Stelzer received his PhD from Oregon State University. He then did postdoctoral training at the University of Wisconsin before coming to CWRU. His research focuses on the mechanisms of cardiac muscle contractile function, and how defects in this process contribute to the development and progression of heart failure.

Witold K. Surewicz, PhD. Prof. Surewicz received his PhD from the University of Lodz in Poland. He then did postdoctoral training at McMaster University before joining CWRU. His research focuses on the role of protein misfolding and aggregation in neurodegenerative diseases, including prion disorders, Alzheimer's disease, and amyotrophic lateral sclerosis. He is working to develop new therapeutic approaches for these presently incurable3 diseases.

Learn more about the Physiology and Biophysics faculty at https://physiology.case.edu