

### Ultrastructural contributions to bone fragility

We are interested in how bone strength and quality are impacted by aging and disease. Understanding the multifactorial nature underlying reduced bone quality is critical for improving clinical assessment and management of fracture risk. The ongoing projects in the lab focus on investigation of bone tissue composition and properties using state of the art spectroscopic imaging and fiber optic approaches combined with mechanical testing, micro CT , microscopy, biochemical analyses, and machine learning. Students involved in these projects will work with pre-clinical models, human tissues, and/or cells, and learn spectroscopic data collection and analysis, including machine learning techniques. Some projects may be data analysis-based only. Students would work closely with senior investigators and graduate students, with the potential to contribute to research presentations and publications.

**Location:** Main

**Student Majors Accepted:** Chemistry/(Bio)-Physics/Materials Science/Math/Data Science (Biology or Biochemistry considered)

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** The candidate should be motivated, willing to participate actively in the lab in a team environment, as well as capable of being responsible for their own experiments.

**Nancy Pleshko**  
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Engineering  
Bioengineering

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### Understanding human decision making

Our lab studies how humans make decisions using a multi-methodological approach (eye tracking, biometrics, surveys and experimental research). Specific domains include product preferences, risk and uncertainty, financial decisions and detecting misinformation. As part of URP, you will assist with existing projects by helping design experiments, code experiments using Python/Psychopy or Matlab and collect data. Depending on the level of interest, you will also assist with analyzing the data and making inferences.

**Location:** Main

**Student Majors Accepted:** Any

**Class Preferences:** Freshmen & Sophomores

**Important Selection Criteria:** Ability to code in Python/Psychopy or Matlab. Interest in experimental design and neuroscience methods (no prior experience necessary).

**Vinod Venkatraman**  
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Fox School of Business  
Marketing, Center for Applied  
Research in Decision Making

### Sequential Endothelial Function Assessment in Lung Transplantation

The objective of this study is to perform a non-invasive endothelial function assessment by ultrasound measurement of brachial artery to assess and analyze flow mediated dilation (FMD) in lung transplantation (LTx) patients. These will be performed before and after LTx to understand sequential FMD in LTx. This will be a continuation of the previously approved IRB protocol under Dr. M. Abul Kashem where 5 patients were recruited out of 15 patients proposed protocol. 2 patients were excluded due to one subject had cardiopulmonary circulatory arrest in the operating room, who needed 20 min of ROSC, and another one consented was a non-English speaker by O.R. Spanish speaking nurse using Spanish interpreter over the phone. A total of 15 lung transplant recipients will be studied in two groups and patients will be asked to consent (IRB approved) to undergo the ultrasound measurement of the brachial artery for flow-mediated dilation immediately before lung transplantation and pre-lung assessment will be measured. The same patients will be studied at 3-months, 6-months, and 1-year post-operatively as a non-invasive measurement of endothelial function. The length of stay in the intensive care unit (ICU), length of stay in hospital post-surgery, length of intubation, proportional survival, ECMO status, PGD, acute rejection, and pulmonary function of consenting patients will be assessed. Pre- and post-lung transplant endothelial flow mediated dilation will be compared for significance. Endothelial function will be measured in the Cardiovascular and Transplant section vascular physiology laboratory, using non-invasive ultrasound. The protocols for Flow Mediated Dilatation (FMD) measures are well established in the laboratory and established protocols for Brachial Artery Ultrasound (using an Envisor Ultrasound System, available at Temple University Hospital's Clinical Research Center) will be used to analyze the degree of brachial artery dilation in response to a reactive hyperemia-induced increase in forearm blood flow. All vascular studies will be performed in a quiet room, with the patient lying recumbent. The electrocardiogram will be continuously monitored. The patient's left arm will be immobilized in the extended position and baseline arterial diameter and blood flow measurements will be obtained using Doppler ultrasound transducer (7.5Mhz). Volume flow will be calculated at baseline and during reactive hyperemia from vessel cross-sectional area and mean blood flow velocity. The Flow Mediated Dilation measure is used to assess abnormal endothelial function, where higher FMD percentages indicate improved endothelial function. We expect a 5-10% average increase in FMD post-lung transplantation.

**Location:** HSC

**Student Majors Accepted:** Pre-med majors and CST

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Be able to handle an ultrasound machine and be able to transfer it to place to place inside the hospital building, back to the OR office space, and MRB if needed across the street

**Mohammed Kashem**  
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LKSOM  
Cardiothoracic Surgery

### Stem cell therapy for cardiac repair

The project would help in understanding different mechanisms that could be involved in heart repair after stem cell or exosomes transplantation after cardiac injury. Immune response is one of the major events that occur after injury. We would study how stem cells can play a part in modulating immune response after myocardial infarction. We will also study interaction of stem cells and other heart cell types including fibroblasts and myocytes.

**Location:** HSC

**Student Majors Accepted:** All majors

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** N/A

**Sadia Mohsin**  
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LKSOM  
Cardiovascular Research Center

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### The role of extracellular vesicles in vascular disease

Atherosclerosis, hypertension and aneurysms are the major causes of cardiovascular disease (CVD) including heart attack and stroke. Despite recent advances in clinical therapies, CVD remains the leading cause of morbidity and mortality world-wide. Thus, there is a need to discover the underlying mechanisms that lead to CVD. Inter-cellular communication is essential for maintenance of blood vessel homeostasis and disease development. Our laboratory is interested in a new mechanism of cell-cell communication which involves extracellular vesicles (EV). These vesicles carry unique cargo (lipids, proteins, miRNAs and DNA) which can be transmitted to target cells as well as serve as biomarkers which indicate the health status of the vasculature. Specific projects focus on 1) characterization of EVs in vascular health and disease 2) functional effects of EVs in the vasculature and 3) the potential for EVs to act as therapeutic agents to treat CVD.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Chemistry or Bioengineering

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Seeking motivated students who desire to gain hands-on experience in basic biomedical research.

**Victor Rizzo**  
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LKSOM  
Cardiovascular Research Center

### Human cardiac progenitor cell exosomes for cardiac regeneration

Injury to the heart leads to development of a scar that never goes away. Current therapies do not target regeneration of the heart or scar replacement. Our current research utilizes cardiac progenitor cells isolated from human heart samples. Tiny vesicles called exosomes from human cardiac progenitor cells that carry immense therapeutic potential will be tested for their ability to repair the heart after myocardial injury.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** N/A

**Mohsin Khan**  
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LKSOM  
Cardiovascular Sciences

### Reparative Neutrophils and Myocardial Repair

Heart failure (HF) following myocardial infarction (MI) is the leading cause of morbidity and mortality worldwide. Cardiomyocyte death following ischemia activates an inflammatory response that clears the injured myocardium from dead cells and stimulates repair. However, excessive inflammation or impaired inflammation resolution results in additional CM loss, which further reduces cardiac function. Therefore, understanding the signaling pathways that orchestrate inflammatory cell recruitment, activation, and timely removal following MI may optimize myocardial repair and regeneration therapies. Neutrophils are the most abundant and first-responder immune cells that invade sites of inflammation to remove dead cells and clear debris. Neutrophils have long been considered detrimental following myocardial injury, and their detection was often associated with cardiac dysfunction. However, recent studies demonstrated that neutrophils might also play an essential role in cardiac repair by regulating reparative processes. However, the mechanisms by which neutrophils participate in cardiac repair are mainly unknown. The proposed project aims to determine whether an anti-inflammatory neutrophil subset can be considered a potential therapeutic target in promoting myocardial healing and repair following MI.

**Location:** HSC

**Student Majors Accepted:** Cell and molecular Biology

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** Background in cardiac and vascular physiology and pathology

**Abdelkarim Sabri**  
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LKSOM  
Cardiovascular Sciences

### Measuring Compartmentalized Metabolism

The Snyder Lab works to quantify, understand, predict, and manipulate the connections between metabolism, exposures, and health outcomes. We conduct a wide range of fundamental research and quantitatively study the metabolism of drugs, the metabolic fate of environmental exposures in the human body, and the normal and pathologic adaptations of human metabolism. We also conduct disease focused research, which includes metabolic conditions, many types of cancer, and investigating modifiable risk factors for autism spectrum disorder. To accomplish these goals, the lab uses cutting edge analytical chemistry, most notably liquid chromatography- high resolution mass spectrometry and works with a wide net of collaborators. We have a diversity of small defined projects suitable for undergraduates with different interests including analytical chemistry, biochemistry, studies of drugs and metabolism.

**Location:** HSC

**Student Majors Accepted:** Any biological, physical, or chemical science

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Some chemistry/biochemistry background

**Nathaniel Snyder**  
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LKSOM  
Cardiovascular Sciences

### The role of YAP and Vitamin A signaling in cardiac development

Congenital Heart Disease (CHD) is a leading cause of mortality in kids. This project seeks to understand regulatory mechanisms that underly heart development. The overarching goal is to improve tools for prevention, cure and diagnoses of CHD. We investigate how the Vitamin A, an essential nutrient, regulates gene expression during the formation of the heart. We use mouse models, human embryonic stem cells and cardiac organoids to identify new regulatory mechanisms of the Vitamin A signaling essential for proper heart development.

**Location:** HSC

**Student Majors Accepted:** Biology/sciences

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** The candidate has to be motivated, willing to participate actively in the lab and responsible with their own experiments.

**Conchi Estaras**  
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LKSOM  
Cardiovascular Sciences/Center  
for Translational Medicine

**HHcy suppresses microglial A $\beta$  phagocytosis in Alzheimer's disease**

Alzheimer's disease (AD) is a neurodegenerative disorder characterized by initial memory impairment and cognitive decline. AD development can be caused by complex interactions among multiple factors including age, genetics, lifestyle, and coexisting medical disorders. The pathological features of AD are extra-neuronal accumulation of amyloid  $\beta$  (A $\beta$ ) protein and intra-neuronal deposition of neurofibrillary tangles composed of hyperphosphorylated tau protein. Hyperhomocysteinemia (HHcy) is an established independent risk factor for AD. However, the role of HHcy on microglia (MG) function and A $\beta$  phagocytosis in AD development is unknown. In this project, we will determine effect of HHcy in microglial A $\beta$  phagocytosis, and AD pathology in HHcy mice and cultured MG.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Bioinformatics

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Highly motivated and responsible

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**Vascular energy metabolism (bioenergetics)**

Hyperhomocysteinemia (HHcy) is an independent risk factor for cardiovascular disease (CVD). We will study metabolic cross talk between homocysteine (Hcy) metabolism and glucose metabolism, and analyses glycolysis & mitochondrial respiration in vascular cells. We will use genetic, biology and biochemical tools to characterize the molecular pathway underlying HHcy–altered vascular energy metabolism and its role in CVD.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Bioinformatics

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Highly motivated and responsible

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**Hong Wang**  
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Cardiovascular Sciences/CMDR

**Hong Wang**  
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Cardiovascular Sciences/CMDR

### Liver cytotoxic effects in metabolic disorders

We study liver cytotoxic effects in metabolic disorders mice and experimental conditions. We generated transgenic mice deficient with genes encoding key enzymes in amino acid metabolic and identified significant liver pathology in these mice. We will characterize lipid glucose and amino acid metabolism and examine mechanisms determining liver cytotoxic effects in metabolic disorders.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Bioinformatics

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Highly motivated and responsible

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**Hong Wang**  
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Cardiovascular Sciences/CMDR

### Angiogenic effect of Carom KO in murine models

Carom is a novel homocysteine (Hcy) response protein. Hyperhomocysteinemia (HHcy), a syndrome displayed by high concentration of Hcy in plasma has been demonstrated as a significant risk factor for cardiovascular disease and inhibition of blood vessel growth (angiogenesis). We have shown in vitro that Carom can inhibit EC function and it's knockout can rescue Hcy inhibited EC functions. This project will demonstrate Carom's effect in vivo. We have produced several murine Carom knockout trains and study several angiogenic assays in these strains. The student will receive hands on experience in DNA technology and histology.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Bioinformatics

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Highly motivated and responsible

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**Hong Wang**  
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Cardiovascular Sciences/CMDR

### Organ Specific Endothelial Cell Heterogeneity

Endothelial Cell (EC) formed vascular network to support organ blood supply, and contribute to organ development and function. Organ specific endothelial cell heterogeneity is not well understood. We are characterizing gene expression profile in endothelial cells isolated from different mouse organ and will study their functional implication in different organ. We will also analyze gene expression changes in different vascular beds in metabolic disease models and identify organ-specific molecular targets in metabolic disease.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Bioinformatics

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Highly motivated and responsible

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**Hong Wang**  
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LKSOM  
Cardiovascular Sciences/CMDR

### Molecular control of vascular remodeling and lymphangiogenesis

The focus of the project is to identify novel signaling pathways that regulate vascular angiogenesis and lymphangiogenesis, one of the major cardiovascular problems. Reticulon family proteins (RTN) are mainly localized to endoplasmic reticulum (ER) and regulate mitochondria associated ER membrane (MAM). In this project we are using genetic modified animal models, cellular and molecular techniques to uncover how Nogo-B, the only RTN-4 family protein expressed in vessel wall, regulate MAM remodeling in endothelial cells, and vascular and lymphatic angiogenesis in diabetes.

**Location:** HSC

**Student Majors Accepted:** Any

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Highly motivated and responsible. Basic cell and molecular biology techniques and understanding of human physiology are a plus.

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**Jul Yu**  
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LKSOM  
Cardiovascular Sciences/CMDR



### **Molecular control of atherosclerotic plaque stability**

Cardiovascular diseases are still a leading cause of death worldwide. Unstable atherosclerotic rupture, rather than narrowing of the blood vessel, is the major cause of myocardial infarction. Using novel small animal models and state-of-the-art technologies, this project is aimed at uncovering molecular control of this deadly pathological processes, and provide proof-of-concept for developing new drug target to treat coronary artery disease.

**Location:** HSC

**Student Majors Accepted:** Any

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** Highly motivated and responsible. Basic cell and molecular biology techniques and understanding of human physiology are a plus.

**Jun Yu**  
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LKSOM  
Cardiovascular Sciences

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### **Risk and Protective Factors Associated with AD/ADRD and CRC Among the High-Risk Low-Income Asian American Elderly**

In this study, we investigate the influence of multiple lifestyle factors on AD/ADRD and the underlying mechanisms through which they interplay to affect AD/ADRD health outcome. We are conducting an epidemiological study to collect cross-sectional data among 300 low-income Asian American elders and analyze the data using binary logistic regression and structural equation modeling.

**Location:** HSC

**Student Majors Accepted:** Neuroscience, psychology, biology

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Passion and commitment in health disparities research are required. Training and experience in cognitive health, behavioral health, and data analysis are a plus.

**Grace Ma**  
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LKSOM  
Center for Asian Health

**Unpacking Mechanisms of Disparities for HIV-related Hypertension in African Am and Asian Pacific Am MSM**

The research team at Center for Asian Health (CAH), LKOM along with the team at the University of Hawaii at Ma noa, is interested in determining the disparities for HIV-related Hypertension in African American and Asian Pacific American MSM. The purpose of this study is to learn more about how to better manage healthy living (e.g., without high blood pressure or hypertension) associated with the HIV disease. The finding of this study will help in creating effective prevention programs. Students will participant in recruiting eligible participants, conducting baseline and follow-up data collection, literature review, data management and presentation. Other research projects on a wide range of topics, including chronic illness, cancer screening, diagnosis, prevention, and treatment, behavioral intervention, and cognitive health are also available at CAH.

**Location:** HSC

**Student Majors Accepted:** Biology, Neuroscience, Psychology, etc.

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Passion and commitment in health disparities research is a requirement. Previous training and/or experience in public health, data analysis, community engagement constitutes a plus.

**Grace Ma**  
grace.ma@temple.edu  
LKSOM  
Center for Asian Health

**The role of exosomes in idiopathic pulmonary fibrosis**

Our research projects focus on the pathophysiology of idiopathic pulmonary fibrosis. It is associated with a high mortality rate and limited effective treatments. We isolate alveolar epithelial cells from lung transplants to determine the mechanism of their dysfunction in this disease. Exosomes are secreted from alveolar epithelial cells to the extracellular space and can have autocrine and paracrine effects. Our goal is to define their role in idiopathic pulmonary fibrosis development using various methods.

**Location:** HSC

**Student Majors Accepted:** N/A

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** N/A

**Karim Bahmed**  
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LKSOM  
Center for Inflammation and Lung  
Research

**Studying offspring metabolic and reproduction associated with PCOS mom**

Pregnant mice which have increased testosterone will be mated with normal male mice for 3 months, their offspring will be examined for insulin signaling, glucose homeostasis, puberty and fertility

**Sheng Wu**  
sheng.wu@temple.edu  
LKSOM  
Center for Metabolic Disease  
Research

**Location:** HSC

**Student Majors Accepted:** Biology and/or science orientated majors

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** responsible and self-motivated students who are interested in studying human diseases associated with sex hormones using mouse model.

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**Studying sex hormones effects on liver, central nervous system and ovary**

Our lab is using genetic modified mouse models, cellular and molecular techniques to identify how steroid hormones affect metabolic function (such as insulin signaling pathway and glucose homeostasis); Especially investigate the molecular mechanisms of testosterone sexual dimorphic effects on liver function, focus on the link between type 2 diabetes and polycystic ovary syndrome

**Sheng Wu**  
sheng.wu@temple.edu  
LKSOM  
Center for Metabolic Disease  
Research

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, or pharmacology

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Interested in metabolic diseases. Highly motivated and responsible.

### Bacterial amyloid imaging

Amyloids are proteins with cross beta-sheet structure. In each amyloid associated human disease a different amyloid protein accumulates in a different organ. Protein folding disorders and amyloid formation are linked with neurodegenerative ailments such as Parkinson's, and Alzheimer's diseases. Efforts are underway to understand the role of amyloid fibrils in the pathophysiology of enigmatic neurodegenerative diseases.

However, the exact cause and no early diagnosis make the diseases non-curable till now.

Many bacteria also produce amyloids as a major component of biofilms to protect themselves from environmental assaults. Curli, bacterial amyloid, is encoded by the csg gene cluster and is highly conserved between enteric bacteria including Salmonella serotypes and E. coli. Our lab previously reported that curli is expressed in the gastrointestinal tract and starts inflammatory processes. In this project, student will develop novel techniques to image and quantify bacterial amyloid curli in different tissues following infection.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Genomic Medicine

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Previous lab experience is a plus but not required

**Cagla Tukul**  
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LKSOM  
Center for Microbiology and  
Immunology

### Effects of histamine-induced itch and kappa opioid receptor agonists on activity of brain regions

Using c-Fos activation as a proxy for neuronal activation, we will investigate effect of histamine-induced itch on c-Fos activation in brain regions of TRAP2 x Ai6 mice and effects of the kappa opioid agonists U50,488H and nalfurafine, which have anti-itch effects, on the activation pattern. In addition, we will determine differences in c-Fos activation in brains following treatment with U50,488H and nalfurafine, which have different side effect profiles. The student will participate in the project working under the supervision of senior lab members.

**Location:** HSC

**Student Majors Accepted:** Neuroscience, Biology or related

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** interested in lab research, eager to learn, organized, resilient

**Lee-Yuan Liu-Chen**  
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LKSOM  
Center for Substance Abuse  
Research

### Causal pathways of overuse injury

To determine in young adult rats, using our operant model of overuse injuries: (a) causal pathways in overuse MSKIs, focusing on roles of poor sleep, inflammation and fibrosis; (b) whether sleep has a role in moderating pain intensity/persistence; and (c) whether undisturbed sleep or whole body exercise, and reduced fibrosis using a novel antibody against a fibrogenic molecule (anti-CCN2), or a combination, effectively reduces pain and improves function.

**Location:** HSC

**Student Majors Accepted:** Biology, or health science related degree

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** Western blot/electrophysiology or microscopy skills (or desire to learn)

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**Mary Barbe**  
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LKSOM  
Center for Translational Medicine

### Cardiac Fibrosis in Heart Failure

Approximately six million adults in the US suffering from heart failure (HF), representing a significant health care burden for the nation. A common feature of HF is excessive extracellular matrix deposition by a specialized and differentiated fibroblast population, known as myofibroblasts, in response to injury of the heart. While myofibroblasts help maintain the structure of the injured heart and prevent heart wall rupture, persistence of myofibroblasts results in excessive fibrosis and cardiac dysfunction. Therefore, identifying molecular mechanisms of myofibroblast differentiation in cardiac fibrosis could yield novel clinical targets to delay or reverse the development of HF. Our lab is studying the mechanisms by which metabolism controls the epigenetic reprogramming of myofibroblasts. These projects have identified enzymes that produce acetyl-CoA as crucial regulators of myofibroblast differentiation and as players in the epigenetic reprogramming of cardiac fibrosis. We hypothesize that stress and injury alter the metabolism of cardiac fibroblasts and affect how acetyl-CoA bioavailability mediates changes in histone acetylation and chromatin structure to activate the myofibroblast gene program.

**Location:** HSC

**Student Majors Accepted:** Biology, Chemistry, Biochemistry, Neuroscience

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Priority placed on previous molecular biology laboratory experience. Self-motivated, hard-working individuals with a desire to learn are a must.

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**John Elrod**  
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LKSOM  
Center for Translational Medicine

### Mitochondrial Calcium Exchange in Alzheimer's Disease

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by memory loss, neuronal death, and rapid cognitive decline. The "amyloid hypothesis" of AD posits that accumulation of amyloid beta (A $\beta$ ) plaques in the brain parenchyma is a primary mechanism of neuronal death and AD pathogenesis. Unfortunately, the amyloid pathway has proven to be an ineffective therapeutic target through multiple clinical trials and effective treatments for AD remain elusive. Our lab has previously demonstrated that mitochondrial calcium (mCa $^{2+}$ ) overload promotes AD pathology. mCa $^{2+}$  overload causes excessive production of reactive oxygen species (ROS), metabolic derangement, and cell death, all hallmark features of AD. Our lab has shown significant alterations in expression of mCa $^{2+}$ -handling machinery in human brains from sporadic AD patients and established these changes to be causal of AD pathology and cognitive decline using mouse models of AD. We are currently working to understand how alterations of mCa $^{2+}$  regulatory proteins affect disease course. Students will develop strong foundations in basic cell and molecular biology techniques (mouse handling, genotyping, cell culture, cloning, fluorescence microscopy etc.) as well as be exposed to more advanced and specialized techniques such as behavioral phenotyping. We seek driven, dependable, and articulate individuals for this project.

**Location:** HSC

**Student Majors Accepted:** Any

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Priority placed on previous molecular biology laboratory experience. Self-motivated, hard-working individuals with a desire to learn are a must.

**John Elrod**  
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LKSOM  
Center for Translational Medicine

### Mitochondrial Calcium Exchange in Heart Disease

Mitochondrial calcium exchange plays a critical role in regulating cellular bioenergetics, but also contributes to cell death. The overall goal of this project is to understand how alterations in mitochondrial calcium exchange contribute to cardiac injury and heart failure. Our lab has generated numerous genetic mouse models to knock out or overexpress the genes facilitating mitochondrial calcium uptake and efflux in the heart, and we are currently using surgical models of heart failure to assess how perturbation of these pathways protects or predisposes to heart disease. We are also taking in vivo and in vitro approaches to understand the molecular mechanisms that regulate the activity of these calcium handling proteins in order to understand how they could be targeted therapeutically. Students will gain experience in standard cell and molecular biology techniques as well as mouse handling, genotyping, and cardiovascular phenotyping. We seek driven, dependable individuals for this project.

**Location:** HSC

**Student Majors Accepted:** Biology, Chemistry, Biochemistry, Neuroscience

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Priority placed on previous molecular biology laboratory experience. Self-motivated, hard-working individuals with a desire to learn are a must.

**John Elrod**  
elrod@temple.edu  
LKSOM  
Center for Translational Medicine

### Myeloid cell responsiveness to cardiac injury

We are investigating the impact of altered receptor expression/signaling in myeloid cells on their responsiveness to cardiac injury. The URP student will be involved in assessing markers of cardiac injury and remodeling via immunohistochemical and biochemical/molecular biology assays.

**Location:** HSC

**Student Majors Accepted:** Biology and Chemistry

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Previous research lab experience a plus

**Douglas Tilley**  
douglas.tilley@temple.edu  
LKSOM  
Center for Translational Medicine

### The role of ADGRs in the heart

We are investigating the impact of a new class of receptors, adhesion G protein-coupled receptors, on cardiac function and remodeling during heart failure. The URP student will be involved in analyzing echocardiography data for function and immunohistochemical and molecular biology readouts will be used to assess remodeling parameters. Some in vitro work to assess receptor activity/responsiveness may also be pursued.

**Location:** HSC

**Student Majors Accepted:** Biology and Chemistry

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Previous research lab experience a plus.

**Douglas Tilley**  
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LKSOM  
Center for Translational Medicine

### The mechanisms of lung injury

Multiple factors can induce lung injury leading to pulmonary diseases such as emphysema or fibrosis. Our goal is to determine the mechanisms of lung injury using cells lines and samples obtained from patients with these diseases. We use various laboratory methods in our projects.

**Location:** HSC

**Student Majors Accepted:** N/A

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** N/A

**Beata Kosmider**  
beata.kosmider@temple.edu  
LKSOM  
Department of Microbiology,  
Immunology, and Inflammation



**Genetics and Epigenetics of sex-specific expression patterns in early embryogenesis**

We are investigating differences between male and female mouse embryonic stem cells and mouse embryos, and identifying the mechanisms by which these early differences are established. We integrate gene expression, DNA methylation and chromatin conformation analyses with bioinformatics to establish how sex biases affect cellular phenotypes in health and disease.

**Nora Engel**  
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LKSOM  
Fels Cancer Institute

**Location:** HSC

**Student Majors Accepted:** Biology

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** Basic laboratory skills, such as pipetting, running gels, PCR and making solutions required.

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**Regulation of the PP2A tumor suppressor in normal and cancer cells**

There are various projects available that deal with the characterization of the substrate specificity of the B55 $\hat{\pm}$ /PP2A holoenzyme, its regulation in normal cells and its deregulation in cancer. (1) B55 $\hat{\pm}$ /PP2A holoenzyme substrate specificity. This project focuses on determining the determinants of substrate specificity of B55 $\hat{\pm}$ /PP2A holoenzymes using various unrelated substrates of this holoenzyme. We have an extensive collection of B55 $\hat{\pm}$  and substrate mutants and more to be made to be tested for binding using transient co-transfections made in human cells grown in culture. The project involves cell culture, transfections, immunoprecipitation, western blot analysis and generation and maintenance of plasmids. (2) To identify the motifs in substrates recognized by B55/PP2A protein phosphatases. This project is centered on determining the amino acid residues that mediate the interaction of various substrates with the PP2A. We have an extensive collection of GST-mutants to characterize these interactions. More mutants will be generated based on bioinformatics docking analysis and the results of binding assays. The project involves cell culture, GST pull-down assays, western blot analysis and generation and maintenance of plasmids. (3) Role of B55 $\alpha$ /PP2A holoenzymes in prostate cancer. The project involves cell culture, organoid growth, transfections, immunoprecipitations, western blot analysis and generation and maintenance of plasmids. It may also involve confocal microscopy. (4) immortalization of primary prostate cells and establishment of primary cancer cells. The project involves cell culture, organoid growth, transfections, immunoprecipitations, western blot analysis and generation and maintenance of plasmids. It may also involve confocal microscopy. (5) Role of B55 $\alpha$ /PP2A holoenzymes in prostate cancer. The project involves cell culture, organoid growth, transfections, immunoprecipitations, western blot analysis and generation and maintenance of plasmids. It may also involve confocal microscopy.

**Location:** HSC

**Student Majors Accepted:** Biochemistry, Biology, Bioinformatics - Genetics and/or Biochemistry and/or Cell Biology

**Class Preferences:** Freshmen, Sophomores & Juniors

**Important Selection Criteria:** Motivation for Science and Research. Background knowledge: Previous lab experience is NOT required.

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**Xavier Graña**  
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LKSOM  
Fels Cancer Institute

**Epigenetic differences in different assisted reproductive technologies; and in different population groups in colorectal cancer**

To identify best approaches for assisted reproductive technology using epigenetic assays; and to identify the epigenetic basis of racial disparity in colorectal cancer.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Students interested to learn molecular techniques and computational analyses

**Jayashri Ghosh**  
jayashri.ghosh@temple.edu  
LKSOM  
Fels Cancer Institute for  
Personalized Medicine

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**Role of STIM-dependent calcium signals in T cell differentiation**

T cells are critical players in adaptive immunity. T cells are made in the thymus and then released into peripheral blood where they seek out foreign agents. One of the first events that occurs in T cells when activated is a change in cytosolic calcium concentration. These calcium responses drive their differentiation into multiple differentiated T cell subsets that control the immune response in a manner dependent on both the duration and intensity of the calcium signal. We utilize a combination of cell lines and mouse models to understand the molecular events in control of calcium signal generation and T cell differentiation. This project would involve working closely with senior investigators in my lab, with the potential to learn multiple research approaches. Some prior students have earned publications.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Student must be enthusiastic with a genuine interest in learning research. Prior lab experience would be highly desirable but not required. Project involves cell culture, Western blots, cloning and fluorescence microscopy.

**Jonathan Soboloff**  
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LKSOM  
Fels Cancer Institute for  
Personalized Medicine

### Thermosensitive Archaeosomes

This project is to develop a new liposome system that can have extraordinary stability at body temperature yet can be converted to an efficient drug delivery system for cancer therapy when the temperature of the tumor area is raised to 42-44°C (local hyperthermia treatment). This new liposome system will contain archaea tetraether lipids (specifically, the polar lipid fraction E, PLFE); thus, they are called archaeosomes. PLFE, an asymmetric macrocyclic compound with one end carrying a negative charge and another end carrying no charge at neutral pH, is used to provide great liposome stability and the capability to change the liposome surface charge. In addition, the new liposome will carry a ligand which can bind specifically to phosphatidylserine (PS)-rich surfaces, a hallmark of the surface of most cancer cells. The research work includes how to grow hyperthermophilic archaea (optimal growth: 75-80°C and pH 2-3), isolate archaea PLFE lipids, make archaeosome nanoparticles, characterize physicochemical properties of archaeosomes, and study their interactions with cancer cells.

**Location:** HSC

**Student Majors Accepted:** chemistry, biology, biochemistry, & biophysics

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Students with a keen interest in basic science research are encouraged to apply

**Parkson Chong**  
pchong02@temple.edu  
LKSOM  
Medical Genetics and Molecular  
Biochemistry

### Novel Antithrombotic Agent

According to the CDC, strokes are the fifth leading cause of death in the United States. However, alarming issues exist with current anticoagulants such as Heparin which can cause a low platelet count (thrombocytopenia) and Warfarin which causes bleeding by inhibiting clotting factor production. It is crucial to develop a potent and safer anti-thrombotic agent that can be utilized clinically to reduce the number of strokes suffered each year. Recently, our lab partnered with scientists at Jefferson and a biotech company found that Zn(II)-Bis-dipicolylamine-containing liposomes exhibited anti-thrombotic activity and did not lead to thrombocytopenia. These findings lead to a US patent (#11,090,309, issued 8/17/2021; Title: Anti-thrombotic agents and methods of use thereof.). In this URP project, students will join this collaborative research and study how DPA-containing liposomes interact with the activated platelets and how to optimize the liposome formulation to achieve maximal antithrombotic activities. Liposome methodology, fluorescence spectroscopy, dynamic light scattering, particle tracking, and cytotoxicity assays on endothelial cells will be employed.

**Location:** HSC

**Student Majors Accepted:** chemistry, biology, biochemistry, and biophysics

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Students with a keen interest in basic science research

**Parkson Chong**  
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LKSOM  
Medical Genetics and Molecular  
Biochemistry

### Deciphering the role of STAT2 in colorectal cancer

Cancer is a very complex disease driven by multiple genetic alterations. The focus of my research is to investigate the mechanism by which the transcription factor STAT2 promotes tumor progression in colorectal cancer. The long-term goal of this project is to determine how STAT2 cooperates with tumor oncogenes to enable tumor progression, conversion of benign lesions to malignant and metastasis. Understanding this process will lead to the development of novel therapeutic interventions to treat colorectal cancer.

**Location:** HSC

**Student Majors Accepted:** Biology and Biochemistry

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** No prior research experience is required. Good communication skills, attention to detail and able to follow directions. Self-motivated, eager to learn.

**Ana Gamero**  
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LKSOM  
Medical Genetics and Molecular  
Biochemistry

### Memory Discrimination in Mouse Models of Alzheimer's Disease

Student researchers will use behavioral assays to compare memory discrimination ability of young, middle-aged, and old mice carrying the APOE4 gene--the major genetic risk factor for late onset Alzheimer's disease. Students will learn mouse surgeries, molecular biology, immunohistochemistry, and fluorescence imaging in order to identify synaptic targets that could rescue memory deficits in these mice.

**Location:** HSC

**Student Majors Accepted:** Neuroscience, Psychology, Cellular/Molecular Neuroscience, Biology

**Class Preferences:** Freshmen, Sophomores & Juniors

**Important Selection Criteria:** Highly motivated students will always be welcome. Previous lab experience is a plus but not a requirement.

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### Noncoding RNAs in reward

Student will measure expression of noncoding RNA pathways in brain tissue from animals that have undergone a learning task. Student may study the brain circuits involved in regulating the noncoding RNA pathway during reward learning. Student may evaluate behavior of animals during a reward learning task after manipulation of noncoding RNA pathways.

**Location:** HSC

**Student Majors Accepted:** Biology or Neuroscience

**Class Preferences:** Sophomores, Juniors & Seniors

**Important Selection Criteria:** Must be willing to work with animals

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**Victor Luna**  
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LKSOM  
Neural Sciences

**Stephanie Sullivan**  
stephanie.sullivan@temple.edu  
LKSOM  
Neural Sciences

### Chemogenetic evaluation of neural function

1) Chemogenetic stimulation of descending motor pathways in juvenile rats to promote functional recovery after spinal cord injury. 2) Evaluation of neurocircuits involved in learning and memory associated with rehabilitation after spinal cord injury.

**George Smith**  
george.smith@temple.edu  
LKSOM  
Neural Sciences

**Location:** HSC

**Student Majors Accepted:** Neuroscience, engineering, chemistry

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** Techniques used in the lab: spinal surgery, gene therapy, immunohistochemistry, western blot analyses, electrophysiology, motion capture, kinematics.

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### Role of motor learning and memory in rehabilitation after spinal cord injury

The project will use gene therapy to express chemogenetic modulators within specific circuits to determine if they participate in recover of function after rehabilitation. Similar genetic tools will be used to increase excitation of these circuits to enhance rehabilitation. Students will learn rodent surgery, application of gene therapy, behavioral techniques and immunohistochemistry. There is also opportunities to learn electrophysiology and kinematics with these studies.

**George Smith**  
george.smith@temple.edu  
LKSOM  
Neural Sciences

**Location:** HSC

**Student Majors Accepted:** Neuroscience, Biology, Bioengineering or Chemistry.

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** GPA above 3.3

**Analysis of transgenic mice to study Peripheral nerve degeneration, tumorigenesis or regeneration**

Student(s) will be involved in immunohistochemical, Western blotting and/or electron microscopic analysis of various transgenic or knockout mice in which expression of Yap/Taz or related factors are removed or increased selectively in Schwann cells. We aim to understand how Yap/Taz contribute to the normal maintenance, tumorigenesis and regeneration of fully functional motor and sensory nerve in adult.

**Young-Jin Son**  
yson@temple.edu  
LKSOM  
Neural Sciences

**Location:** HSC

**Student Majors Accepted:** Biology, Neuroscience, Chemistry or related

**Class Preferences:** Juniors & Seniors

**Important Selection Criteria:** high motivation and serious about learning bench work, excellent organization skills

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**Therapeutic potential of Cannabinoids for Pain and Cognition**

My laboratory currently studies the therapeutic potential of non-psychoactive cannabinoid compounds for the treatment of nervous system disorders, including neuropathic pain, neuroinflammation, cognition, and substance abuse. We use mouse and rat models of these disorders to investigate the safety and effectiveness of constituents of the Cannabis plant, assessing behavioral and molecular outcomes.

**Sara Jane Ward**  
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LKSOM  
Neural Sciences

**Location:** HSC

**Student Majors Accepted:** Neuroscience, Biology

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** N/A

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### Neurobiology of Addiction

Research in the Unterwald lab investigates cellular and molecular basis of addiction using pre-clinical rodent models. Students participate in all phases of the research by working with other members of the laboratory. Some methods that are utilized include 1) rodent behavioral tests of drug-seeking/drug-taking behaviors, anxiety, and depression, 2) analysis of brain tissue for levels of proteins and genes of interest, 3) tests of pharmacological interventions, and 3) cell analysis by florescent microscopy.

**Location:** HSC

**Student Majors Accepted:** Biology, Chemistry, Neuroscience

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Enthusiastic and Responsible

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**Ellen Unterwald**  
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LKSOM  
Neural Sciences and Center for  
Substance Abuse Research

### Combinatorial effects of ionizing radiation and cannabinoids against Glioblastoma multiforme

Glioblastoma multiforme (GBM) is the most common primary brain tumor in adults and has a nearly fatal outcome in both children as well as adults. Despite the best possible treatments available, the median survival after diagnosis is usually 12 to 15 months and there has not been significant improvement over the past two decades. Since primary or acquired resistance of various tumors to conventional treatment regimens, till now constitute a major concern in cancer therapies, alternative strategies to target tumor cell resistance are of prime importance to improve patient outcome. Several studies showed that the effect of RT can be enhanced if combined with certain alternative modes of treatment. During the past two decades, such combination therapies have made great strides in cancer treatment. One of the alternative modes of cancer therapy that has been picked up momentum recently includes, use of certain alkaloids especially cannabinoids (functioning as synergizers or radiosensitizers or even tumor cell killers) with appropriate conventional treatments. In this investigation attempts will be made to determine the cellular and molecular effects of cannabinoids (tetrahydrocannabinol [THC] and cannabidiol [CBD]) in combination with ionizing radiation (IR) on Glioblastoma multiforme.

**Location:** HSC

**Student Majors Accepted:** Biology, Biochemistry, Bioengineering

**Class Preferences:** Freshmen, Sophomores & Juniors

**Important Selection Criteria:** Genuine interest in cancer biology, previous lab experience not essential. Research maybe Virtual and/or in-person

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**Mohan P. Achary**  
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LKSOM  
Radiation Oncology

**Potential Toxicological and Tumorigenic Effects of 'Forever Chemicals' (PFASs) on Normal Breast and Brain Cells**

Environmental contaminants such as per and poly fluoroalkyl substances (PFASs) have been recently linked to almost all cancers in epidemiological clinical studies. In this investigation, our aim is to determine potential toxicological as well as tumorigenic effects of certain PFASs on normal breast and brain cells using conventional in vitro techniques.

**Location:** HSC

**Student Majors Accepted:** Biology, Molecular biology, Biochemistry

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Some laboratory research experience is preferred

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**Mohan P. Achary**  
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LKSOM  
Radiation Oncology

**In Utero Ethanol Exposure Induces Mitochondrial DNA Damage and Inhibits mtDNA Repair in Developing Brain**

**Introduction:** Mitochondrial dysfunction is postulated to be a central event in Fetal Alcohol Syndrome (FAS). Recent studies have suggested that EtOH can cause mitochondrial DNA (mtDNA) damage. If mtDNA is not repaired, it impairs mitochondrial function, which further increases oxidative stress and cell damage. Changes in the mtDNA repair protein 8-oxoguanine DNA glycosylase-1 (OGG1) may impair the efficiency of mtDNA repair. Studies of molecular mechanisms are limited by the absence of suitable human models.

**Methods:** We compared human and rat FAS fetal brain tissue from parallel models. Rat FAS was induced by administering a 6.7% alcohol liquid diet to pregnant dams. Human fetal brain tissue (10 – 22 weeks) was collected and characterized by maternal self-reported EtOH exposure. mtDNA was isolated (QIAamp Kit) and amplified (long q-PCR/Gene Amp XL Kit). RNA expression of mitochondrial markers were assayed by qRT-PCR, using mitochondrial energy metabolism array. OGG1, was studied by qRT-PCR.

**Results.** We demonstrate that maternal EtOH exposure increases mtDNA damage in fetal brain tissue. Mitochondrial dysfunction was also noted based on reduced mitochondrial energy metabolism markers. We determined that fetal mtDNA repair, mediated by OGG1 was inhibited in fetal brain tissue following EtOH exposure. Further, we demonstrate that IGF-1 rescued neuronal cells from EtOH-mediated mtDNA damage, and OGG1 inhibition.

**Conclusion:** We demonstrated direct correlation between EtOH exposure and mtDNA damage during development that was seen in both human and murine samples. If IGF-1 decrease can increase risk of FASD, then IGF-1 administration could prevent EtOH-caused mtDNA damage and neuronal apoptosis. Our model presents an ideal platform for investigating of mitochondrial functions affected by EtOH, with direct translational potential.

**Location:** HSC

**Student Majors Accepted:** Neuroscience, Molecular Biology, Genetics

**Class Preferences:** Sophomores & Juniors

**Important Selection Criteria:** Research can be done with very dedicated to science students using hybrid method: virtual (participating in a writing of a research manuscript) and in lab.

**Nune Darbinian**  
nsarkiss@temple.edu  
LKSOM  
Shriners Hospitals Pediatric  
Research Center

### **CNS regeneration and repair**

Our lab is highly interested in neural repair and CNS nerve regeneration research. Our projects focus on the molecular/cellular mechanisms for CNS neuronal growth failure and development of novel and effective strategies to promote neuronal regeneration, remyelination and functional recovery after injury and/or in neurodegenerative disorders. We employ various in vitro and in vivo research approaches, including molecular/cellular neurobiology, biochemistry, genetic and pharmacological methods, transgenic over-expression and knockout mice, and multiple neuronal/axonal lesion models (such as spinal cord injury, optic nerve crush and demyelination of EAE) in mice and rats. We have produced a number of high impact papers related to CNS nerve regeneration and treatments for CNS injury. Our lab is nationally and internationally recognized for discovering that the leukocyte common antigen related phosphatase (LAR) is a receptor for the scare-sourced growth inhibitors of CSPGs and for promoting CNS axon regeneration with available clinical drugs that suppress Rho and GSK-3 signaling pathways. We are currently working on exciting research projects aiming to identify novel genes that regulate CNS neural growth and repair. We currently have ample funds to support graduate study, including two newly-started R01s and similar size of other funds.

**Location:** N/A

**Student Majors Accepted:** Any

**Class Preferences:** N/A

**Important Selection Criteria:** N/A

**Shuxin Li**  
Shuxin.li@temple.edu  
LKSOM  
Shriners Hospitals Pediatric  
Research Center

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### **Prostate Cancer in Renal Transplant recipients**

An increasing number of older patients are being transplanted and as the longevity of the transplanted patients increases, there is an increase in risk of developing prostate cancer. This project aims to determine risk factors for developing prostate cancer in patients with kidney failure and following kidney transplantation.

**Location:** HSC

**Student Majors Accepted:** All majors

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Data science skills preferred but not an absolute requirement.

**Sunil Karhadkar**  
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LKSOM  
Surgery

### Renal dysfunction after Lung Transplantation

A decline in renal function in the first 6 months after heart or lung transplantation progressively worsens in subsequent years. Furthermore, up to 5% of patients eventually progress to end-stage renal disease (ESRD) requiring permanent renal replacement therapy. The prevalence of renal failure following lung transplant is 26% and 38%, at 1 and 5 years, respectively. However, little is known about the prevalence of RF in the immediate post-operative period following lung transplantation and the long-term consequences of peri-operative RF.

This project seeks to determine the prevalence of RF in lung transplant recipients, to identify pre-operative and intra-operative predictive factors for RF, and to assess the effects of RF on long-term renal function and survival.

**Location:** HSC

**Student Majors Accepted:** Biology, Premed

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:**

**Sunil Karhadkar**  
sunilk@temple.edu  
LKSOM  
Surgery

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### Development of drug delivery systems with enhanced in vivo stability

Drug delivery systems can modify the pharmacokinetics of drugs, protect them from decomposition and control their spatial and temporal delivery in the organism. In recent years we were involved in the development of drug delivery systems based on amphiphilic compounds of different molecular weight, from simple surfactants, gemini surfactants, lipids, dendrons and polymers. We are currently seeking talented and highly motivated students to develop the next generation of drug delivery systems with enhanced in vivo stability capable of long circulation time in the human body. Students majoring in chemistry, biochemistry and biology are welcomed. Experience in working with cells and animal models is a plus but it is not required

**Location:** HSC

**Student Majors Accepted:** Chemistry, Biochemistry, Biology

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** General knowledge in chemistry, biochemistry, biology and especially in the interdisciplinary integration of this knowledge is needed.

**Marc Ilies**  
mailies@temple.edu  
Pharmacy  
Pharmaceutical Sciences

**Synthesis, physicochemical and biological evaluation of novel carbonic anhydrase inhibitors, activators and their pharmaceutical formulations**

Carbonic anhydrases (CAs, E. C. 4.2.1.1) are a class of ubiquitous metalloenzymes that catalyze the reversible hydration of carbon dioxide:  $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$ . Fourteen isozymes are currently known in humans, with different catalytic activity, subcellular localization and tissue distribution. These isozymes are involved in critical physiologic and pathologic processes including respiration, acid-base regulation, electrolyte secretion, bone resorption/calcification, gluconeogenesis, tumorigenicity and the growth and virulence of various pathogens. Some of them are over-expressed in pathological conditions such as edemas, glaucoma, obesity and cancer. Therefore CA isozymes have become important targets for pharmaceutical research. We are seeking talented and passionate individuals to be involved in the synthesis, physicochemical and biological testing of novel selective CA inhibitors and of their pharmaceutical formulations aiming towards treatment of various forms of cancer via novel drugs and drug delivery systems.

**Location:** HSC

**Student Majors Accepted:** Chemistry, Biochemistry, Biology

**Class Preferences:** Freshmen, Sophomores, Juniors & Seniors

**Important Selection Criteria:** Previous experience in synthesis, physicochemical and/or biological evaluation of organic compounds and their formulations, as well as towards tissue cell cultures constitutes a plus.

**Marc Ilies**  
mailies@temple.edu  
Pharmacy  
Pharmaceutical Sciences