# Sponsor Projects for Pauley Heart Center
# Summer 2023 Undergraduate Research Fellowship

| *Sponsor Name* | *Sponsor Research Areas* | *Project* |
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| **Dr. Justin Canada, PhD**<br>Assistant Professor<br>Department of Internal Medicine<br>Division of Cardiology | cardiopulmonary exercise testing, exercise physiology of heart failure, cardio-oncology, clinical research | **"Association of Exercise Stress variables with Non-invasive Cardiovascular Imaging Findings"** The coupling of exercise stress testing with non-invasive imaging modalities such as cardiac MRI, stress echocardiography, radionuclide imaging allows the opportunity to evaluate the structure and function of the heart both at rest and during dynamic movement. The project will identify and collect variables obtained during exercise stress and determine their associations with non-invasive imaging variables and cardiovascular risk status. The student will obtain a mentored-learning experience in these exercise stress procedures, identify a clinical question, collect identified variables to answer their clinical question, analyze results, and present a summary abstract of findings. |
| **Dr. Arturo Cardounel, MD**<br>Assistant Professor<br>Division of Cardiothoracic Surgery<br>Department of Surgery | heart disease, heart failure, molecular biology, endocarditis | The research focus of our laboratory is on developing novel therapeutic strategies for treating cardiovascular disease. One of our current projects involves creating tissue valves for treating patients with infections of their heart valves. Studies carried out in the laboratory will evaluate the performance and durability of a tricuspid valve replacement technique in pigs using autologous pericardium. The aims of the study will evaluate dynamic valve morphology, flow characteristics, hemodynamics, ventricular and atrial function and susceptibility to infection. Students participating in the study will participate in all aspects of the research including assisting with the surgical implantation, assessing function of the valve with ultrasound and carrying out molecular biology studies on the valve tissue at the end of the study. |
| **Dr. Jose F. Huizar, M.D., F.A.C.C., F.H.R.S., F.A.H.A.**<br>Professor<br>Department of Internal Medicine<br>Division of Cardiology | cardiomyopathy (pump failure), premature ventricular contractions (called extra beats), ventricular arrhythmias, Holer Monitors | **"Redefining successful Suppression of Premature Ventricular Contractions"**<br>The student will review ambulatory ECG reports with and without PVC suppression with either ablation or antiarrhythmc drugs to assess the PVC reduction needed in a 14-day monitor vs. 24 hour monitor. We hypothesize that 14-day Holters are more sensitive to identify successful suppression and redefining its value >50% when compared to>80% in 24-hr holters. |

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| **Dr. Jordana Kron, MD**<br>Professor<br>Department of Internal Medicine<br>Division of Cardiology | cardiac arrhythmias, electrophysiology, implantable cardioverter defibrillators, Sarcoidosis | **"Cardiac Sarcoidosis Consortium Registry**" The Cardiac Sarcoidosis Consortium is an international multicenter collaboration co-founded in 2011 by VCU, University of Michigan and University of Colorado and has a prospective registry of more than 700 patients with cardiac sarcoidosis from 25 centers. The student will help to update the database for the enrolled patients from VCU and also devise a hypothesis and query the database to try to answer a question with the current data. |
| **Dr. Anindita Das, PhD**<br>Associate Professor<br>Department of Internal Medicine<br>Division of Cardiology | Myocardial ischemia/reperfusion injury, Myocardial pre/post-conditioning, Chemotherapeutic-induced cardiotoxicity, mTOR signaling, Cancer biology, Inflammation, Apoptosis, microRNAs | **Project 1: Role of miRNAs against myocardial ischemia/reperfusion injury in diabetic heart**<br>We are interested to examine the contributions of miRNAs to heart pathology in the diabetic context, including a polycistronic miRNA cluster, miR-17-92. Using cardiomyocyte-specific diabetic miR-17-92 knockout/Knock-in mice, we will scrutinize the critical role of miR-17-92 in the setting of acute myocardial infarction in diabetic mice.<br>**Project 2: Effect of Combination Therapy (with PDE5-mTOR Inhibitors) in Attenuation of Chemotherapy/immunotherapy-induced Cardiotoxicity.**<br>Chemotherapeutic agents and immunotherapy cause systemic inflammation and serious multi-organ toxicity, including cardiotoxicity in many cancer patients. Our lab is also interested to examine the effect of a novel combination therapy (with PDE5-mTOR inhibitors) in attenuation of chemotherapy/immunotherapy-induced cardiotoxicity.<br><br>Students can learn basic Cardio-Oncology research skills by performing experiments in vitro cellular and molecular biology (cardiomyocytes and cancer cells) as well as in vivo (mouse) cardiotoxicity models. |
| **Dr. Yaorong Ge, PhD**<br>Professor<br>Software and Information Systems | Health Informatics, Clinical Information and Decision Support Systems, Data Warehousing, Data Analytics, Machine Learning, Medical Imaging and Image Analysis | **"Understanding and predicting heart failure risks in cancer patients using EHR data and clinical study data"** Cancer patients experience a higher rate of heart failure events following cancer treatment. In this project we will develop machine learning models to predict heart failure risks for cancer patients. We will use routine clinical data from Electronic Health Records and research data captured in clinical studies to construct accurate and early predictive models. Using these models, we will examine the factors that contribute to significant risks as well as factors that contribute to disparities in such risks. We will also compare measurements collected in clinical studies that are of higher quality to data available in routine clinical care that are more numerous and over a longer period to |

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| | | investigate the best approaches to developing heart failure prediction models that leverage routine clinical data recorded in EHR. |
| **Dr. Jennifer Jordan, PhD**<br>Assistant Professor<br>Department of Biomedical Engineering | imaging, cardio-oncology, biomedical engineering | **"Exploring vascular toxicities of estrogen deprivation therapy for premenopausal hormone receptor positive breast cancer patients"**<br>Women experience increased protection due to estrogen from atherosclerosis and cardiovascular disease during premenopausal years. Some breast cancers that thrive on estrogen are treated with estrogen suppression, however, which is associated with higher breast cancer free survival. Through an NIH-funded multi-center study, we are performing advanced cardiovascular imaging in pre-menopausal breast cancer patients to determine the vascular changes during the first two years of estrogen suppression therapy. In this project, the student will utilize image processing software to analyze cardiovascular MRI and CT images to determine the changes in blood flow, vascular stiffness, and plaque burden during treatment. |
| **Dr. Edward Lesnefsky, MD**<br>Professor<br>Department of Internal Medicine<br>Division of Cardiology<br>and<br>**Dr. Qun Chen, PhD**<br>Associate Professor<br>Department of Internal Medicine<br>Division of Cardiology | Myocardial injury is increased in aged heart following heart attack and accelerates the transition to post-infarction heart failure. Aging-induced mitochondrial dysfunction augments cardiac injury during heart attack. My recent research is focused on studying the mechanisms by which aging leads to mitochondrial dysfunction. The ultimate goal is to find effective therapeutic approaches to decrease cardiac injury by improving mitochondrial function in aged population. | Our research finds that endoplasmic reticulum (ER) stress contributes to mitochondrial dysfunction during aging. Complex I is a key component of mitochondrial respiratory chain. We find that key protein subunits of complex I are decreased by aging. calpain is a mitochondrial localized protease. Activation of calpain leads to degradation of complex I subunits during heart attack. Thus, our project is to study if ER stress activates mitochondria-localized calpain causing depletion of subunits of complex I that results in the age-induced mitochondrial dysfunction. Our recent study shows that chronic treatment using metformin can decrease the ER stress in aged hearts. Thus, we will study if chronic metformin treatment can protect complex I in aged hearts by decreasing mitochondrial calpain activation through attenuation of the ER stress. In addition, we will study if the restoration of mitochondrial function with chronic metformin feeding will decrease cardiac injury in the aged hearts following heart attack. |

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| **Dr. Greg Hundley, MD**<br>Professor, Department of Internal Medicine<br>Chair, Division of Cardiology<br>Director, Pauley Heart Center | Imaging, cardio-oncology, cardiology, breast cancer | Students in this program will work on a research team involved in cardiovascular human subjects research. Imaging sciences will represent a large component of the program. Students will gain exposure to echocardiography, magnetic resonance imaging, cardiac catheterization and develop a research question that will use one or more of these modalities to define an important outcome using one of these modalities. Current research include the areas of cardio-oncology (why are patients treated for cancer dying from cardiovascular events as opposed to cancer?), exercise (what exercise regimens are readily accessible in the community that lower cardiovascular risk?), and heart failure (how can we improve one's exercise intolerance when they have heart failure?) Students in this program will work in imaging departments, engage patients, work with exercise equipment, and perform advanced imaging analyses. |
| **Dr. Moe Makkiya, MD**<br>Assistant Professor<br>Department of Internal Medicine<br>Division of Cardiology | Cardiac imaging, cardiac echocardiography, new software and innovation in cardiac imaging, valvular heart disease, hypertrophic cardiomyopathy | **Project 1: "Utilization of a portable ultrasonography to guide the management of systolic heart failure in an outpatient environment"** A pilot prospective study to evaluate the safety and feasibility of Hand held ultrasound performed by a non-cardiologist to assist in evaluating the volume status and treatment safety of patients with decompensated systolic heart failure receiving IV diuresis in the outpatient HF clinic.<br>**Project 2: "Myocardial work in hypertrophic cardiomyopathy"** Myocardial work is a promising echocardiography tool used in the assessment of heart muscle work load. It indices are obtained by speckle tracking imagine in regard to patient hemodynamic measures. We proposed to perform a retrospective study to evaluate myocardial work indices on echocardiograms performed on patient with hypertrophic cardiomyopathy to see if it is a predictor of myocardial scar, arrhythmia event, specific genetic phenotype or worse prognosis.<br>**Project 3: "Socioeconomic Status as a Predictor of Mortality in Patients with hypertrophic cardiomyopathy."** Lower socioeconomic status (SES) is associated with a higher risk of cardiovascular disease. However, the association between SES and mortality in patients with hypertrophic cardiomyopathy is not clear. A retrospective study is needed to see whether SES predicts all-cause mortality in patients with hypertrophic cardiomyopathy. |
| **Dr. Alexander Lucas, PhD**<br>Instructor<br>Department of Health Behavior and Policy | Cancer survivorship, Behavioral Interventions, Physical Activity, Quality of Life | **"Behavioral Exercise Training to Reduce Cardiovascular Disease Risk in Men Undergoing Androgen Deprivation Therapy"** The student will assist us as we develop and refine a behavioral exercise training |

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| Pauley Heart Center | | intervention, that can be remotely delivered to men from medically underserved communities diagnosed with prostate cancer. The goal of this research is to refine a behavioral exercise intervention to buffer the negative sequalae of treatment with ADT. The student will gain experience with functional exercise testing, and creating materials that will be delivered remotely to support exercise training. Students may also be involved in the collection of qualitative interview data to help understand the different experiences of patients who are attempting to adopt exercise while living in rural or urban areas. |
| **Dr. Martin Mangino, PhD**<br>Professor<br>Professor of Surgery<br>Associate Chair for Basic Research | Molecular Mechanisms of Ischemic Cholangiopathy after Cardiac Death Liver Donation | Liver transplantation is the only definitive treatment for patients with end stage liver failure. Organ donation for liver transplantation occurs from patients that die from brain death where the brain is irreversibly damaged but the cardiovascular system is able to still function. These organs are recovered in good condition. Most patients die from heart death where the circulatory system stops and livers and other donor organs suffer prolonged ischemia (loss of oxygen) before donation that injures the graft. Livers transplanted from these donors suffer from ischemic cholangiopathy several weeks after transplantation that limits their use. This disease is characterized by bile duct strictures and loss of microscopic bile ducts causing biliary congestion, liver malfunction, and re-transplantation. If this complication can be understood and overcome, it would unlock a pool of donor livers large enough to move everyone off from the donor wait list. Therefore, this project studies the molecular mechanisms of ischemic cholangiopathy in human cholangiocytes using molecular and cell culture techniques. We have tentatively identified the cause as being an epithelial to mesenchymal transition (EMT) that causes the normal epithelial cells to turn into fibroblast and smooth muscle type cells. Pharmacological treatments to prevent and reverse the transition are undergoing evaluation to develop treatments. |
| **Dr. Arnethea L. Sutton, PhD**<br>Assistant Professor<br>Kinesiology and Health Sciences | Racial Disparities in Cardio oncology | **"Identifying factors associated with racial disparities in cardiovascular toxicities amongst breast cancer survivors."**<br>The student will help to identify factors, namely psychosocial and social need factors, that contribute to racial differences in cardiovascular toxicities (e.g., hypertension, heart failure). The student will have access to electronic health record data and survey data from Black and white women who are either currently receiving treatment or who have recently completed primary treatment for breast cancer. The student will also have an opportunity to work with other members of the team to recruit and interview cancer survivors. |

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| **Dr. Fadi Salloum, PhD**<br>Professor<br>Associate Director of Research Mentoring & Preclinical Science<br>Pauley Heart Center<br>Department of Internal Medicine<br>Division of Cardiology<br>and<br>**Adolfo Mauro, PhD**<br>Post-Doctoral Research Fellow<br>Department of Internal Medicine<br>Division of Cardiology | Cardiac physiology, molecular biology, cardio-oncology, ischemic heart disease, heart failure | **"Translational research on the cardiac complications of targeted cancer therapies."**<br>Winning the battle against cancer and improving the prognosis of patients with malignancies remains the primary objective of the oncology field. Though certain cancers are becoming more treatable, the longer life expectancy patients are experiencing as a result is not without its limitations, particularly chemotherapy-induced cardiotoxicity and heart failure. In our lab, one of the goals is to understand the molecular mechanisms that lead to the development of chemotherapy-induced cardiotoxicity by using innovative translational approaches. The student will have the opportunity to oversee and learn essential molecular technologies applied to preclinical in-vitro cell models and in-vivo animal models of cardiotoxicity. The student will familiarize him or herself with several notions regarding the pathophysiology of the heart while learning. |