



Research Scholars Program

2023-24 Academic Year

*Faculty Mentors &
Research Projects*

Why Research? Why Me?

Research creates mentorship opportunities, pathways to success and provides advanced skills and experience, enabling graduate and professional school success.

There are numerous research opportunities available to CST students. All departments have research courses, coop opportunities, and internship and/or independent study courses. Funded research is available through CST and special programs such as our Frances Velay Fellowship or our NSF-LSAMP projects. These are research leadership programs for female and under-represented minority students available through a competitive selection process. Additionally, there are many funded research opportunities in other academic settings. Summer and academic year internship opportunities are coordinated through our professional development center, located in the CST Advising Center in Tuttleman Learning Center - 111.

CST's Undergraduate Research Program, CST-URP is changing to increase opportunities for students in their early college years and to create more connections beyond main campus laboratories.

Our new **CST-Research Scholars Program, CST-RSP** will begin with introductory experiences, include numerous professional development opportunities and encourage success well beyond the baccalaureate.

During the academic year, **CST-RSP** students engaging in research **MUST**:

- register for a research course for one credit and a special/designated section of CST's professional development course, SCTC 2002 or a research course for a total of two credits, and commit a minimum of 10 hours each week to the project, and
- and students will receive a grant of \$500 upon completing the project as certified by their mentor, and
- research students may be paid participants of CST research for two terms, after which they are encouraged to continue their research for academic credit or join another funded program.

If you would like to be considered for a research position this academic year, please provide the information requested below.

You must be a current CST student to be eligible and you must have an overall and science GPA > 2.75.

We will sort and match students with mentors and projects in the first selection stage to help you to connect with faculty mentors. You will be invited to a mandatory research orientation to meet lab members and learn more about the projects available and opportunities. Mentors may choose to interview you beyond this orientation or not, but **THEY** make the final decisions as to which students can join their labs. Do not be discouraged if you are not selected. There can be lab space limitations. **JUST TRY AGAIN** next semester!!!

Early Career Projects

**(≤ 60 credits completed &
minimum of 10 credits in
science)**

PI: Arora, Sanjeevani

Cancer and Cellular Biology/LKSOM and Cancer Prevention and Control/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The trainee will assist in performing research to understand the genetics of colorectal cancer. With the rising incidence of colorectal cancer globally in individuals younger than the age of 50 years and more specifically rising incidence of young-onset rectal cancer, we are interested in exploring the genetics and relating it to socioeconomic factors as well as clinical and demographic factors. An EC trainee will analyze DNA sequencing data from cancer tissues on a computer software, and will correlate it to factors such as clinical variables of interest, demographics and so on. This is a hypothesis-driven project, and will be led by current literature. The trainee will be expected to review the current literature and contrast their findings. For database driven work, there is a possibility to work remotely and we can discuss this on an individual basis. **Special Requirements:** None.

PI: Astsaturov, Igor

Department of Hematology-Oncology/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: My laboratory is focused on metabolism in cancer. Specifically, we are working on the mechanism by which dietary carbs cause inflammation in insulin-responsive tissues such as liver. We have also discovered how scar tissue cells called fibroblasts feed cancer cells with lipids in a process called trogocytosis. **Special Requirements:** None.

PI: Azim, Homaira

Biomedical Education/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Position will provide students with the opportunity to help with medical education research projects. Research projects will entail conducting a literature review on medical education journals, participating in data collection and data analysis, proofreading manuscripts, etc. **Special Requirements:** None.

PI: Bellas, Evangelia

Bioengineering/COEng

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: We develop in vitro adipose tissue (fat) models of obesity using 3D tissue culture methods. Obesity adipose tissue has dysregulated matrix remodeling (i.e. fibrosis) which impairs adipocyte (fat cell) function. Students will explore how fibrosis and dysregulated matrix remodeling impairs adipocytes. **Special Requirements:** None.

PI: Bonfim, Mariana

Biology/CST

Type of Research Position: Early Career **Location:** Ambler Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: While forests provide important ecosystems services such as carbon storage and the maintenance of biodiversity, these systems are in the midst of profound transformations due to human impacts and changes to disturbance regimes due to climate change. To contribute to the global effort to monitor forests through time and sustain a long-term effort in research and education, the Ambler Field Station is working to establish a forest observatory plot following standardized protocols shared by the Smithsonian Institution through the ForestGEO network. A tornado that formed from Hurricane Ida, caused substantial damage to the Temple Forest Observatory in September 2021. The current goal of the project is to provide fine scale field data on the plant community composition, ecosystem biodiversity, animal activity, novel ecosystems created after the disturbance and carbon storage capacity among other factors that help inform research about resilience and recovery to climate-driven disturbances. Students will engage in outdoor, hands-on research to understand forest recovery, while developing skills in field data collection and more, while also developing an independent project that complements the Temple Forest Observatory and Ambler Field Station research goals. Transportation between Main Campus and Ambler available to Temple students. **Special Requirements:** None.

PI: Borguet, Eric

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Catalysis with metal oxyhydroxides. While it is known that many metal salts react in water to form small assemblies (metal oxyhydroxide clusters) that can catalyze important chemical reactions, the structure of these clusters and the mechanisms of their activity is not well understood. Under appropriate supervision, students will perform experiments, plot and analyze data. They will learn to make connections with the literature to interpret their data. They will gain skills in presenting their results in group meetings in my group and eventually at local, regional and even national conferences. Many undergraduates have been co-authors on peer-reviewed publications. Students will learn about catalysis, spectroscopy, and kinetics. **Special Requirements:** None.

PI: Borguet, Eric

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Laser Vibrational Spectroscopy and Dynamics of Molecular Species at Bio and Geochemical Interfaces - Research involves learning to use ultrafast lasers (we make some of the shortest infrared pulses in the world) to perform vibrational Sum Frequency Generation (SFG) a technique that provides sensitivity to less than a single layer of molecules. Students will investigate water, arguably the most important molecule on the planet, at interfaces of biological and geochemical relevance.

Under appropriate supervision, students will perform experiments, plot and analyze data. They will learn to make connections with the literature to interpret their data. They will gain skills in presenting their results in group meetings in my group and eventually at local, regional and even national conferences. Many undergraduates have been co-authors on peer-reviewed publications. Students will learn about optics, surface chemistry, biointerfaces, geochemistry and laser spectroscopy. **Special Requirements:** None.

PI: Borguet, Eric

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Capture, detection and destruction of toxic chemicals. Metal organic frameworks (MOFs) are nanoporous materials that can trap and even destroy chemical species. We want to understand how and where these molecules bind in the MOFs as well as understand the mechanisms of chemical transformation. Under appropriate supervision, students will perform experiments, plot and analyze data. They will learn to make connections with the literature to interpret their data. They will gain skills in presenting their results in group meetings in my group and eventually at local, regional and even national conferences. Many undergraduates have been co-authors on peer-reviewed publications. Students will learn about infrared spectroscopy, mass spectrometry and vacuum systems as well as adsorption/desorption and diffusion kinetics. **Special Requirements:** None.

PI: Borriello, Lucia

Cancer and Cellular Biology/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The student will have a great opportunity to study lung cancer and breast cancer progression and metastasis. **Special Requirements:** None.

PI: Buttaro, Bettina

Sol Sherry Thrombosis Research Center/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Contributions of biofilm biomaterial properties and spatial organization in metabolic cooperation, antibiotic resistance, and virulence using biology, mathematics, and machine learning. Biological experiments including laser scanning confocal microscopy, 16S rRNA gene sequencing for identification bacteria, and qPCR for gene expression. The use and development of software tools to analyze the properties of the biofilms including phylogeny software for bacterial identification, Matlab, VR Studio, and machine learning for biofilm analysis. **Special Requirements:** None.

PI: Buynevich, Ilya

Earth and Environmental Science/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: BIOGEOMORPHOLOGY: Project focuses on investigating the impact of resurging beaver populations on streambank stability (zoogeomorphology). Field research in suburban Philadelphia and analysis of collected datasets, with results presented at regional geoscience conferences. **Special Requirements:** None.

PI: Chen, Lu

Department of Cancer and Cellular Biology/LKSOM and Cancer Epigenetics Institute/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Independently carryout experiments to biochemically reconstitute CRISPR-Cas9/13 RNPs with different chemical compositions, and test the potency of their cellular activity in human cell lines using live-cell imaging techniques. **Special Requirements:** None.

PI: Chong, Parkson

Medical Genetics & Molecular Biochemistry/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: One of the projects is to design, fabricate, and characterize novel lipid-based nanoparticles for possible clinical applications such as cancer therapy and thrombosis prevention. Students will learn lab skills related to lipid and membrane biochemistry, nanotechnology, and biological spectroscopy. **Special Requirements:** None.

PI: Dai, Hai-Lung

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: 1. Laboratory research aimed at understanding antibiotic resistance of bacteria through working with PhD students and postdoctoral researchers.
2. Laboratory research aimed at understanding the properties of aerosols in the atmosphere and their environmental impact through working with PhD students and postdoctoral researchers. **Special Requirements:** None.

PI: Dikin, Dmitriy

Physics/CST, Mechanical Engineering/COEng

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Literature review of recent advances in the commercial use of graphene (nanocarbon) materials. **Special Requirements:** None.

PI: Escalante, Ananias

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Assist in the creation of databases with parasites' or pathogens' genomic data. Students should pay close attention to details and be capable of understanding how carefully curated data is essential in comparative genomics. **Special Requirements:** None.

PI: Estaras, Conchi

Cardiovascular Sciences/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: We are investigating the role of YAP1 in early development. The student will assist with a variety of experiments, including genotyping, western blot, PCRs. The student will also have the opportunity to learn culture of human stem cells and handling mouse embryos **Special Requirements:** None.

PI: Feitelson, Mark

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: critical thinking on mechanisms of cancer biology. **Special Requirements:** None.

PI: Freestone, Amy

Biology/CST

Type of Research Position: Early Career **Location:** Ambler Campus **Positions Available:** 10
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Forests are critical assets to humanity and provide a suite of services that sustain human society, by regulating climate, purifying air and water, and providing food, energy, and medicines. Global change, including land use change, climate change, and biological invasions, have modified forests on a massive scale, undermining ecological resilience and degrading forest capacity to provide critical services to human society. The environmental and biological dynamics that underlie forest ecosystem services and their resilience to global change are complex, and substantial gaps remain in the scientific understanding of these fundamental processes. Research conducted for this project will use the Temple Forest Observatory, a forest stand that was recently hit by an EF2 tornado at the Ambler Field Station, as a model system to understand the resilience of forest ecosystem services, specifically carbon storage and sequestration, to climate-driven wind disturbance. Students will assist with field data collection, processing of samples in the lab, data entry and management, and will conduct an independent project that aligns with the goals of the larger collaboration. The Ambler Field Station is located on the Temple Ambler Campus, and student transportation is provided to/from Main Campus by the inter-campus bus. **Special Requirements:** None.

PI: Gamero, Ana

Biochemistry/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Student will learn different molecular and cellular biology applications that will be applied for performing experiments to study the role of diet and inflammation in cancer and inflammatory bowel disease. **Special Requirements:** None.

PI: Golemis, Erica

Molecular Therapeutics/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The student would assist a senior graduate student on a project evaluating mechanisms of drug resistance in head and neck cancer. Work would involve methods in cell and molecular biology. **Special Requirements:** None.

PI: Grana, Xavier

Fels Cancer Institute for Personalized Medicine/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Biochemical, molecular and cellular biology studies to understand the function of Protein Phosphatase 2A in the human cell division cycle and cell signaling. The work uses human normal and cancer cell lines. **Special Requirements:** None.

PI: Gray, Alexander

Physics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Experimental investigations of quantum materials and interfaces using advanced X-ray spectroscopic and imaging techniques **Special Requirements:** None.

PI: Habas, Raymond

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 4-6
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The students will work with the PI in learning techniques, designing experiments and with experience perform independent projects. **Special Requirements:** None.

PI: Habas, Raymond

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The students will work with the PI in learning techniques, designing experiments and with experience perform independent projects. **Special Requirements:** None.

PI: Hedges, Blair

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Biodiversity: we explore the patterns and mechanisms that have shaped the tree of life including speciation, extinction, diversification, and biogeography. We often use time-calibrated phylogenies (timetrees) to address these questions. Students typically conduct projects that involve DNA sequencing, or morphological analyses of preserved vertebrates, or computational analyses of all types of organisms. For examples of recent studies, see our lab website and publications, hedgeslab.org. **Special Requirements:** None.

PI: Helmus, Matthew

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Assessment of spotted lanternfly ecology, evolution, modeling, and control actions.
Special Requirements: None.

PI: Karhadkar, Sunil

Surgery/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Study of outcomes following kidney and pancreas transplantation for obese diabetics with renal failure **Special Requirements:** None.

PI: Kim, Daniel

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Synthetic Organic Chemistry: Develop new light-mediated transformations and methodologies. Working closely with a graduate student mentor, undergraduates are expected to help develop new synthetic transformations with the use of transition metal catalysis and photoredox catalysis. No prior knowledge or expertise required. Highly recommended to have taken CHEM 2201/2202. **Special Requirements:** None.

PI: Kosmider, Beata

Center for Inflammation and Lung Research/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The goal of this project is to study the pathophysiology of emphysema development and progression. Emphysema belongs to chronic obstructive pulmonary disease. It is caused by cigarette smoking and second-hand smoking. Effective therapy is very limited. This disease is characterized by alveolar wall destruction. We use alveolar type II cells and various methods to study dysregulated genes and proteins in emphysema. **Special Requirements:** None.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Gene x environment interactions in exposure-based diseases.

Addressing complex global problems requires robust research frameworks to guide research inquiry and generate actionable outcomes. The proposed project will use the Temple-made Bio3Science framework for convergent scientific research, harnessing Temple expertise in human and environmental geography, ecology, genetics, and health sciences, to study the dense and dynamic relationships between the individual human body and the world around it. More specifically, we propose to apply the Bio3 framework to develop a convergence science of health and well-being by conceptualizing and operationalizing sustainable regional systems. A Bio3Science framework provides an opportunity to understand and address sustainability challenges emerging from the confluence of biological, biographical (life experience), and biospheric (biophysical environment) processes. The framework offers Rules of Life research a means through which to identify and understand complex causal relationships related to bio-social and eco-social mechanisms, which can help to predict human health outcomes. Biology includes the individual human organism, including measurable biomarkers related to genetics, physiology, and disease and qualitative characteristics related to the experience of symptoms, as well as interactions with other living organisms (e.g., microbiomes, infectious agents); Biography indicates the lived experience of urban and rural residents, including how they are situated in constellations of relations of power and inequity, specific contexts, social networks, (im)mobility and the content and connotation of acute events and/or longer-term cultural or affective dynamics; Biosphere, denotes the dynamic physical, living, and chemical conditions of the environment as shaped by relationships between people and nature.

Our team's previous collaborations have provided the theoretical backing and collaborative tools for Bio3Science to enable comprehensive examination of complex problems that demand multiple domains of expertise and cross-epistemological collaboration. The Bio3Science framework is promising because it offers a structure to integrate highly diverse kinds of data and to move across epistemological divides, thereby directly addressing many of the recently identified grand challenges of socio-ecological systems modeling. We plan to extend our foundation of the Bio3 Science framework into its first proof-of-concept using air quality in the urban Aburrá valley, housing the city of Medellín, Colombia, as a point of convergence to ask: how do proximal and telecoupled human and ecological interactions impact multi-scalar biosocial mechanisms associated with people's health and well-being? Therefore, we also will have a proof-of-concept to better conceptualize health and well-being across regions in order to understand the barriers to and opportunities for sustainable regional systems.

In this project in the Kulathinal lab, we will build a webtool that integrates data from the extensive GWAS (genome-wide association study) catalog with comprehensive SNP data from the 1000 Genomes Project. The project will allow researchers to identify genes that are found at higher than expected frequencies in

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The neurogenomics of incipient speciation in *Drosophila*.

Behavioral isolation is thought to be among the first stages in forming new species. Among known populations of *Drosophila melanogaster*, female fruit flies from Zimbabwe display a unique preference to mate with males of their own population and discriminate against foreigners, including those from neighboring Zambia and global populations such as those from North Carolina. This Zimbabwean population presents one of the few naturally occurring examples of incipient speciation, presenting an excellent model to study behavioral isolation at its earliest stage.

In this project, we identify highly differentiated candidate genes from population-specific genomes and test them via RNAi knock-outs using a recently developed high-throughput behavioral assay in our lab. From these comparative functional assays, we hope to gain a detailed understanding of both the neurogenes and evolutionary processes involved in population divergence and early species formation. **Special**

Requirments: None.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: On the origins of Darwin's thoughts. Mapping communications onto successive editions of *On the Origin of Species* **Special Requirments:** None.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: phyloDIVaS: Building a generalized interactive comparative genomics database resource of divergence and selection for user-selected assemblies.

Based on current genomic assemblies, FlyBase annotations, and OrthoDB orthology calls of the original 12 *Drosophila* sequenced species (Clark et al. 2007), the Kulathinal lab built/published flyDIVaS. This freely available resource contains melanogaster-centric orthologous gene sets, CDS and protein alignments, divergence statistics (% gaps, dN, dS, dN/dS), and codon-based tests of positive Darwinian selection. Genes and their orthologs can be selected from four different taxonomic datasets differing in phylogenetic depth and coverage density and visualized via interactive alignments and phylogenetic trees. We are developing a new platform that is more interactive, phylogenetically informative, and visual AND, most importantly, can work of ANY set of NCBI-blessed genome assemblies. **Special Requirements:** None.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Population genomics of domesticated dogs and the evolution of disease.

With a relatively short time (thousands of years) since a known common ancestor (wolves), extant dog breeds provide an excellent example of rapid evolution in action. The variety of phenotypes from behavior to morphology demonstrate how artificial selection can quickly act within a population. Accordingly, dozens of breeds of dogs have been sequenced with genomes publicly available. Dogs have also become a model for human disease with several databases available that connects genotypes to specific disease. In this project, we test whether breed-specific phenotypic traits including certain diseases will correlate to genome-wide SNP frequencies in that breed by performing the following:

1. Build an alignment of genomes/SNPs across all known breeds of dogs including wolves against a reference genome sequence.
 2. Map all known disease mutations in dogs to the reference genome sequence
 3. Correlate known breed-specific diseases to uniquely high SNP frequencies across a given breed.
 4. Develop a platform with visualizations that can be useful for similar problems using same Illumina Bead Chip technology.
- Special Requirements:** None.

PI: Lee, Hyan

Nuclear Dynamics and Cancer Program/FCCC

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Run R/python programs, and build up example files. **Special Requirements:** None.

PI: Liberles, David

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Various projects in computational comparative genomics and molecular evolution are available for a student who has some basic programming skills and who is mathematically inclined. The student will have a role in shaping the research design together with me. **Special Requirements:** None.

PI: Lyyra, Marjatta

Physics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Laser spectroscopy **Special Requirements:** None.

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: People form opinions (e.g.: is climate change real?) and make decisions (e.g.: should I get vaccinated?) based on data visualizations. However, research shows that people frequently misunderstand visualizations. Our project, Expert Goggles, helps people with limited data literacy skills see visualizations through the eyes of an expert by automatically annotating visualizations with key insights and scaffolding for interpretation. **Special Requirements:** None.

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: People will increasingly interact with AI systems to commute to work, recommend music and news, and help them to perform their work. This raises important new questions about how people understand AI systems and how they adapt when these systems break down. **Special Requirements:** None.

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 4
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Creating tools for civic designathons and hackathons. Our research team hosts the OwlHacks hackathon. For these events, our research team has developed a technology platform that collects the ideas that emerge across teams to summarize activities, provide cross-team inspiration, and facilitate real-time feedback exchange. You will learn to design social computing systems and will have opportunities to develop web applications. **Special Requirements:** None.

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Generative AI Tools for Learning. This project investigates ways that natural language processing (large language models) can be used to support learning. You will be able to design AI-powered educational experiences, develop web prototypes, and conduct human-subjects experiments with students in computing classrooms. **Special Requirements:** None.

PI: Manhart, Carol

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: My lab studies how the enzymes that are involved in DNA repair processes work. Students will learn basic lab techniques in addition to biochemical experiments, molecular biology approaches, molecular modeling, and bioinformatic techniques. **Special Requirements:** None.

PI: Martoff, Jeff

Physics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Detector construction/operation for directional dark matter detection. Detector operation & shielding enhancements for HPGe ultra-low background gamma ray assay facility. **Special Requirements:** None.

PI: Picone, Joseph

Electrical and Computer Engineering/COEng

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 12
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: We typically employ a large number of undergraduates in our group on projects involving machine learning applications in the health sciences. We currently are working on automatic interpretation of EEG signals and digital pathology images. We are also exploring applications of quantum computing to machine learning. Students will get a chance to learn how to create extensive simulations using Python, and how to do design and develop machine learning systems. We also have openings for projects involving the development of a new EEG corpus of long-term ambulatory EEG recordings. **Special Requirements:** None.

PI: Queisser, Gillian

Mathematics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The student's research project will advance the tool Neuro-VISOR, which immerses the user in a virtual lab world where brain cells can be visualized, interacted with, and stimulated. Real-time simulations of neuronal activity can be analyzed and interacted with, making Neuro-VISOR a unique tool in the area of computational neuroscience, used in an instructional and scientific context. The project revolves around the development of novel virtual reality-based computational tools, applied to neuroscientific modeling and simulation, and is co-advised by Dr. Seibold and Dr. Queisser. Students will have the opportunity to work in a team that covers a broad range of research, from mathematical modeling, numerical and visualization methods, to optimizing computational scalability for large problems. **Special Requirements:** None.

PI: Queisser, Gillian

Mathematics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The student's research project will advance our understanding of antibiotic resistance in complex bacterial biofilms, which are ubiquitous in the human body. Research will lie at the intersection of modeling biological processes and developing computational tools to quantify and simulate biological dynamics in biofilms. The project is co-advised by Dr. Buttaro (LKSOM, Temple) and Dr. Queisser (Math). Students will have the opportunity to work in a team of medical and mathematical researchers. **Special Requirements:** None.

PI: Safak, Mahmut

Center for Neurovirology and Gene Editing/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Project 1. Regulatory roles of PML nuclear bodies in JC virus life cycle
Special Requirements: None.

PI: Satya P Kunapuli

Sol Sherry Thrombosis Research Center/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Depending on the career interest of the student we expose them to a biochemical project (for those aspiring to do Ph.D) or a physiological project (for those aspiring to be MD) in the biology of platelets. **Special Requirements:** None.

PI: Seibold, Benjamin

Mathematics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Intuitive Visualization of Traffic Flow and Simulation Data. A recent experiment has produced a large data set of traffic flow, controlled by a swarm of automated vehicles; other data sets include neuroscience simulation data or results from radiotherapy simulations. For researchers and practitioners to better understand structures and patterns in the data, novel pathways for visualizing the data must be explored, including the use of virtual reality and user-interactive environments. **Special Requirements:** None.

PI: Sewall, Brent

Biology/CST

Type of Research Position: Early Career **Location:** Ambler Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Field Studies of Spotted Lanternfly Impacts on Native Plants – Ambler Campus
The spotted lanternfly is an invasive insect that poses an emerging threat to native forest ecosystems. In this project, the student will work as part of a team, using field surveys, standardized field experiments, greenhouse studies, mesocosm studies, and laboratory work to understand the ecology of spotted lanternflies and the effects they have on forest ecosystems. Research will occur at the Temple Ambler Field Station, located on the Temple Ambler Campus. Transportation from Main Campus to the Field Station is available via the inter-campus bus. **Special Requirements:** None.

PI: Sewall, Brent

Biology/CST

Type of Research Position: Early Career **Location:** Ambler Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Seed dispersal and regeneration of a forest community following disturbance
Disturbance is a major factor influencing ecological communities and severe disturbance may initiate new trajectories that drive important changes in community structure and composition for decades or centuries to come. In this project, we will investigate the ecological processes of seed dispersal and plant regeneration after a severe disturbance caused by an EF-2 tornado at the Temple Ambler Field Station (on Temple's Ambler Campus). Research will include observational and experimental studies of seed dispersal and initial regeneration of native and invasive plant species, including both woody and herbaceous species, within a forest ecosystem. The goal will be to understand early stages of plant dispersal and regeneration following a severe disturbance. **Special Requirements:** None.

PI: Sewall, Brent

Biology/CST

Type of Research Position: Early Career **Location:** Ambler Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Bat Susceptibility to White-Nose Syndrome – Main Campus
White-nose syndrome is an emerging infectious disease of hibernating bats caused by an invasive fungal pathogen. Since its first detection in 2006, it has caused extensive mortality of bats during hibernation, and has spread across much of North America. In this project, we will use statistical approaches, image analysis, and other tools to document infection and improve understanding of factors influencing both the impacts and spread of the disease, and means to conserve bat populations in light of this ongoing threat. **Special Requirements:** None.

PI: Singh, Anita

Bioengineering/COEng

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3-5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Imaging, scoring and data analysis **Special Requirements:** None.

PI: Sinha, Durgesh

Mathematics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: I am involved in mathematical modeling of infectious diseases to predict the eradication of disease and its impact on socioeconomic demographic regions. Students will find the data online, I will teach them how to extract parameters and how to model based on all involved criteria. **Special Requirements:** None.

PI: Sivek, Jeromy

Mathematics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: This study focuses on methods related to ranked preference voting. Topics include "spatial models" for preference formation based on policy ideas, networks modeling social interactions which lead to preference updates (and sometimes consensus), and disagreements between counting methods in simulated and historical ranked-preference elections. Potential work includes coding in python, writing summaries of observations/ experiments, participating in group discussions and presenting posters/ slides on group and individual work. **Special Requirements:** None.

PI: Slobodan Vucetic

Computer and Information Sciences/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Prof. Vucetic is looking for students interested in using AI technology to build AI-assisted software in a range of applications. Students with all kinds of backgrounds are welcome and their roles will depend on their background. The most advanced roles will be available for students with knowledge of software development and AI (such as data science, machine learning, statistics). At the minimum, it is expected that the students will have one semesters of programming experience. **Special Requirements:** None.

PI: Snyder, Nathaniel

Cardiovascular Sciences/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Projects available on quantitatively studying cell metabolism and developing new tools to examine and modify cancer, cardiovascular, and disease relevant metabolism. **Special Requirements:** None.

PI: Soboloff, Jonathan

Fels Cancer Institute for Personalized Medicine/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: My laboratory focuses on physiological and pathophysiological implications of cytosolic calcium signals. we currently have projects on immunology, cancer biology and arthritis. We typically have 3 to 5 undergrads in the lab; they work closely with senior personnel, under my direction. In general, most students have done well, with several gaining their own funding, authorship on published papers and ultimately moving on to PhD program, medical school and dental school. For the most part, students have entered my lab with zero experience; those that were successful maintained a high GPA while still putting in real time in the lab and engaging with other lab members. Anyone that feels that they would be a good candidate should reach out for a conversation. **Special Requirements:** None.

PI: Spigler, Rachel

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: We are conducting separate experiments to address the following questions: Why do flowers of some species last only 1 day while others more than 20? How do plants tolerate heavy metals in soils, and how do these soils influence floral traits and plant-pollinator interactions? Students will assist in carrying out experiments to address these question, working in the lab and in the plant growth facility. **Special Requirements:** None.

PI: Spigler, Rachel

Biology/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: How does plant genetic quality affect population persistence? This project will involve recording demographic data from a large experiment to answer this question. Students will assist in processing images of plants taken from the field to address questions related to germination and plant growth. **Special Requirements:** None.

PI: Stanley, Robert

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Optimization of Extremophilic Photolyase Protein Folding
Enzymes found in extremophilic organisms that thrive in high and low temperature face challenges to stability that mesophilic proteins (like ours) don't face. Mimicking the cytosolic contents of extremophiles to stabilize their intracellular constituents is a formidable but necessary task. You will explore a wide range of solvent additive conditions to find regions of protein-folding stability for the DNA repair enzyme, DNA photolyase **Special Requirements:** None.

PI: Stanley, Robert

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: iFADs - creating new optical probes of redox-driven metabolism
Students will assist in the development and characterization of a new class of optical probes of metabolism based on vitamin B2 analogs. Techniques include enzyme assays, PCR, UV/Vis spectroscopy, and protein purification. **Special Requirements:** None.

PI: Surrow, Bernd

Physics/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Detector development for particle collider facility at Brookhaven National Laboratory
Special Requirements: None.

PI: Unterwald, Ellen

Neural Sciences & CSAR/ LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Our laboratory investigates cellular and molecular mechanisms involved in the actions of drugs of abuse that lead to addiction using rodent models. The methods used include rodent behavioral tests, protein and gene expression analyses, and microscopy. **Special Requirements:** None.

PI: Voelz, Vincent

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Early career undergraduate students will use computational tools (Python, UNIX) to analyze molecular dynamics trajectories of biomolecules. This would be a good project for students with experience and/or interest in computer programming to apply this knowledge to biophysical simulation.
Special Requirements: None.

PI: Whetstine, Johnathan

Cancer Epigenetics Institute/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Students will be trained in the assays we use to evaluate DNA amplification and epigenetics with a focus on molecular biology and microscopy. Once proficient they will work along side other trainees to investigate the epigenetic mechanisms controlling DNA amplification. Some resources for more information are on the lab website- www.whetstinelab.com **Special Requirements:** None.

PI: Whitaker, Amy

Nuclear Dynamics and Cancer/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Pancreatic cancer is one of the most aggressive cancer types and represents a major clinical challenge. The primary genetic lesions in pancreatic cancer are mutations in the KRAS gene, which result in the overstimulation of signaling pathways that drive cancer growth. However, despite its strong potential, KRAS has been deemed a challenging therapeutic target, even “undruggable”, after efforts over the past four decades have largely failed. The indirect targeting of KRAS, through reducing its expression, offers an exciting alternative. The folding of the KRAS promoter DNA into a secondary structure called a G-quadruplex (G4) is critical for KRAS expression. Importantly, DNA damage and repair modify the KRAS promoter DNA structural fold and stability. However, despite being a prerequisite for rational drug design, the key mechanistic details describing how G4 folding and DNA damage/repair regulate mutant KRAS expression remains enigmatic. To this end, the goal of this project is to explore the role of DNA damage and repair as G4-associated regulators of KRAS gene expression in pancreatic cancer. **Special Requirements:** None.

PI: Yang, Zeng-jie

Nuclear Dynamics and Cancer/FCCC

Type of Research Position: Early Career **Location:** Fox Chase Cancer Center **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The projects aim to investigate the cellular and molecular basis underlying brain tumor initiation and progression. We are exploring novel therapeutic targets and strategies to treat primary brain tumors and brain metastases. The students are expected to work with postdocs and graduate students, to isolate and culture tumor cells, and study the phenotypes in tumor cells after genetic manipulations.

Special Requirements: None.

PI: Zaidi, Raza

Fels Cancer Institute for Personalized Medicine/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Using cell culture and mouse models to discover novel molecular mechanisms of UV radiation-induced melanoma initiation, progression and metastasis of melanoma skin cancer. **Special Requirements:** None.

PI: Zdilla, Michael

Chemistry/CST

Type of Research Position: Early Career **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The Zdilla group offers a number of research opportunities at the interface of chemistry and energy. These include synthetic bioinorganic chemistry to understand how plants harness the power of the sun, design of catalysts for solar water splitting, discovery of safer materials for high-energy batteries, and novel compositions for explosives and propellants. Students in the Zdilla lab perform chemical synthesis (organic, inorganic, and materials) and characterization of their compounds using a suite of techniques, including NMR, FT-IR, absorption spectroscopy, electron microscopy, electron paramagnetic resonance spectroscopy, and X-ray diffraction. The materials are then explored for their scope of reactivity or effectiveness in energy storage. **Special Requirements:** None.

PI: Zhu, Lin

Center for Asian Health/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: In this NIH-funded study, we are leverage existing data of a nationally representative sample of Asian American adolescents from the 2010–2019 National Immunization Survey-Teen (NIS-Teen) to examine the integrative effects of adolescent, parent, provider, and practice level factors in six Asian American subgroups. The study sample includes 6,019 boys and girls aged 13–17 of Chinese (1,613), Filipino (1,383), Japanese (834), Indian (800), Korean (786), and Vietnamese (603) ethnicity, and be well-powered to elucidate the complex multilevel social mechanisms of HPV vaccination outcomes and to identify subgroup disparities. Findings of this proposed study will provide subgroup-specific epidemiological data, guide the improvement of clinical practices, and inform the development of evidence-based strategies to reduce missed opportunities and improve adolescent vaccination in Asian American adolescents. Students will be engaged in literature review, scientific writing, results presentation and interpretation, conference abstract and manuscript development. **Special Requirements:** None.

PI: Zhu, Lin

Center for Asian Health/LKSOM

Type of Research Position: Early Career **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: We seek support to develop an interactive educational model for patients with biliary tract cancer (BTC) undergoing molecular and genetic testing. We propose that this model will help oncologists to deliver the best patient-education to underrepresented groups from various socioeconomic and educational backgrounds in the community setting.

The biliary tract cancer (BTC) landscape is rapidly evolving; molecular profiling efforts have unearthed actionable, targeted mutations in 40% of patients, with recently FDA-approved targeted therapies that act on them. As physicians are moving towards the era of precision oncology, there is an unmet need to identify genetic testing knowledge gaps in patients from different socioeconomic and educational backgrounds and the impact of these knowledge gaps on treatment. Creating awareness and educating patients on genetic testing, targetable mutations, and concurrent therapeutic options will help BTC patients understand the work up and treatment options that may be available to them, promoting treatment compliance and increased survival outcomes. The aim of this proposed study is to identify knowledge gaps among BTC patients of different races and socioeconomic statuses in their understanding of available genetic testing techniques and their impact on treatment and prognosis. **Special Requirements:** None.

Upperclassman Projects

(\geq 61 credits completed)

PI: Amini, Shohreh

Biology/CST

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Fall Only

Project Description: Role of immunomodulators in neuropathogenesis . **Special Requirments:** Familiarity with Cell Biology and Molecular genetics.

PI: Arora, Sanjeevani

Cancer and Cellular Biology/LKSOM and Cancer Prevention and Control/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Spring Only

Project Description: The trainee will assist in performing research to understand the genetics of colorectal cancer. With the rising incidence of colorectal cancer globally in individuals younger than the age of 50 years and more specifically rising incidence of young-onset rectal cancer, we are interested in exploring the genetics and relating these genetic data to clinical and demographic factors. It is anticipated that the trainee will perform functional assays to assess the impact of targeting specific genes of interest in cancer cell lines. If there is interest from the trainee, there is a possibility to also work on a database-driven project in this area and we encourage the trainee to discuss this with the principal investigator. **Special Requirments:** Background in biology, genetics and genomics, and cancer biology is a plus. Advanced knowledge of excel, experience with R, statistical knowledge, and any other computational languages is also a plus but not required. Depending on the aspect of the project.

PI: Astsaturov, Igor

Department of Hematology-Oncology/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: My laboratory is focused on metabolism in cancer. Specifically, we are working on the mechanism by which dietary carbs cause inflammation in insulin-responsive tissues such as liver. We have also discovered how scar tissue cells called fibroblasts feed cancer cells with lipids in a process called trogocytosis. **Special Requirements:** We are particularly interested in anyone with programming skills. Most important is your time commitment. We will invest our time to train a student. However, if the student is not available for experimental work or analysis of the data, we will not bene

PI: Autieri, Michael

The Lemole Center for Integrated Lymphatics Research/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: We study the role of mRNA stability, and the proteins that regulate mRNA stability in vascular diseases. The student will observe, learn, then perform RNA isolation, reverse transcription, and quantitative PCR from cultured vascular cells and vascular tissue to characterize gene expression. Some mouse genotyping will also be involved. **Special Requirements:** classroom knowledge of molecular biology and some rudimentary lab techniques. Punctuality and communication.

PI: Azim, Homaira

Biomedical Education/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Spring Only

Project Description: Position will provide students with the opportunity to help with medical education research projects. Research projects will entail conducting a literature review on medical education journals, participating in data collection and data analysis, proofreading manuscripts, etc. **Special Requirements:** Any experience with qualitative data collection and/or analysis will be appreciated, but it is not required.

PI: Bellas, Evangelia

Bioengineering/COEng

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: We develop in vitro adipose tissue (fat) models of obesity using 3D tissue culture methods. Obesity adipose tissue has dysregulated matrix remodeling (i.e. fibrosis) and vascularization which impairs adipocyte (fat cell) function. Students will explore how dysregulated matrix remodeling and vascularization impairs adipose tissue function across different sexes. **Special Requirements:** n/a, but strong work ethic, accountability and critical thinking skills lead to more successful outcomes.

PI: Bonfim, Mariana

Biology/CST

Type of Research Position: Upperclassman **Location:** Ambler Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: While forests provide important ecosystems services such as carbon storage and the maintenance of biodiversity, these systems are in the midst of profound transformations due to human impacts and changes to disturbance regimes due to climate change. To contribute to the global effort to monitor forests through time and sustain a long-term effort in research and education, the Ambler Field Station is working to establish a forest observatory plot following standardized protocols shared by the Smithsonian Institution through the ForestGEO network. A tornado that formed from Hurricane Ida, caused substantial damage to the Temple Forest Observatory in September 2021. The current goal of the project is to provide fine scale field data on the plant community composition, ecosystem biodiversity, animal activity, novel ecosystems created after the disturbance and carbon storage capacity among other factors that help inform research about resilience and recovery to climate-driven disturbances. Students will engage in outdoor, hands-on research to understand forest recovery, while developing skills in field data collection and more, while also developing an independent project that complements the Temple Forest Observatory and Ambler Field Station research goals. Transportation between Main Campus and Ambler available to Temple students. **Special Requirements:** Students will present results and findings from their independent research as a poster presentation on the Ambler Field Station Research symposium and other CST/ University symposia.

PI: Borguet, Eric

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Catalysis with metal oxyhydroxides. While it is known that many metal salts react in water to form small assemblies (metal oxyhydroxide clusters) that can catalyze important chemical reactions, the structure of these clusters and the mechanisms of their activity is not well understood. Under appropriate supervision, students will perform experiments, plot and analyze data. They will learn to make connections with the literature to interpret their data. They will gain skills in presenting their results in group meetings in my group and eventually at local, regional and even national conferences. Many undergraduates have been co-authors on peer-reviewed publications. Students will learn about catalysis, spectroscopy, and kinetics. **Special Requirements:** Curiosity and persistence - Interest in research - Aptitude for careful laboratory research

PI: Borguet, Eric

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Capture, detection and destruction of toxic chemicals. Metal organic frameworks (MOFs) are nanoporous materials that can trap and even destroy chemical species. We want to understand how and where these molecules bind in the MOFs as well as understand the mechanisms of chemical transformation. Under appropriate supervision, students will perform experiments, plot and analyze data. They will learn to make connections with the literature to interpret their data. They will gain skills in presenting their results in group meetings in my group and eventually at local, regional and even national conferences. Many undergraduates have been co-authors on peer-reviewed publications. Students will learn about infrared spectroscopy, mass spectrometry and vacuum systems as well as adsorption/desorption and diffusion kinetics. **Special Requirements:** Curiosity and persistence - Interest in research - Aptitude for careful laboratory research

PI: Borguet, Eric

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Laser Vibrational Spectroscopy and Dynamics of Molecular Species at Bio and Geochemical Interfaces - Research involves learning to use ultrafast lasers (we make some of the shortest infrared pulses in the world) to perform vibrational Sum Frequency Generation (SFG) a technique that provides sensitivity to less than a single layer of molecules. Students will investigate water, arguably the most important molecule on the planet, at interfaces of biological and geochemical relevance. Under appropriate supervision, students will perform experiments, plot and analyze data. They will learn to make connections with the literature to interpret their data. They will gain skills in presenting their results in group meetings in my group and eventually at local, regional and even national conferences. Many undergraduates have been co-authors on peer-reviewed publications. Students will learn about optics, surface chemistry, biointerfaces, geochemistry and laser spectroscopy. **Special Requirements:** Curiosity and persistence - Interest in research - Aptitude for careful laboratory research

PI: Borriello, Lucia

Cancer and Cellular Biology/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The student will have a great opportunity to study lung cancer and breast cancer progression and metastasis. **Special Requirements:** Knowledge about cell biology

PI: Buttar, Bettina

Sol Sherry Thrombosis Research Center/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Contributions of biofilm biomaterial properties and spatial organization in metabolic cooperation, antibiotic resistance, and virulence using biology, mathematics, and machine learning. Biological experiments including laser scanning confocal microscopy, 16S rRNA gene sequencing for identification bacteria, and qPCR for gene expression. The use and development of software tools to analyze the properties of the biofilms including phylogeny software for bacterial identification, Matlab, VR Studio, and machine learning for biofilm analysis. **Special Requirements:** No special requirements.

PI: Buynevich, Ilya

Earth and Environmental Science/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Fall Only

Project Description: BIOGEOMORPHOLOGY: Project focuses on investigating the impact of resurging beaver populations on streambank stability (zoogeomorphology). Field research in suburban Philadelphia, analysis of collected datasets, and integration with previously collected data, with results presented at regional geoscience conferences. **Special Requirements:** Introductory EES/Ecology courses

PI: Buynevich, Ilya

Earth and Environmental Science/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Fall Only

Project Description: HURRICANE IMPACT AND SEA TURTLE NESTS: Analysis of geophysical (georadar) images collected in Florida, with emphasis on distinguishing storm surge channels from sea turtle nests. **Special Requirements:** Introductory EES/Math

PI: **Chen, Lu**

Department of Cancer and Cellular Biology/LKSOM and Cancer Epigenetics Institute/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Independently carryout experiments to biochemically reconstitute CRISPR-Cas9/13 RNPs with different chemical compositions, and test the potency of their cellular activity in human cell lines using live-cell imaging techniques. **Special Requirments:** None.

PI: **Chong, Parkson**

Medical Genetics & Molecular Biochemistry/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: One of projects is to address the issues related to stability, cytotoxicity, targeting-capability, and controlled-release of novel lipid-based nanoparticles in test tubes and in cultured mammalian cells. For example, students will be involved in the use of thermoacidophilic archaea tetraether lipids as a new stabilizing agent of liposomal drugs and the use of hybrid liposomes containing both archaea lipids and conventional diester lipids to develop novel stable yet thermo-sensitive liposomal drugs. Techniques of organic chemistry, cell culture, microbiology, biochemical assays, microscopy, and advanced spectroscopy will be employed. **Special Requirments:** chemistry and biology courses

PI: **Constantinou, Martha**

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Fall Only

Project Description: The project is on pion structure using lattice QCD. The student will be responsible for producing data on a supercomputer, and performing a data analysis in order to extract physical quantities. **Special Requirments:** Proficiency with Python. Interest in theoretical/computational nuclear physics (Quantum Chromodynamics (QCD)) Offered to undergraduate students that have prior experience in data analysis for Lattice QCD

PI: Dai, Hai-Lung

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: 1. Laboratory research aimed at understanding antibiotic resistance of bacteria through working with PhD students and postdoctoral researchers. 2. Laboratory research aimed at understanding the properties of aerosols in the atmosphere and their environmental impact through working with PhD students and postdoctoral researchers. **Special Requirements:** Has taken the physical chemistry course and has general background in chemistry and physics in general.

PI: Dikin, Dmitriy

Physics/CST, Mechanical Engineering/COEng

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Study of the electrical properties of composite powders of a mixture of nanocarbon and polymer particles.

The student will prepare the material, take measurements, and process the results. **Special Requirements:** Principles of electromagnetism and electrical circuits.

Desire and ability to work accurately and responsibly with your own hands, attention to details.

PI: Escalante, Ananias

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Assist in the analysis of parasites' or pathogens' genomic data. Students should pay close attention to details. **Special Requirements:** Basic computational skills, coding is preferable but not required.

PI: Feitelson, Mark

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: critical thinking on mechanisms of cancer biology; bioinformatics background a plus
Special Requirements: basic core biology and chemistry classes; bioinformatics a plus; at least a 3.2 GPA

PI: Freestone, Amy

Biology/CST

Type of Research Position: Upperclassman **Location:** Ambler Campus **Positions Available:** 10
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Forests are critical assets to humanity and provide a suite of services that sustain human society, by regulating climate, purifying air and water, and providing food, energy, and medicines. Global change, including land use change, climate change, and biological invasions, have modified forests on a massive scale, undermining ecological resilience and degrading forest capacity to provide critical services to human society. The environmental and biological dynamics that underlie forest ecosystem services and their resilience to global change are complex, and substantial gaps remain in the scientific understanding of these fundamental processes. Research conducted for this project will use the Temple Forest Observatory, a forest stand that was recently hit by an EF2 tornado at the Ambler Field Station, as a model system to understand the resilience of forest ecosystem services, specifically carbon storage and sequestration, to climate-driven wind disturbance. Students will assist with field data collection, processing of samples in the lab, data entry and management, and will conduct an independent project that aligns with the goals of the larger collaboration. The Ambler Field Station is located on the Temple Ambler Campus, and student transportation is provided to/from Main Campus by the inter-campus bus. **Special Requirements:** No special coursework or experience required.

PI: Gamero, Ana

Biochemistry/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Students will apply their scientific knowledge gained in the classroom to design and perform experiments to study cancer and autoinflammatory conditions. **Special Requirements:** Biology, chemistry and/or genetics

PI: Golemis, Erica

Molecular Therapeutics/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Potential projects include 1. Mechanisms of drug resistance in head and neck cancer; 2. high throughput screening and validation to characterize the role of CBD in cancer drug resistance; 3. the role of cholesterol signaling in pancreatitis and pancreatic cancer risk **Special Requirements:** None.

PI: Grana, Xavier

Fels Cancer Institute for Personalized Medicine/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Biochemical, molecular and cellular biology studies to understand the function of Protein Phosphatase 2A in the human cell division cycle and cell signaling. The work uses human normal and cancer cell lines. **Special Requirements:** Genetics, and/or Cell Structure

PI: Gray, Alexander

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Fall Only

Project Description: Experimental investigations of quantum materials and interfaces using advanced X-ray spectroscopic and imaging techniques **Special Requirements:** Some programming experience would be beneficial

PI: Habas, Raymond

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The students will work with the PI in learning techniques, designing experiments and with experience perform independent projects. **Special Requirements:** Enthusiasm and a desire to learn.

PI: Hedges, Blair

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Biodiversity: we explore the patterns and mechanisms that have shaped the tree of life including speciation, extinction, diversification, and biogeography. We often use time-calibrated phylogenies (timetrees) to address these questions. Students typically conduct projects that involve DNA sequencing, or morphological analyses of preserved vertebrates, or computational analyses of all types of organisms. For examples of recent studies, see our lab website and publications, hedgeslab.org. **Special Requirements:** None.

PI: Helmus, Matthew

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Assessment of spotted lanternfly ecology, evolution, modeling, and control actions.
Special Requirements: None.

PI: Isenberg, Derek

Department of Emergency Medicine/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Temple University is the hub for the Optimizing the Use of Prehospital Stroke Systems of Care—Reacting to Changing Paradigm (OPUS-REACH) consortium. The OPUS-REACH consortium is a group of 8 health systems in the northeastern United States. Our goal is to optimize prehospital stroke care through the optimal routing of patients. Students involved in OPUS-REACH would be creating and helping to manage the databases for OPUS-REACH. There is also the opportunity to analyze data from the project and present a poster or write a manuscript. **Special Requirements:** Prior knowledge of emergency medicine (e.g., EMT) or neurology is helpful

PI: Jensen, Liselotte

Microbiology, Immunology and Inflammation/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Spring Only

Project Description: The project examines mechanisms of skin inflammation in atopic dermatitis and infections. This includes normal innate immune mechanisms and their dysregulation in chronic disease. We use cell culture and mouse models to define how cells communicate with each other and undergo metabolic and regulatory changes in response to stress. The student will utilize conventional and organotypic cell cultures, ELISA, real-time PCR and Western blotting. More proficient students may gain experience working with mice and/or pathogenic viruses and bacteria. **Special Requirements:** Some previous lab experience

PI: Jensen, Liselotte

Microbiology, Immunology and Inflammation/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Spring Only

Project Description: The IL-36 cytokines are a group of immune system activators that are increasingly being linked to chronic inflammatory diseases and cancer. Hence, there is a growing need to understand how they are activated and inactivated at the molecular level. The student will use biochemical, molecular biology and cellular approaches to understand how proteases dynamically modify IL-36 functions over time. The student will gain experience working with, for example, cell reporter assays, ELISA, real-time PCR and Western blotting. More proficient students may get the opportunity to work with mice and/or pathogenic viruses and bacteria. **Special Requirements:** Some previous lab experience

PI: Jocelyn Behm

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The student will research factors affecting spotted lanternfly distribution across host plants. This work will incorporate a mix of field research and data analyses. **Special Requirements:** Familiarity with spotted lanternflies.

PI: Karhadkar, sunil

Surgery / LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Racial disparities in access to and support for renal transplantation in urban centers
Special Requirements: None.

PI: Khan, Mohsin

Cardiovascular Sciences/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The project aims to develop novel therapeutics for heart repair and regeneration that will be tested in animal models of heart disease and aging. A significant focus is to understand the role of metabolism in regulating cardiac repair and regeneration. Students will be able to learn latest techniques in cardiac regeneration, metabolic assays and including data analysis. **Special Requirements:** Biology and Biochemistry.

PI: Kim, Daniel

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Synthetic Organic Chemistry: Develop new light-mediated transformations and methodologies. Working closely with a graduate student mentor, undergraduates are expected to help develop new synthetic transformations with the use of transition metal catalysis and photoredox catalysis. No prior knowledge or expertise required. Highly recommended to have taken CHEM 2201/2202. **Special Requirements:** Taken or plan to take one upper division Organic Chemistry Course. (CHEM 4201, CHEM 4202, CHEM 4207)

PI: Klapper, Isaac

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Research project: develop mathematical and lab models of the effects of microorganisms on sea ice structure. Students can be involved in either or both. The mathematical side will be aimed at developing computer codes to simulate biotic ice sheet structure, and the lab side will be aimed at studying simple ice+algae behaviors. **Special Requirements:** For the mathematical side, some experience with mathematical coding is useful.

PI: Kosmider, Beata

Center for Inflammation and Lung Research/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The goal of this project is to study the pathophysiology of emphysema development and progression. Emphysema belongs to chronic obstructive pulmonary disease. It is caused by cigarette smoking and second-hand smoking. Effective therapy is very limited. This disease is characterized by alveolar wall destruction. We use alveolar type II cells and various methods to study dysregulated genes and proteins in emphysema. **Special Requirements:** None.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Gene x environment interactions in exposure-based diseases.

Addressing complex global problems requires robust research frameworks to guide research inquiry and generate actionable outcomes. The proposed project will use the Temple-made Bio3Science framework for convergent scientific research, harnessing Temple expertise in human and environmental geography, ecology, genetics, and health sciences, to study the dense and dynamic relationships between the individual human body and the world around it. More specifically, we propose to apply the Bio3 framework to develop a convergence science of health and well-being by conceptualizing and operationalizing sustainable regional systems. A Bio3Science framework provides an opportunity to understand and address sustainability challenges emerging from the confluence of biological, biographical (life experience), and biospheric (biophysical environment) processes. The framework offers Rules of Life research a means through which to identify and understand complex causal relationships related to bio-social and eco-social mechanisms, which can help to predict human health outcomes. Biology includes the individual human organism, including measurable biomarkers related to genetics, physiology, and disease and qualitative characteristics related to the experience of symptoms, as well as interactions with other living organisms (e.g., microbiomes, infectious agents); Biography indicates the lived experience of urban and rural residents, including how they are situated in constellations of relations of power and inequity, specific contexts, social networks, (im)mobility and the content and connotation of acute events and/or longer-term cultural or affective dynamics; Biosphere, denotes the dynamic physical, living, and chemical conditions of the environment as shaped by relationships between people and nature.

Our team's previous collaborations have provided the theoretical backing and collaborative tools for Bio3Science to enable comprehensive examination of complex problems that demand multiple domains of expertise and cross-epistemological collaboration. The Bio3Science framework is promising because it offers a structure to integrate highly diverse kinds of data and to move across epistemological divides, thereby directly addressing many of the recently identified grand challenges of socio-ecological systems modeling. We plan to extend our foundation of the Bio3 Science framework into its first proof-of-concept using air quality in the urban Aburrá valley, housing the city of Medellín, Colombia, as a point of convergence to ask: how do proximal and telecoupled human and ecological interactions impact multi-scalar biosocial mechanisms associated with people's health and well-being? Therefore, we also will have a proof-of-concept to better conceptualize health and well-being across regions in order to understand the barriers to and opportunities for sustainable regional systems.

In this project in the Kulathinal lab, we will build a webtool that integrates data from the extensive GWAS (genome-wide association study) catalog with comprehensive SNP data from the 1000 Genomes Project. The project will allow researchers to identify genes that are found at higher than expected frequencies in specific human populations. **Special Requirements:** A good understanding of coding, statistics, and databasing as well as an interest in webtool development.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Population genomics of domesticated dogs and the evolution of disease.

With a relatively short time (thousands of years) since a known common ancestor (wolves), extant dog breeds provide an excellent example of rapid evolution in action. The variety of phenotypes from behavior to morphology demonstrate how artificial selection can quickly act within a population. Accordingly, dozens of breeds of dogs have been sequenced with genomes publicly available. Dogs have also become a model for human disease with several databases available that connects genotypes to specific disease.

In this project, we test whether breed-specific phenotypic traits including certain diseases will correlate to genome-wide SNP frequencies in that breed by performing the following:

1. Build an alignment of genomes/SNPs across all known breeds of dogs including wolves against a reference genome sequence.
2. Map all known disease mutations in dogs to the reference genome sequence
3. Correlate known breed-specific diseases to uniquely high SNP frequencies across a given breed.
4. Develop a platform with visualizations that can be useful for similar problems using same Illumina Bead Chip technology.

Special Requirements: A good understanding of coding, statistics, and databasing as well as an interest in webtool development.

PI: Kulathinal, Rob

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: phyloDIVaS: Building a generalized interactive comparative genomics database resource of divergence and selection for user-selected assemblies.

Based on current genomic assemblies, FlyBase annotations, and OrthoDB orthology calls of the original 12 *Drosophila* sequenced species (Clark et al. 2007), the Kulathinal lab built/published flyDIVaS. This freely available resource contains melanogaster-centric orthologous gene sets, CDS and protein alignments, divergence statistics (% gaps, dN, dS, dN/dS), and codon-based tests of positive Darwinian selection. Genes and their orthologs can be selected from four different taxonomic datasets differing in phylogenetic depth and coverage density and visualized via interactive alignments and phylogenetic trees. We are developing a new platform that is more interactive, phylogenetically informative, and visual AND, most importantly, can work of ANY set of NCBI-blessed genome assemblies. **Special Requirements:** A good understanding of coding, statistics, and databasing as well as an interest in webtool development.

PI: Latecki, Longin Jan

Computer and Information Sciences/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Work on deep learning projects for computer vision. **Special Requirements:** Programming in Python and PyTorch

PI: Lee, Hayan

Nuclear Dynamics and Cancer Program/FCCC

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Analyzing methylation data, identifying epigenetic signatures, integrating single-cell data, and designing machine learning models. **Special Requirements:** Python or R coding skills will be very appreciated.

PI: Liberles, David

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Various projects in computational comparative genomics and molecular evolution are available for a student who has some basic programming skills and who is mathematically inclined. The student will have a role in shaping the research design together with me. **Special Requirements:** No specific requirements, but programming and math courses are a plus in addition to Genetics.

PI: Lyyra, Marjatta

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Quantum control using interaction of light with matter **Special Requirements:** Quantum Mechanics and Electricity and Magnetism

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: People form opinions (e.g.: is climate change real?) and make decisions (e.g.: should I get vaccinated?) based on data visualizations. However, research shows that people frequently misunderstand visualizations. Our project, Expert Goggles, helps people with limited data literacy skills see visualizations through the eyes of an expert by automatically annotating visualizations with key insights and scaffolding for interpretation. **Special Requirements:** You will have the opportunity to learn about large language models (e.g.: chatGPT), data visualization, and web programming (e.g.: ReactJS, Flask, etc).

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Generative AI Tools for Learning. This project investigates ways that natural language processing (large language models) can be used to support learning. You will be able to design AI-powered educational experiences, develop web prototypes, and conduct human-subjects experiments with students in computing classrooms. **Special Requirements:** You will have the opportunity to learn about large language models (e.g.: chatGPT), data analysis (R), and web programming (e.g.: ReactJS, Flask, etc).

PI: MacNeil, Stephen

Computer and Information Sciences/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: People will increasingly interact with AI systems to commute to work, recommend music and news, and help them to perform their work. This raises important new questions about how people understand AI systems and how they adapt when these systems break down. **Special Requirements:** None.

PI: Manhart, Carol

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: My lab studies how the enzymes that are involved in DNA repair processes work. Students will learn basic lab techniques in addition to biochemical experiments, molecular biology approaches, molecular modeling, and bioinformatic techniques. **Special Requirements:** CHEM 4401 (biochemistry) is preferred for upperclasspersons.

PI: Martoff, Jeff

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Detector construction/operation for directional dark matter detection. Detector operation & shielding enhancements for HPGe ultra-low background gamma ray assay facility. **Special Requirements:** would prefer computer programming, laboratory electronics (e.g. oscilloscope), carpentry, plumbing or metalworking experience

PI: Picone, Joseph

Electrical and Computer Engineering/COEng

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 6
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: EEG Database Development: learn how to manually interpret EEG signals and how to design machine learning algorithms to match human performance.
Software Developer: contribute to our rapidly growing codebase of open source machine learning algorithms
Quantum Computing: learn how to run machine learning algorithms on a quantum computer.
Algorithm Research: design and optimize new algorithms on large corpora of EEG and digital pathology data. **Special Requirements:** Programming experience and some Linux experience is highly desirable. However, we often teach students these skills as part of the experience.

PI: Queisser, Gillian

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The student's research project will advance the tool Neuro-VISOR, which immerses the user in a virtual lab world where brain cells can be visualized, interacted with, and stimulated. Real-time simulations of neuronal activity can be analyzed and interacted with, making Neuro-VISOR a unique tool in the area of computational neuroscience, used in an instructional and scientific context. The project revolves around the development of novel virtual reality-based computational tools, applied to neuroscientific modeling and simulation, and is co-advised by Dr. Seibold and Dr. Queisser. Students will have the opportunity to work in a team that covers a broad range of research, from mathematical modeling, numerical and visualization methods, to optimizing computational scalability for large problems. **Special Requirements:** A mathematical background and programming skills are strongly recommended.

PI: Queisser, Gillian

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The student's research project will advance our understanding of antibiotic resistance in complex bacterial biofilms, which are ubiquitous in the human body. Research will lie at the intersection of modeling biological processes and developing computational tools to quantify and simulate biological dynamics in biofilms. The project is co-advised by Dr. Buttaro (LKSOM, Temple) and Dr. Queisser (Math). Students will have the opportunity to work in a team of medical and mathematical researchers. **Special Requirements:** A mathematical background and programming skills are highly recommended.

PI: Riseborough, Peter

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Spring Only

Project Description: Topological Invariants in Classical Systems **Special Requirements:** Calculus III, Partial Differential Equations, Numerical Methods

PI: Safak, Mahmut

Center for Neurovirology and Gene Editing/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: 1. First, students will be trained in molecular biology techniques, including western blotting, PCR, RT-PCR, microscopy, tissue culture, solution preparations, cloning, bioinformatics, literature reading and writing etc.

2. Then, students are involved in experimental design and performing experiments for specific projects

Special Requirements: None.

PI: Kunapuli, Satya P.

Sol Sherry Thrombosis Research Center/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Depending on the career interest of the student we expose them to a biochemical project (for those aspiring to do Ph.D) or a physiological project (for those aspiring to be MD) in the biology of platelets. **Special Requirements:** Good to have biochemistry and molecular biology background courses.

PI: Seibold, Benjamin

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Understanding the Impact of Vehicle Automation on Traffic Flow. Possible research directions: (a) developing and analyzing mathematical models for traffic waves and smart vehicle controllers that smooth them; (b) prototype 3D virtual reality simulators that can enable human drivers to be incorporated into simulated traffic models. **Special Requirements:** Good performance in Calculus sequence and/or similar courses. Good programming skills.

PI: Sewall, Brent

Biology/CST

Type of Research Position: Upperclassman **Location:** Ambler Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Field Studies of Spotted Lanternfly Impacts on Native Plants – Ambler Campus
The spotted lanternfly is an invasive insect that poses an emerging threat to native forest ecosystems. In this project, the student will work as part of a team, using field surveys, standardized field experiments, greenhouse studies, mesocosm studies, and laboratory work to understand the ecology of spotted lanternflies and the effects they have on forest ecosystems. Research will occur at the Temple Ambler Field Station, located on the Temple Ambler Campus. Transportation from Main Campus to the Field Station is available via the inter-campus bus. **Special Requirements:** Major or coursework in Biology; Ecology, Evolution, and Behavior; Environmental Science; or a related field

PI: Sewall, Brent

Biology/CST

Type of Research Position: Upperclassman **Location:** Ambler Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Bat Susceptibility to White-Nose Syndrome – Main Campus
White-nose syndrome is an emerging infectious disease of hibernating bats caused by an invasive fungal pathogen. Since its first detection in 2006, it has caused extensive mortality of bats during hibernation, and has spread across much of North America. In this project, we will use statistical approaches, image analysis, and other tools to document infection and improve understanding of factors influencing both the impacts and spread of the disease, and means to conserve bat populations in light of this ongoing threat. **Special Requirements:** Major or coursework in Biology; Ecology, Evolution, and Behavior; Environmental Science; Math; Statistics; Computer Science; or a related field

PI: Sewall, Brent

Biology/CST

Type of Research Position: Upperclassman **Location:** Ambler Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Seed dispersal and regeneration of a forest community following disturbance. Disturbance is a major factor influencing ecological communities and severe disturbance may initiate new trajectories that drive important changes in community structure and composition for decades or centuries to come. In this project, we will investigate the ecological processes of seed dispersal and plant regeneration after a severe disturbance caused by an EF-2 tornado at the Temple Ambler Field Station (on Temple's Ambler Campus). Research will include observational and experimental studies of seed dispersal and initial regeneration of native and invasive plant species, including both woody and herbaceous species, within a forest ecosystem. The goal will be to understand early stages of plant dispersal and regeneration following a severe disturbance. **Special Requirements:** Major or coursework in Biology; Ecology, Evolution, and Behavior; Environmental Science; or a related field

PI: Singh, Anita

Bioengineering/COEng

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Perform staining and cutting alongside imaging and analysis. **Special Requirements:** None.

PI: Sinha, Durgesh

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: I am involved in mathematical modeling of infectious diseases to predict the eradication of disease and its impact on socioeconomic demographic regions. Students will find the data online, I will teach them how to extract parameters and how to model based on all involved criteria. **Special Requirements:** They must know statistics, and calculus

PI: Sivek, Jeromy

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Fall Only, Spring Only

Project Description: This study focuses on methods related to ranked preference voting. Topics include "spatial models" for preference formation based on policy ideas, networks modeling social interactions which lead to preference updates (and sometimes consensus), and disagreements between counting methods in simulated and historical ranked-preference elections. Potential work includes coding in python, writing summaries of observations/ experiments, participating in group discussions and presenting posters/ slides on group and individual work. **Special Requirments:** Coding experience is helpful. But special background in lieu of coding is helpful too - economics, poli-sci, probability theory, etc.

PI: Sivek, Jeromy

Mathematics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Fall Only, Spring Only

Project Description: Metric fixed point theory focuses on the mix of operator and domain conditions that guarantee a map (with the given continuity-related hypothesis) acting on a domain (with the given geometry-related hypotheses) will have a fixed point. Current work by undergraduates focuses on a growing category of counterexamples. The theory is deep but has proven accessible at the undergraduate level. **Special Requirments:** Basic concepts in math (or some other rigorous proof-based coursework). We use analytic and linear-algebraic ideas. But a willingness to grapple with details is more important than any particular course.

PI: Slobodan Vucetic

Computer and Information Sciences/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Prof. Vucetic is looking for students interested in using AI technology to build AI-assisted software in a range of applications. Students with all kinds of backgrounds are welcome and their roles will depend on their background. The most advanced roles will be available for students with knowledge of software development and AI (such as data science, machine learning, statistics). At the minimum, it is expected that the students will have one semesters of programming experience. **Special Requirments:** Maturity, strong work ethics, being open to learn new things.

PI: Snyder, Nathaniel

Cardiovascular Sciences/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Projects available on quantitatively studying cell metabolism and developing new tools to examine and modify cancer, cardiovascular, and disease relevant metabolism. **Special Requirements:** Organic Chemistry, Biochemistry (or currently taking biochemistry)

PI: Soboloff, Jonathan

Fels Cancer Institute for Personalized Medicine/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 5
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: My laboratory focuses on physiological and pathophysiological implications of cytosolic calcium signals. we currently have projects on immunology, cancer biology and arthritis. We typically have 3 to 5 undergrads in the lab; they work closely with senior personnel, under my direction. In general, most students have done well, with several gaining their own funding, authorship on published papers and ultimately moving on to PhD program, medical school and dental school. For the most part, students have entered my lab with zero experience; those that were successful maintained a high GPA while still putting in real time in the lab and engaging with other lab members. Anyone that feels that they would be a good candidate should reach out for a conversation. **Special Requirements:** None.

PI: Spano, Frank

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Student will work on computational code to evaluate the photophysical response of organic molecular aggregates. **Special Requirements:** Experience with coding, Successful completion of Pchem II.

PI: Spigler, Rachel

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 3
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: We are conducting separate experiments to address the following questions: Why do flowers of some species last only 1 day while others more than 20? How do plants tolerate heavy metals in soils, and how do these soils influence floral traits and plant-pollinator interactions? Students will assist in carrying out experiments to address these question, working in the lab and in the plant growth facility. UC Students will also have the opportunity to carry out related independent research projects. **Special Requirments:** Introduction to Organismal Biology. General Chemistry & Labs. Principles of Ecology (preferred).

PI: Spigler, Rachel

Biology/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: How does plant genetic quality affect population persistence? This project will involve recording demographic data from a large experiment to answer this question. Students will assist in processing images of plants taken from the field to address questions related to germination and plant growth. UC Students will have opportunities to participate in related independent projects. **Special Requirments:** Introduction to Organismal Biology. Principles of Ecology.

PI: Stanley, Robert

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Optimization of Extremophilic Photolyase Protein Folding
Enzymes found in extremophilic organisms that thrive in high and low temperature face challenges to stability that mesophilic proteins (like ours) don't face. Mimicking the cytosolic contents of extre-mophiles to stabilize their intracellular constituents is a formidable but necessary task. You will explore a wide range of solvent additive conditions to find regions of protein-folding stability for the DAN repair enzyme, DNA photolyase **Special Requirments:** Chemical Analysis (CHEM 3105) and Biochemistry I (CHEM 4401, taken concurrently) are desirable.

PI: Stanley, Robert

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: iFADs - creating new optical probes of redox-driven metabolism

Students will assist in the development and characterization of a new class of optical probes of metabolism based on vitamin B2 analogs. Techniques include enzyme assays, PCR, UV/Vis spectroscopy, and protein purification. **Special Requirements:** Chemical Analysis (CHEM 3105) and Biochemistry I (CHEM 4401, taken concurrently) are highly desirable. Some experience with molecular biology (PCR, plasmid preps, etc.) also desirable.

PI: Sun, Yugang

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Fall Only

Project Description: This project focuses on creating composite materials composed of ultrafine metal nanoparticles on dielectric spheres, representing a class of promising catalysts, particularly by using light as the energy source to drive chemical synthesis. The students will concentrate on developing the appropriate chemical methods to synthesize the composite materials as well as characterize the synthesized materials with a suite of techniques, including electron microscopy and spectroscopy. **Special Requirements:** The students should have taken Physical Chemistry I.

PI: Surrow, Bernd

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Detector development for particle collider facility at Brookhaven National Laboratory
Special Requirements: Basic math and computational skills

PI: Tao, Rongjia

Physics/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 1
Semesters Available: Fall Only

Project Description: Project in soft matter physics, related to basic science of turbulence and application in energy and environment. EC student may participate in experimental research. **Special Requirements:** Having had undergraduate physics courses such as Analytical Mechanics, Electricity and Magnetism.

PI: Testa, Joseph

FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Molecular biology studies of malignant mesothelioma. **Special Requirements:** Molecular biology

PI: Toran, Laura

Earth and Environmental Science/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Urban hydrology is the study of how humans are impacting streams and stormwater runoff. Our research groups collect field data to better understand how stormwater control measures work and what factors are most harmful to streams. Undergraduate researchers collect field data, process samples, and use software to interpret data. **Special Requirements:** Prefer students who have had a hydrology course.

PI: Torres-Ayuso, Pedro

Cancer and Cellular Biology/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Lung and head and neck squamous cell carcinomas (LSCC and HNSCC, respectively) are frequent epithelial tumors with a strong association with smoking. Treatments include surgery, chemotherapy, radiotherapy, and immunotherapies. However, LSCC and HNSCC often show limited responses to these treatments; therefore, patient survival remains poor. The Torres-Ayuso lab works to identify new targets and mechanisms of therapy resistance in LSCC and HNSCC. Specifically, the lab is studying protein kinases, i.e., enzymes that phosphorylate proteins to control biological processes such as cell proliferation or survival, which are dysregulated in LSCC and HNSCC. The undergraduate student joining the lab will contribute to the study of a protein kinase frequently amplified in squamous cell carcinomas that our preliminary observations suggest as a potential target in HNSCC. Students will have the opportunity to develop strong foundations in basic cell and molecular biology techniques, including cell culture, transfection, western blot analysis, immunoprecipitation, plasmid generation and mutagenesis, and plasmid maintenance. Students will also be exposed to work with a wide net of collaborators at Temple University and the Fox Chase Cancer Center. **Special Requirments:** The candidate has to be motivated for science and research, responsible, and willing to participate actively in the lab. Previous lab experience is NOT required. Completion of introductory biology, molecular biology and/or biochemistry courses is required.

PI: Unterwald, Ellen

Neural Sciences & CSAR/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Our laboratory investigates cellular and molecular mechanisms involved in the actions of drugs of abuse that lead to addiction using rodent models. The methods used include rodent behavioral tests, protein and gene expression analyses, and microscopy. **Special Requirments:** Basic Neuroscience

PI: Voelz, Vincent

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Upperclassperson (UC) undergraduate students will prepare molecular models of biomolecules (e.g. proteins), and use high-performance computing (Owlsnest) to perform molecular dynamics simulations of them using the GROMACS simulation software. The resulting trajectory data will be analyzed using numerical Python inside Jupyter notebooks. This would be a good project for students with experience and/or interest in computer programming to apply this knowledge to biophysical simulation. **Special Requirments:** Background in computing and physics/physical chemistry is highly recommended.

PI: Wang, Pei

Computer and Information Sciences/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: NARS (Non-Axiomatic Reasoning System) is an Artificial General Intelligence (AGI) technique that can be applied to various domains. The Temple AGI Team (<https://cis.temple.edu/tagit/>) is expending NARS and using it in several practical problems. UC students will be mostly involved in data collection and pre-processing, prototype testing, etc. **Special Requirements:** CIS 1166: Mathematical Concepts in Computing, CIS 2033: Computational Probability and Statistics, CIS 2168: Data Structures

PI: Whetstine, Johnathan

Cancer Epigenetics Institute/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 1-2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Students will be trained in the assays we use to evaluate DNA amplification and epigenetics with a focus on molecular biology and microscopy. Once proficient they will work along side other trainees to investigate the epigenetic mechanisms controlling DNA amplification. Some resources for more information are on the lab website- www.whetstinelab.com **Special Requirements:** Ideally but not required would have had classes or exposure to cell biology and/or molecular biology.

PI: Whitaker, Amy

Nuclear Dynamics and Cancer/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Pancreatic cancer is one of the most aggressive cancer types and represents a major clinical challenge. The primary genetic lesions in pancreatic cancer are mutations in the KRAS gene, which result in the overstimulation of signaling pathways that drive cancer growth. However, despite its strong potential, KRAS has been deemed a challenging therapeutic target, even “undruggable”, after efforts over the past four decades have largely failed. The indirect targeting of KRAS, through reducing its expression, offers an exciting alternative. The folding of the KRAS promoter DNA into a secondary structure called a G-quadruplex (G4) is critical for KRAS expression. Importantly, DNA damage and repair modify the KRAS promoter DNA structural fold and stability. However, despite being a prerequisite for rational drug design, the key mechanistic details describing how G4 folding and DNA damage/repair regulate mutant KRAS expression remains enigmatic. To this end, the goal of this project is to explore the role of DNA damage and repair as G4-associated regulators of KRAS gene expression in pancreatic cancer. **Special Requirements:** None.

PI: Yang, Zeng-jie

Nuclear Dynamics and Cancer/FCCC

Type of Research Position: Upperclassman **Location:** Fox Chase Cancer Center **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: The projects aim to investigate the cellular and molecular basis underlying brain tumor initiation and progression. We are exploring novel therapeutic targets and strategies to treat primary brain tumors and brain metastases. The students are expected to work with postdocs and graduate students, to learn mouse colony management, evaluation of tumor growth in vivo by MRI and live cell imaging etc.
Special Requirements: Students are expected to complete molecular biology course, with some experience working on cell culture and molecular biology.

PI: Yu, Jun

Cardiovascular Sciences/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Novel molecular target(s) regulating Arteriovenous fistula (AVF) maturation. Dialysis is a common treatment for people with end-stage chronic kidney disease (CKD). Reliable and matured AVF is a “gate of life” for patients who need dialysis. However, the primary AVF failure rate is as high as 30-70%, which largely attribute to pathological vascular remodeling. This project is aimed at uncovering molecular mechanisms in vascular smooth muscle cells, a major cell type in the vessel wall, that regulate AVF maturation in CKD. We have been in close collaboration with the surgeons at the Department of Vascular and Endovascular Surgery on this ongoing project. In the projects, the student will gain hands-on experience in variety of techniques in histology, biochemistry, molecular biology, and/or bioinformatics.

Special Requirements: Have taken biology, molecular biology, or biochemistry. Previous lab work experience is desired.

PI: Yu, Jun

Cardiovascular Sciences/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: Molecular control of atherosclerotic plaque stability. Cardiovascular diseases are still a leading cause of death worldwide. Unstable atherosclerotic rupture, rather than a 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 these deadly pathological processes and providing proof-of-concept for developing new drug targets to treat coronary artery disease. In this project, the student will gain hands-on experience in various techniques in histology, biochemistry, molecular biology, and/or bioinformatics. **Special Requirements:** None.

PI: Zaidi, Raza

Fels Cancer Institute for Personalized Medicine/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring)

Project Description: Using cell culture and mouse models to discover novel molecular mechanisms of UV radiation-induced melanoma initiation, progression and metastasis of melanoma skin cancer. **Special Requirements:** Genetics and Biochemistry

PI: Zdilla, Michael

Chemistry/CST

Type of Research Position: Upperclassman **Location:** Main Campus **Positions Available:** 2
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: The Zdilla group offers a number of research opportunities at the interface of chemistry and energy. These include synthetic bioinorganic chemistry to understand how plants harness the power of the sun, design of catalysts for solar water splitting, discovery of safer materials for high-energy batteries, and novel compositions for explosives and propellants. Students in the Zdilla lab perform chemical synthesis (organic, inorganic, and materials) and characterization of their compounds using a suite of techniques, including NMR, FT-IR, absorption spectroscopy, electron microscopy, electron paramagnetic resonance spectroscopy, and X-ray diffraction. The materials are then explored for their scope of reactivity or effectiveness in energy storage. **Special Requirements:** Preferred (bio)chemistry majors but others may be considered. In order to maximize training, productivity, and impact, a student who wishes to be considered for a position in the Zdilla lab should plan to apply early (freshman or sophomore year) and plan

PI: Zhu, Lin

Center for Asian Health/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: In this NIH-funded study, we are leverage existing data of a nationally representative sample of Asian American adolescents from the 2010–2019 National Immunization Survey-Teen (NIS-Teen) to examine the integrative effects of adolescent, parent, provider, and practice level factors in six Asian American subgroups. The study sample includes 6,019 boys and girls aged 13–17 of Chinese (1,613), Filipino (1,383), Japanese (834), Indian (800), Korean (786), and Vietnamese (603) ethnicity, and be well-powered to elucidate the complex multilevel social mechanisms of HPV vaccination outcomes and to identify subgroup disparities. Findings of this proposed study will provide subgroup-specific epidemiological data, guide the improvement of clinical practices, and inform the development of evidence-based strategies to reduce missed opportunities and improve adolescent vaccination in Asian American adolescents. Students will be engaged in literature review, scientific writing, results presentation and interpretation, conference abstract and manuscript development. **Special Requirements:** none

PI: Zhu, Lin

Center for Asian Health/LKSOM

Type of Research Position: Upperclassman **Location:** Health Sciences Campus **Positions Available:** 1
Semesters Available: Full Academic Year (Fall & Spring), Fall Only, Spring Only

Project Description: We seek support to develop an interactive educational model for patients with biliary tract cancer (BTC) undergoing molecular and genetic testing. We propose that this model will help oncologists to deliver the best patient-education to underrepresented groups from various socioeconomic and educational backgrounds in the community setting.

The biliary tract cancer (BTC) landscape is rapidly evolving; molecular profiling efforts have unearthed actionable, targeted mutations in 40% of patients, with recently FDA-approved targeted therapies that act on them. As physicians are moving towards the era of precision oncology, there is an unmet need to identify genetic testing knowledge gaps in patients from different socioeconomic and educational backgrounds and the impact of these knowledge gaps on treatment. Creating awareness and educating patients on genetic testing, targetable mutations, and concurrent therapeutic options will help BTC patients understand the work up and treatment options that may be available to them, promoting treatment compliance and increased survival outcomes. The aim of this proposed study is to identify knowledge gaps among BTC patients of different races and socioeconomic statuses in their understanding of available genetic testing techniques and their impact on treatment and prognosis. **Special Requirements:** Good communication skills. Previous clinical/research experience preferred.