The Study Abroad Foundation
An International University Network

The Study Abroad Foundation Research Experiences

Research programs proposed by member universities to SAF

Summer 2016

The Study Abroad Foundation Research Experiences

SUMMER 2016

Contents

George Washington University Research Experience

Goals

This research experience at a preeminent university in the heart of America's capital is designed to introduce scholars to the skills they need to be successful in graduate school. Not only will participants perform teamwork, but they will be taught how to develop a thesis and more critical skills that will help them thrive as graduate students. The program will have a curricular focus on Data Science. More details will be forthcoming.

Research Topics

- Special Research Topics - Course will engage students in cross-disciplinary teamwork and communication through a series of problem-solving modules. Practitioners and researchers in industrial and/or research-focused institutions will present real-world problems that the students will present solutions to as teams.

- Academic Writing and Research - Course introduces the organization and planning of academic papers that are coherent, cohesive, logical and convincing. Activities throughout the course will center around research topics and problems, helping students to develop an active academic vocabulary as well as accurate grammar and usage. The course also includes training in important academic skills such as summarization, evaluation of sources and use of documentation styles.

2016 Summer Research Course Descriptions

Introduction to Data Science

This class covers the basic techniques of data science, algorithms for data mining, and introductory statistical modeling. Students learn to apply data science principles to disciplines from the natural sciences to social sciences that are characterized by the need to manage and analyze big data sets. Field professionals will provide real-world problems they are working to solve and students will work in groups to develop solutions. Typical areas of natural science include astrophysics, bioinformatics, and mathematics. In social sciences, examples include economic forecasting, political campaign analytics, and geographic information systems (GIS). As a result of the course, students will gain skills in problem analysis, research, team work and communication.

Writing and Communication for Data Science

This course teaches students the principles and practices associated with academic writing in U.S. higher education and supports the development of a specialized skill set for the interdisciplinary field of data science.

Students will learn to assess and respond to the communicative expectations of the field, receiving targeted instruction and feedback on a range of tasks that support their coursework in Data Science. Possible writing assignments include explaining concepts and data items, documenting client needs and project goals, proposing projects, and writing progress and research reports. Oral communication tasks may involve collaborative group projects, interviewing an expert in the field, and preparing and delivering presentations based on research. This course is taught by experienced faculty in the English for Academic Purposes (EAP) program, and the small class size offers many opportunities for students to interact with classmates and the professor in a supportive classroom environment.

Overview

- Duration of the program: July 3-August 12, 2016 (6 weeks)
- Credits: 6 (Undergraduates will earn undergraduate credits and graduate students will earn graduate credit.)
- Number of spots available: Minimum of 15 SAF
- Visa: F-1
- Two courses - Special Research Topics, Academic Writing and Research
- Sessions on graduate admissions and the U.S. university experience
- Site visits to research institutions in Washington, D.C.
- Pre-Requisites: Students should have taken courses in multivariate calculus and introductory statistics. Programming experience is desirable, ideally with Python. STEM courses are a plus.

Eligibility

GPA	TOEFL, IELTS	Standing
3.0/4.0 (3.75/5.0)	iBT 80 or satisfactory completion of a GW-approved alternative English proficiency test. IELTS 6.0 Band score of 6.0. No individual band score below 5.0	Upper-level undergraduate and graduate students considering futures in STEM. Must have completed Mulitvariable Calculus or equivalent.

Program Strengths

Fee and More

- Estimate Fee: $8,525.40
- Housing
  - Cost of double occupancy in a GW dorm will be included in the program fee
  - Move in July 3; move out August 12
- Meals
  - The program fee includes meals. GW does not have standard cafeterias, however students may use their meal card at a wide variety of restaurants and grocery stores in Washington, D.C. Students will have approximately $40 per day for the duration of their program.
- Health Insurance
  - GW student health insurance will be included in the program fee. We will add fees for Sky Rescue.
- Extracurricular Activities
  - The cost of GW Summer Research Program co- and extra-curricular activities will be included in the program fee.

About George Washington University

A Global University

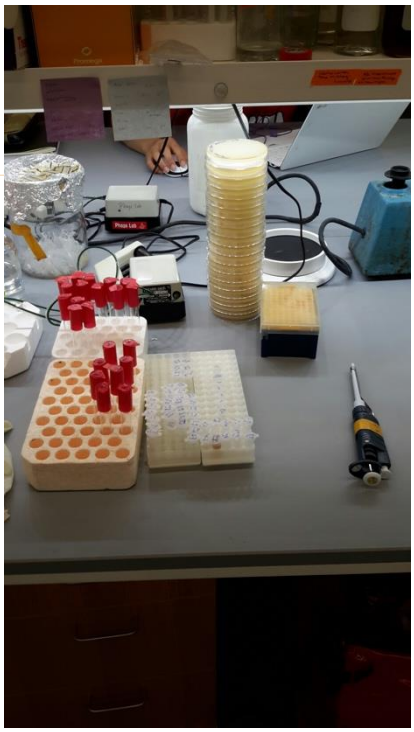
The George Washington University (GW) is the largest private university in Washington, DC, enrolling 25,000 students from across the country and the world. GW's critical research initiatives, the strength of its academic programs, its distinguished faculty, and accomplished students have earned GW its reputation as a leader in global education.

An American University Experience

The campus is accessible by public transit and within walking distance of the White House, Smithsonian Institution, World Bank, and several other major institutions.

Source: George Washington University

Johns Hopkins University Research Labs



Goals

One of the main goals of this research program is to engage students in real-word tasks that will help prepare them for futures in science. Not only will participants perform lab tasks, but during incubation periods or “downtime,” they will be taught how to make their own media, pour plates and more skills that will help them become self-sufficient and valuable team members in a lab setting.

The program will also set a goal of having the students manage their projects independently. Students will have an opportunity to design and carry out their own experiments. The intent of this program is to start the students down the path toward becoming mature, independent scientists. More details regarding the various research labs will be forthcoming.

Research Labs

- Phage Research - Students will isolate and characterize novel bacteriophages (viruses that infect bacteria) from the environment using modern molecular biological techniques.
- Protein Engineering and Biochemistry - Protein engineering and biotechnology techniques are used to modify proteins to give them new structural or physical properties. Students are introduced to standard biochemistry laboratory practice and protein science; perform experiments in site-directed mutagenesis, protein purification and structural and physical characterization of biological macromolecules.
- Chirality (Chemistry)- Techniques for the organic chemistry laboratory including methods of purification, isolation, synthesis, and analysis will be explored through a project focused on chemical chirality.

Overview

- Duration of the program: June 20-July 29, 2016 (6 weeks)
- Credits: 2
- Number of spots available: Maximum of 5 SAF participants per lab
- Visa: F-1
- M-F 09:00-13:00 entry-level project lab (20 hours per week)
- Mandatory Introduction to Computing with applications in many disciplines (natural and social sciences, humanities, and engineering). Students will obtain basic computing skills and tools, including familiarity with UNIX, with the use of complex UNIX commands (e.g. grep, awk, sed) and shell scripts, with the Python programming language, with graphing software and with a package for numerical and statistical computing, such as Mathematica or Matlab.
- Statement of Purpose/Personal Statement (see page 20)

Eligibility

GPA	TOEFL	Standing
3.0/4.0 (3.75/5.0)	iBT 90	Students must have completed at least two years of university study.

Sample Phage Research Program Schedule

Week 1	Week 2	Week 3	Week 4
Orientation, safety training, direct plating of environmental samples, setting up enrichment cultures and plating	As needed, set up additional cultures. Isolate/propagate phage.	Isolate/propagate/purify phage. Purify DNA from isolated phage.	Characterize DNA from isolated phage. Electron microscopy of phage.

Week 5	Week 6
Prepare phage for archiving. Research topics for experiments. Experimental design.	Experimental design. Individual experiments.

Fee and More

- Estimate Fee: $7,261.00
- Housing
  - Fees will include housing
- Fees will not include
  - Renter's insurance and internet service
  - Local transportation
  - Meals
  - Personal expenses

About Johns Hopkins University

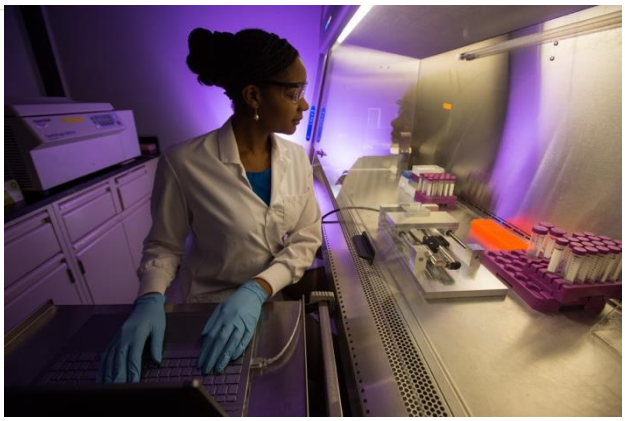
Johns Hopkins University is a private research university located in Baltimore. The world-renowned institution was founded in 1876 and is considered to be the United States' first research university. It has a total undergraduate enrollment of 6,000 and graduate enrollment of 15,000. The opportunity to do research at the undergraduate level is one of the distinguishing characteristics of Hopkins' education, with about 80 percent of undergraduates taking part in research. Johns Hopkins counts 37 Nobel Prize laureates among its alumni including U.S. President Woodrow Wilson.

Source: Johns Hopkins University

University of Arkansas Engineering and Food Science Research

Goals

The Study Abroad Foundation is pleased to introduce the University of Arkansas Research Experience for Undergraduates Program, where talented students can gain experience working in top-tier research laboratories with local and international peers. Students are matched with distinguished faculty in small groups for 6 weeks of intensive research that will prepare students to become competitive candidates for graduate programs and post-graduation employment. Participants of the program are able to select their preferred field of research from a wide selection of programs offered by the College of Engineering in the following research disciplines.



Research Disciplines

- Biological and Agricultural Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Science
- Computer Engineering
- Electrical Engineering
- Industrial Engineering
- Mechanical Engineering

Overview

- Duration of the program: 6 weeks (July 11 – Aug 19, 2016)
- Number of spots available: 50
- Visa: F-1
- Application Deadline March 18
- Statement of Purpose/Personal Statement (see page 20)

Eligibility

GPA	TOEFL and IELTS	Standing
3.0/4.0 (3.75/5.0)	TOEFL 79/550+ High level of English proficiency IELTS 6.5 For SAF, ITP scores of 550 are also acceptable	Rising fourth year preferred Execptional movitation, emotional maturity, and a high aptitude for new environments. Previous research experinece, and strong interest in attending graduate school.

Sample Schedule

July 10	July 11-15	July 18-August19	Weekends
Arrival	Lab safety training and Intro to US Higher Education and Graduate Programs	40 hours per week in a supervised lab.	Cultural field trips and many social activities.

Expand Your Experience

- Students are strongly encouraged to consider combining the summer research program with attendance at the University of Arkansas for the Fall Academic Semester of 2016 (August 22 – December 16) with the Visiting Student Program. Interested students will be able to continue their summer research for 20 hours per week throughout the fall semester (earning six academic credits) and enroll in two regularly offered University of Arkansas courses for an additional six credits. Students who combine the summer research with the fall semester will be considered stronger candidates for admission to the REU.

- Students will receive a Certificate of Completion and official UA Transcript for their summer program that showing one hour of academic credit for the summer and 12 hours of academic credit for the fall. Students will need to apply for an F-1 student visa and show evidence of financial support for the entire duration of their intended stay. Students will be evaluated for the possibility of an extension at the end of each term.

Documents Needed for Application

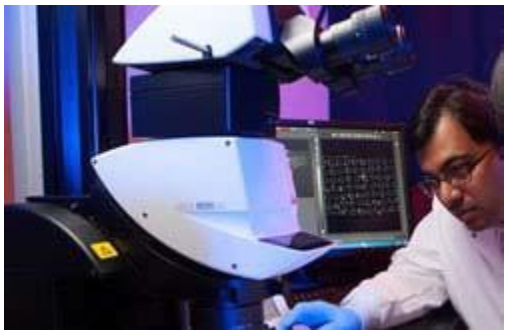
- Online Application will be posted on the UARK Website
- Completed Student Information Sheet
- Letter of Nomination from SAF
- Official Transcripts
- Proof of English Proficiency
- Copy of Passport Identification Page
- Proof of Immunization Form (Students are encouraged to take care of the immunization requirement ahead of time. To be cleared, they should provide proof of two doses of the combined MMR vaccination. Link to Immunization Form)
- Personal Statement (including research interests. See page 31)
- Record of any Previous Research Conducted

Descriptions of Labs

Please note: The following information has been provided to the Foundation by the University of Arkansas. Professors' information is included only for applicants' reference. Please discourage students from contacting the professors directly as this is frowned upon and will not help advance their chances of acceptance into the program.

College of Engineering

Biomedical Engineering
As a new and growing department in the College of Engineering, Biomedical Engineering was designed to serve and attract faculty with exceptional promise and innovation when it comes to building a research program. Facilities such as the University of Arkansas Engineering Research Center (ENRC) offers a range of resources allowing our faculty, students and collaborators to expand the boundaries of biomedical engineering research. Our faculty utilizes the following laboratories to perform research in various areas of the biomedical engineering field

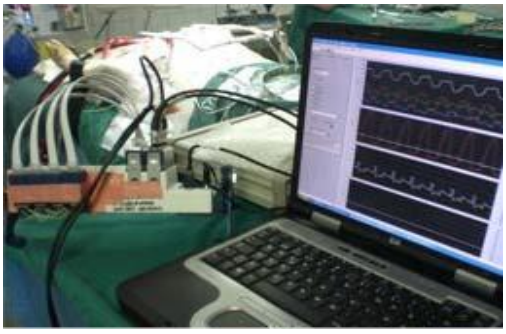


Mechanobiology and Soft Materials Laboratory

Primary Investigator: Kartik Balachandran, Ph. D

The MSML investigates the role of mechanical forces on physiology, function and disease. In particular, we are interested in understanding the interaction between structure and mechanics in regulating biological responses at different length-scales. We employ micro- and nano-fabrication tools to recreate the cellular and tissue environment in the laboratory. We also utilize live imaging, cell/tissue mechanics and tissue engineering techniques to understand several cardiovascular bioengineering problems including cardiac valve calcification, valve fusion and blood-brain barrier dysfunction. Knowledge gained from these studies will help guide the development of medical interventions and regenerative therapies.

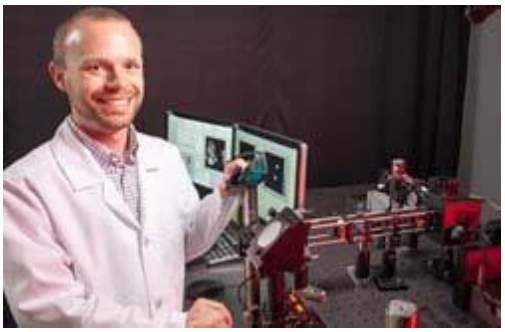
Cardiovascular Biometrics Laboratory



Primary Investigators: Morten Jensen, Ph.D., Dr.Med. & Hanna Jensen, M.D., Ph.D.

Understanding etymology of disease while creating solutions and dedicated devices is the primary focus of biomedical engineering. The CB Lab is an interdisciplinary environment that focuses on building the bridge between the clinical and engineering worlds with an innovative approach to solving critical problems.

Using modalities such as ultrasound and MRI combined with research techniques for measuring biomechanical parameters in soft tissue, the results from this work has been adopted by the NIH guidelines for designing certain repair devices for heart surgery. The lab employs both in vivo and in vitro techniques to deliver the best possible solutions that will eventually benefit patients. Our team has more than 20 years of combined academic, clinical and industry experience, providing the optimal balance for surgical technique and device development for cardiovascular intervention.

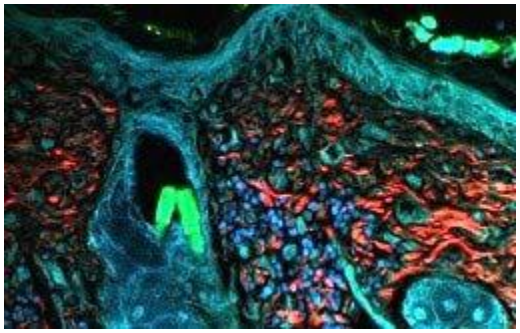


Translational Biophotonics and Imaging Laboratory

Primary Investigator: Tim Muldoon, M.D., Ph.D.

The Translational Biophotonics and Imaging Laboratory is interested in creating novel technologies based on optical imaging or spectroscopic methods to aid clinicians in the diagnosis, management, or treatment of disease at the point-of-care. Our work is focused on developing new imaging techniques, methods, and devices, validating these technologies, and translating them to a clinical setting.

Optical imaging techniques offer great promise as point-of-care diagnostic tools. These optical tools can be used to probe tissue for early indicators of disease by examining a wide array of metrics, from biochemical and cellular-level changes to analyzing blood flow and perfusion. With the emergence and dissemination of highly sensitive detectors, light sources, imaging sensors and optical components, optical technologies as point-of-care clinical tools have become a potentially transformational field in
the area of biomedicine.



Quantitative Tissue Diagnostics Laboratory
Primary Investigator: Kyle P. Quinn, Ph. D

The Quantitative Tissue Diagnostics Lab is a multi-disciplinary research group focused on developing quantitative biomarkers of tissue structure and function to diagnose disease, assess trauma, and guide therapies. Using imaging modalities such as multiphoton microscopy and fluorescence lifetime imaging, we can non-destructively obtain 3D images from live tissue without adding any stains or dyes.

From these images, our group develops and utilizes quantitative analysis techniques to measure changes in cell metabolism and structural organization. Our primary research efforts are focused on exploring applications in the field of wound healing, with the end goal of developing non-invasive real-time quantitative readouts to detect impaired healing and guide care. For more information, please visit us atquinnlab.org.

Regenerative Biomaterials Laboratory
Primary Investigator: Jeff Wolchok, Ph.D.

The Regenerative Biomaterials Lab uses cells to build biomaterials that mimic the properties of human tissue. We are currently exploring the use of these biomaterials for the treatment of damaged muscle. Our group also investigates the effects of traumatic brain injury at the cellular level using a novel benchtop "crash tester."

Laboratory for Vaccine and Immunotherapy Delivery
Primary Investigator: David Zaharoff, Ph.D.

The Laboratory for Vaccine and Immunotherapy Delivery research focuses on the preclinical development and evaluation of translatable delivery systems for cancer vaccines and immunotherapies. Our delivery platforms utilize concepts in biomaterials engineering, tumor immunology, transport phenomena, biochemistry, cancer biology and nanotechnology.

College of Engineering

Biological and Agricultural Engineering
The Department of Biological and Agricultural Engineering conducts research on problems of importance to Arkansas and the entire nation. The two focus areas of research in the department are:

- **Biotechnology Engineering**
- **Ecological Engineering**

Biotechnology Engineering: designing systems to manipulate plant, animal and microbial materials into industrially and medically relevant consumer products, and to develop environmentally relevant biotechnology to manage natural resources. Examples are: genetically modifying bacteria to produce novel chemicals and pharmaceuticals; utilizing bacterial processes to convert dangerous waste products into beneficial soil; utilization of by-products into energy and high-value products,

biomass extraction for phytonutrients, and biomass conversion to energy; providing safe and plentiful food by plant and animal production; food safety; and integrating biological materials into systems at the micro- and nanometer scale for the next generation of bio/abio hybrid engineered systems for medical diagnoses.

Ecological Engineering: applying the science of ecology with the practice of engineering to solve complex ecosystem problems. These solutions include designing advanced wastewater treatment, erosion control systems, stream restoration, hydrology, watershed management and ecological risk assessment; broiler litter management and effects on air quality, mitigation of air emissions; non-point source pollution engineering, animal waste management, and water quality and quantity analyses and management; remote sensing, and applications of site-specific and geospatial technologies in biological and agricultural.

Danielle Julie Carrier, Professor
Conversion of Biomass to Biofuels: Depolymerization of Hemicellulose
Bioprocessing for Phytonutrients and High-value Compounds
Biomass Feedstocks Pretreatment Processing

Thomas Costello, Associate Professor
Algae Production Research
Poultry Housing Systems and Litter Management
Energy Conservation, Reducing Emissions, and Improving Air Quality

Brian Haggard, Professor
Water Quality Monitoring and Modeling
Pollutant Transport in Aquatic Systems
Ecological Engineering, Environmental, Soil, and Water Sciences

Christopher Henry, Assistant Professor
Irrigation Water Use and Management in Arkansas Row Crop Agriculture
Water Quality
Irrigations Systems

Jin-Woo Kim, Professor
Micro/Nanoscale Bio/Abio Interfacing Technology
Self-Assembly of Multifunctional Nanocomposites for Multiplex, Multimodal Nanotheranostics
Environmental Biotechnology and Biocatalysis Technology

Yanbin Li, Professor, Tyson Endowed Chair in Biosensing Engineering
Aptasensors for Rapid Screening of Avian Influenza Virus
Biosensors for Detection of Foodborne Pathogens
Microbial Predictive Modeling, Risk Assessment, and Anti-microbial Technologies

Otto Loewer, Professor
Computer Simulation of Biological Systems
Linkages Among Technology, Economics, and Societal Values

Marty Matlock, Professor and Area Director
Center for Agricultural and Rural Sustainability Sustainable Metrics for Agriculture
Ecological Engineering
Biological Assessment and Monitoring
Ecosystem Design and Management

G. Scott Osborn, Associate Professor
Improving Drinking Water Quality and Availability Dissolved Oxygen
and Ozone Technologies Biological Modeling, Drying, and Energy Processes

Benjamin Runkle, Assistant Professor
Wetland ecohydrology
Surface water nutrient fluxes and source partitioning
Land-atmosphere exchange of carbon dioxide, methane, and water vapor

Jun Zhu, Professor
Waste treatment technologies for protecting air and water quality related to animal production
Renewable energy production technologies
Bioconversion of wastes into value-added products.

College of Engineering
Chemical Engineering

Faculty Research Areas

Dr. Michael Ackerson
Biofuels

Dr. Robert Babcock, **Dr. Robert Beitle**
Biochemical engineering, separation and fermentation
Molecular biology

Dr. Ed Clausen
Engineering education, emphasizing K-12 education
Bioprocess engineering

Dr. Jerry Havens
Hazard assessment

Dr. Christa Hestekin
Separation of biomolecules using microchannel electrophoresis Biomedical engineering, emphasizing early detection of diseases

Dr. Jamie Hestekin
Membrane separations
Conversion of algae to biofuels

Dr. Keith Roper
Electrodynamics in nanomaterials and bio/chemical systems, emphasizing biomedicine, sustainable energy and optoelectronics
Microelectronics/photonics

Dr. Shannon Servoss
Biomedical engineering, early detection of diseases
A Biomimetic material with peptoid constructs

Dr. Tom Spicer
Assessment of hazards from airborne contaminants and from fire and explosion phenomena
Chemical Hazards Research Center

Dr. Greg Thomas
Sustainability
Life cycle assessment

Dr. Ranil Wickramasinghe Membrane Science and Technology Responsive membranes
Water treatment recycle and recovery
Bioseparation

College of Engineering
Civil Engineering

Environmental Engineering

Environmental Engineers focus on problems related to the quality of water, air, soils, and sediments. They work in areas of drinking water treatment distributions systems, wastewater collection and treatment systems, solid waste disposal, air pollution control, hazardous waste management, and contaminated site remediation Water resources engineers work in areas related to the quantity of water, in which aspects of hydrology and hydraulics are applied to water supply management (cities, industries, agriculture, floods, and droughts), environmental protection and restoration, and habitat protection and rehabilitation.

Undergraduates interested in pursuing careers in Environmental Engineering should consider courses related to water chemistry, reaction design, ecology, geographic information systems, and microbiology.

The University of Arkansas offers two degree options in Environmental Engineering. For students who already possess an ABET-accredited Bachelor of Science in Engineering degree, any Engineering Master's degree (Civil, Bio-Ag, Chemical, Mechanical) with a concentration in environmental related

studies is a good option. For students who do not have an ABET-accredited Bachelor of Science in Engineering degree, the Master's of Science in Environmental Engineering (MSEnE) degree is the best option.

Removal of Endocrine Disrupters from Wastewater Streams
- Timeframe: October 2013 through September 2016
- Funded By: GARVER USA
- Collaborators: Wickramasinghe, P.I., Wen Zhang, Co-P.I., Qian, Co-P.I.

New Methods of Microalgae Quantification in Wastewater Treatment and Biofuel Production
- Timeframe: January 2015 through December 2015
- Funded By: SURF Grant, Arkansas Department of Higher Education
- Collaborators: Wen Zhang, P.I.

Reengineering Carbon Nanotubes for Enhanced Adsorption of Disinfection Byproduct Precursors
- Timeframe: May 2013 through April 2018
- Funded By: National Science Foundation
- Collaborators: Julian Fairey(PI)

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- Timeframe: May 2013 through April 2018
- Funded By: National Science Foundation
- Collaborators: Julian Fairey(PI)

Modifying Activated Carbons for Trihalomethane Precursor Removal
- Timeframe: August 2013 through October 2016
- Funded By: Tulsa Metropolitan Utility Authority and Beaver Water District
- Collaborators: Julian Fairey(PI)

Integration of Water Filtration Systems Into Emergency Shelters for Developing Countries
- Timeframe: July 2015 through June 2016
- Funded By: University of Arkansas, College of Engineering
- Collaborators: Gary Prinz(PI), Julian Fairey(Co-PI)

Polyacrylamide-based Applications for Turbidity Control at Highway Construction Sites
- Timeframe: July 2013 through December 2015
- Funded By: Arkansas State Highway and Transportation Department
- Collaborators: Julian Fairey(PI), Wen Zhang(Co-PI)

Fee and More

- Estimate Fee: $6,615.40
- Housing
  - Students will be in double rooms for the duration of the program; doubles in the dorms and doubles in the hotel for the last week of the program.
- Meals
  - The program fee includes three meals per day (two meals per day on Sunday). Students can eat in any of the university cafeterias or at the Walmart on-campus.
- Health Insurance
  - U Ark student health insurance will be included in the program fee. We will add fees for Sky Rescue.

About the University of Arkansas

The University of Arkansas boasts a tradition unique among the nation's universities: Senior Walk, consisting of more than three miles of sidewalks crisscrossing campus that are engraved with the names of more than 170,000 graduates, dating back nearly 140 years. It's concrete proof of the university's commitment to our students.

Our picturesque campus is located in Fayetteville in the hilly northwest corner of Arkansas and includes two arboreta overlooking the Ozark Mountains. Some of the nation's best outdoor amenities and most spectacular hiking trails are within a short drive of campus. Fayetteville is routinely considered among the country's finest college towns, and the surrounding Northwest Arkansas region is regularly ranked one of the best places to live in the U.S.

Source: The University of Arkansas

Cornell University
Provost's International Research Internship Program

Goals

The Provost's International Research Internship Program (PIRIP) at the prestigious Ivy League university is designed to introduce scholars to the laboratory skills they need to be successful in graduate school and the workplace. Hosted by the School of Continuing Education in various disciplines, with the largest capacity being in the College of Agriculture and Life Sciences, the internships place students in labs that complement their interests. Successful applicants will submit statements of purpose, which admissions professionals will present to professors whose interests align with the students' goals. Participants will reside in student housing on Cornell's picturesque campus in Ithaca, New York.

Departments with Research Opportunities

- Astronomy
- Agriculture and Life Sciences
- Computing & Information Science
- Electrical and Computer Engr
- Food Science
- Mechanical & Aerospace Engr
- Molecular Medicine
- Nutritional Science
- Plant Science
- Plant Breeding and Genetics
- Animal Science
- Astronomy, Physics
- Chemical and Biomolecular Engr
- Crop and Soil Sciences
- Entomology
- Landscape Architecture
- Microbiology
- Natural Resources
- Plant Biology
- Plant Pathology and Plant-Microbe Biology
- Applied and Engineering Physics
- Bio and Envir Engineering
- Civil & Environmental Engr
- Earth and Atmospheric Sciences
- Fiber Science & Apparel Design
- Materials Science & Engr
- Molecular Biology and Genetics
- Neurobiology & Behavior
- Psychology

Overview

- Duration of the program: June 27-August 9, 2016 (6 weeks)
- Students do not have to come for the entire period but must be finished by August 10, as all campus housing will close that day
- Credits: 6 (of independent coursework)
- Students will receive a Cornell University transcript
- All grades are pass/fail
- Previous lab experience is a plus
- Students who are taking upper-level coursework are more likely to have the skills to succeed in the lab work

Eligibility

GPA	TOEFL, IELTS	Standing
3.0/4.0 (3.75/5.0)	TOEFL 100/550+ High level of English proficiency. IELTS 7.0	Upper-level students considering futures in STEM. Previous lab experince helpful.

Documents Needed for Application

- Visa: F-1
- I-20 Request Form
- School of Continuing Education Enrollment Form
- Provost's International Research Internship Program (PIRIP) Form
- Health History Form
- Proof of Immunizations
- Statement of Purpose/Personal Statement (see page 31)

Fee and More

- Estimate Fee: $7,087.40

Descriptions of Research Interests

The following information has been provided to the Foundation by Cornell University. Summaries of the professors' research interests and projects are only for applicants' reference in choosing their desired department of study and for writing their statements of purpose. Successful applicants may be assigned to new or different projects than outlined here. Please discourage students from contacting the professors directly, as this is frowned upon and will not help advance their chances of acceptance into the program.

Animal Science

Xin Gen Lei
Our research mission covers both basic and translational aspects of nutritional genomics. The scope spans from the fundamental mechanisms of antioxidant nutrients and enzymes in metabolism and pathogenesis of chronic diseases, to the development of novel hydrolytic enzymes and alternative feed protein sources. Our laboratory is conducting active research in four exciting areas. The first area, funded by NIH, is molecular nutrition of selenium and functional genomics of antioxidant enzymes.

Michael Van Amburgh
My program is devoted to discovery and problem solving contemporary issues in nutrition, physiology and management in the dairy and livestock industries and disseminating new knowledge to students and the industry. Research Areas

Heather Huson
Areas of Interest: Genetic Improvement of Animal Health and Production, Dairy Cattle Management and Genetic Evaluations, Population Structure and Adaptation, Genomic Tool Development, Wildlife and Indigenous Population Conservation, Canine Genetics Current Research: My research utilizes genomic tools to identify population structure and relatedness to production, adaption, and disease in animals. I specifically focus on dairy cattle and goat production and improvement through the identification of genetic markers influencing traits and those markers potential as diagnostic tools for herd management.

Applied Engineering and Physics

Chris Xu
Advanced materials biomedical instrumentation and diagnostics optical physics, quantum electronics, and photonics.

Astronomy and Astrophysics

David Cernoff
Chernoff's current research interests encompass cosmology, quantum mechanics, statistics and numerical methods for solving analytically intractable problems in physics. One exciting intersection of these different interests involves exploring constraints that astrophysical observations can place on the fundamental theories of physics and cosmology that have emerged over the past two decades.

Ira Wasserman
Recently Dr. Wasserman's research is focused on the following:
Long term variation in the rotation of neutron stars, specifically neutron star precession and implications for the physics of superfluids in their interiors. Nonlinear mode coupling in rotating neutron stars, and the saturation of the r-

mode instability driven by gravitational radiation.
Astronomical manifestations of remnants of string/brane inflation, particularly cosmic strings, and prospects of constraining models for the early Universe observationally.

Bio & Environmental Engineering

Mingming Wu
Mingming Wu is an Associate Professor in the Department of Biological and Environmental Engineering. She was drawn to the field of biological engineering by her admiration of the exquisite micro- and nano-scale machinery found in the natural world. She is leading a lab that develops micro- and nano-scale technologies for solving contemporary biological, medical, and environmental problems.

Steenhuis, Tammo S
Tammo Steenhuis is a Professor in the Department of Biological and Environmental Engineering. He is also one of the faculty members leading the dynamic and innovative Soil and Water Group. S&W's broad mission relates to the management of soil and water resources and tries to improve the understanding of physical, chemical, and biological processes related to water flow. The ultimate goal is to improve and protect water resources and ecological systems throughout the world.

Anderson, Catherine Lindsay
Professor Anderson's research interests focus on the application of systems modeling and optimization to energy and the environment. Current projects include mitigation of wind generation uncertainty through the use of other renewable energy sources, the cost of wind energy uncertainty on existing power systems, and the implications of process uncertainties in biofuels production outcomes.

College of Agriculture and Life Sciences

Community and Regional Development Institute
CaRDI is a group of research and outreach faculty and professionals working in critical areas of community development. A federation of programs including LEAD-NY, the Cornell Farmworker Program, the Rural Schools Association, and Rust 2 Green partner with other CaRDI faculty working in areas such as land use, regional economic development, community and energy, and demographics.

Chemical and Biochemical Engineering

Jefferson Tester
Chemical Engineering, Geological Sciences, Systems Engineering

David Koch
Complex fluids and polymers

Civil and Environmental Engineering

Jerry Stedinger
Engineering management; environmental and water resources systems engineering

Ruth Richardson
energy, environment, and sustainable development; environmental engineering

Computing and Information Science

Carla Gomes
My research area is Artificial Intelligence with a focus on large-scale constraint-based reasoning and optimization. I exploit connections between different research areas --- in particular artificial intelligence, operations research, and the theory of algorithms. Central themes of my research are: (1) the synthesis of formal and experimental research for understanding and exploiting problem structure, (2) the integration of concepts from constraint reasoning and mathematical programming, and (3) the use of randomization techniques to scale up the performance of complete (exact) search methods.

Crop & Soil Sciences

Matthew Ryan
Matthew Ryan is an agroecologist and conducts research on sustainable cropping systems. Over the next several decades, farmers need to adapt to increased climate variability, decrease their environmental impact, and feed billions of more people. Despite these challenges, it is an exciting time to be involved in agriculture, as more consumers want to know about the practices used to produce their food and new farmers are increasingly from non-farm backgrounds.

Earth & Atmospheric Sciences

Larry Brown
Active source & earthquake seismology; upper crustal structure of late Cenozoic mountain belts

Terry Jordan
Paleoclimate

Ecology & Evolutionary Biology

Anurag Agrawal
My research program addresses questions in the ecology and evolution of interactions between plants and animals. In particular, I focus on the generally antagonistic interactions between plants and insect herbivores and ultimately seek to understand the complexity of community-wide interactions.

David Ward Winkler
We study the variation of swallow life histories over many scales of time and space. At the most fundamental scale of time, we study swallow phylogeny and map trait variation onto this phylogeny. At much shorter temporal scales, we study in detail the effects of weather variation on swallow breeding biology, both directly on metabolic costs and indirectly through the flight behavior of the swallows' aerial insect prey.

Andre Kessler
Our lab studies the mechanisms and ecological consequences of plant induced responses to herbivore damage, including aspects of multi-trophic interactions, population ecology, phenotypic plasticity, plant-pollinator interactions and plant defense mechanisms against herbivores. In particular, we are interested in the ecological relevance of herbivore-induced changes in flower metabolism and morphology. We are using chemical and molecular tools in manipulative field and laboratory experiment.

Electrical & Computer Engineering

Zhiru Zhang
Design automation for heterogeneous computing, including high-level synthesis, architecture and compiler optimization for hardware specialization, and software-defined reconfigurable systems. 1. Accelerated Machine Learning on Reconfigurable Logics 2. Approximate Computing Substrate 3. Heterogeneous Programming for Internet of Things.

Eilyan Bitar
Modern power systems, control, optimization, and market mechanism design: stochastic control, optimization, and game theory and their applications to electricity markets, power systems, and renewable energy integration.

Christoph Studer
The intersection of digital very-large scale integration (VLSI) circuit and system design, signal and image processing, wireless communication. VLSI Design of a Data Detector for Massive MIMO, Large-Scale Semidefinite Programming for Wireless Systems.

Entomology

John Losey
My research, teaching and outreach interests all revolve around the management of insect populations. My program has two complementary foci the management of pest insect populations and the management of endangered or declining insect populations. I am very interested in the processes that make some insect species so numerous that they become pests while others decline so quickly that they become rare or even extinct.

Michael Hoffman
As a professor of entomology my goal is to advance the integrated pest management (IPM) strategy through mission-oriented research and extension. My research program is directed at improving our understanding of pest biology and ecology in vegetable crop systems and applying that information to develop practical, cost-effective, and environmentally sensitive pest management tactics. The goal of my extension program is to ensure that new knowledge is delivered to the end-user and adapted to their needs.

Nicolas Buchon
Our lab is interested in understanding Host-Microbe relationships and the genetic network that governs the host response to microbes. Our goal is to integrate the immune response per se with mechanisms employed by the host to repair the infectious damage in an integrative model. The main focus of our work is to characterize the host mechanisms that control intestinal homeostasis in response to infectious and resident microbes. In addition, we want to understand how microbes can alter intestinal homeostasis and give rise to pathologies of gut origin such as intestinal immune disorders or cancers.

Scott Mc Art
Pollinator health and ecology, particularly in relation to pesticides and pathogens

Katja Poveda
At the farm scale we have been focusing in developing crop management systems that reduce pest pressure and increase yield through the use of functionally important plants (trap plants for pests, repellent plants for pests and flowering plants attractive for natural enemies and pollinators). In addition, we have been studying the responses of different varieties of crop plants to herbivores in order to harness their natural defense mechanisms (resistance and tolerance) in management practices or breeding processes that would lead to higher production with less reliance and chemical fertilizers and pesticide use.

Jeffery Scott
Our research is characterized by the four major areas below and seeks answers to both applied and basic questions. The techniques we use are varied and wide ranging. Insecticide resistance and evolutionary biology. Resistance is one of the major problems facing public health and agriculture. Resistance has been referred to as "instant evolution" and causes major disruption whenever vectors of human disease or pests of agriculture can no longer be controlled. We study resistance as both a problem for which we need practical solutions, as well as an intensely interesting problem in basic evolutionary biology. We specialize in investigating the mechanisms (biochemical and genetic), inheritance, management, fitness costs and population genetics of insecticide resistance. Insect genetics and molecular biology are active areas of research in our laboratory.

Fiber Science & Apparel Design

Juan Hinestroza
Our research group is focused on understanding complex phenomena at the nanoscale that are of fundamental relevance to fiber and polymer science. Our work on textiles nanotechnology can be categorized into three main thrusts:

1. Modification of existing textile materials using electrostatic self-assembly and atomic layer deposition techniques to create novel and customizable surfaces on conventional textile substrates with emphasis on natural fibers. Our group has deposited polyelectrolytes, inorganic and metallic nanolayers over textile fibers with nanoscale precision opening a new avenue for the development of smart textiles.

2. Creation of novel nanofibers using directed and external fields to control self-assembly phenomena at the nanoscale. We use alternating magnetic fields to achieve precise position control of embedded nanoparticles inside polymeric fibers creating novel nanocomposite materials. In collaboration with our partners at UPRM, our group has developed novel nanofibers having unique magnetic signatures with potential anticounterfeiting and positive identification applications.

3. Development of metrology tools based on scanning probe microscopy customized to assess nanoscale phenomena on low energy surfaces with high radius of curvature such as those of textile fibers. Our group is pioneering the use of electric force microscopy as a probing tool to quantitatively determine the effect of electrical charge degradation on the filtration performance of electret filter media. We also use a novel Atomic Force Acoustic Microscopy AFAM to probe the mechanical properties of nanofibers.

Food Science

Syed Rizvi
Physical, chemical and engineering aspects of food and related biomaterials. International developments.

Carl Batt
Our laboratory is engaged in basic and applied research in a wide range of topics. One area of focus in on the use of protein engineering / expression techniques for developing recombinant anti-cancer therapeutics. Another active area of research involves the design and engineering of portable sensor devices using leading-edge micro- and nanofabrication methods.

Carmen Moraru
Studying and optimizing food processing methods capable of enhancing product safety, quality and shelf life. Current research areas: use of membrane separation and pulsed light treatment, as physical methods capable of reducing the microbial load of food products in general and dairy products in particular. 2) Understand the effect of surface nanoscale topography on microbial attachment and use this understanding to develop microbial repellant surfaces 3) Understanding the intermolecular interactions and structural transformations that occur during processing and their effect on the quality and functionality of dairy foods.

Martin Weidmann
The specific objective of my research program is to develop a better understanding of the pathogenesis, ecology, evolution, and transmission of bacterial foodborne and zoonotic diseases. The pathogenesis of foodborne and zoonotic diseases can involve complex interactions between a bacterial pathogen, a variety of environments and one or multiple host species. The ability of bacterial cells to survive and compete in a variety of environments plays a key role in the pathogenesis and transmission of many foodborne diseases.

Veronica Guariglia
The role sigma factors of L. monocytogenes play in regulating the response to stressful conditions

Landscape Architecture

Brian Davis
My research focuses on urban rivers and watersheds in the Americas. Latin America has been a focus of my work since my time living in Argentina. My research in this field started from a simple observation gleaned from first-hand experience: in terms of landscape, the Americas have more in common than not. This includes not only peoples and their cultural institutions, material practices, and histories, but also places- the cordilleras, deltas, high deserts, and expansive forests of the American landscape. In order to undertake this project much of my work is about blending the fields of landscape studies and hemispheric studies.

As contemporary cities face the twinned challenges of environmental justice and a rapidly changing climate the cleanup and management of urban rivers stands as one of the great tasks currently facing societies around the globe. Urban waterfronts and rivers are the site of much historical industrial development, some of the most important and sensitive ecological zones, and a wide range of human settlements which often simultaneously include the most desirable and the most vulnerable populations.

Materials Science & Engineering

Eve Donnelly
Biomedical Engineering, Materials Science and Engineering, Mechanical Engineering

Jin Suntivich
Sustainable energy and environmental technologies

Mechanical & Aerospace Engineering

Christopher Hernandez
Mechanical properties of living biological materials and the response of live tissues to mechanical loading

Elizabeth Fisher
Combustion and pollution; energy, environment, and sustainable development

Max Zhang
Geology, sustainability, emissions, energy and the environment

Microbiology

Ruth Ley
Our research has two broad goals. The first is to better understand the relationships between host genetic variation and variation in the microbiome. We aim to identify relationships between host genetics and aspects of the host microbiome that can point to novel mechanisms underlying host control of the microbiome. To answer this question, we work in human and maize genetics. The second goal is to better understand how interactions between host immunity and microbiota in the mammalian gut result in inflammation, and how adaptive immunity can be utilized to reshape pathogenic microbiomes.

Jillian Waters
Mechanisms of microbiota- transmitted metabolic syndrome in TLR5-/- mice. Molecular Biology and Genetics

Chip Aquardo
I view these responsibilities part of a continuum that runs from current students to alumni to the general public. My research is focused on discovering basic principles that determine the amount of diversity that exists within and between the genomes of organisms, and how we can use that diversity to understand organismal diversity, to discover novel genes, to maximize human health, and to advance agriculture. Our research is carried out primarily with Drosophila, though past work has included mammals and plants.

Fenghua Hu
Biochemistry, Molecular and Cell Biology, Comparative Biomedical Sciences
1. Examine microglial changes in wild type and progranulin knockout mice in disease state.
2. Screen for receptors for neurotrophic factors

Molecular Medicine

Toshi Kawate
Biochemistry, Molecular and Cell Biology, Biophysics, Pharmacology. Uncovering the function of a TTYH protein TTYH (Tweety homologue) is a membrane protein expressed in the nervous system; Obtaining the tertiary structure of an NTPDase.

Natural Resources

Bernd Blossey
His research addresses the following key areas: (1) How do plant invasions and their management affect native ecosystems? (2) What effects do single and combined multiple stressors (deer, earthworms and invasive plants) have on species and ecosystems? (3) How can we achieve improvements in the success of biological weed control? and (4) What determines the increased competitive ability of invasive plants?

Neurobiology & Behavior

Rob Raguso
Floral scent, the focus of my research, is a key sensory component of plant-pollinator communication, a poorly explored dimension of floral phenotype, and a major chemical expression of biological diversity. I work at the rich biological interface between insects and plants, an important source of terrestrial biodiversity and complex ecological interactions. To a great extent, this richness is manifested in chemistry: the chemistry of defense and resistance, of mimicry and deception, of communication between mutualists, and in physiology; the physiology of signal detection and processing, of sensory integration and its impact on behavior.

Maren Vitousek
Vertebrate genomics, zoology. How do extreme weather events influence the physiology and behavior of tree swallows? 2. Why is the response to predators so variable?

Nutritional Science

Julia Finkelstein
Epidemiology, Immunology and Infectious Disease, Nutrition; the role of iron and vitamins B12 and folate in the etiology of anemia and adverse pregnancy outcomes; the applications of epidemiological and GIS methods to improve surveillance and public health.

Shu-Bing Qian
How is mRNA translation controlled by nutrient signaling? How does protein folding and degradation occur during protein synthesis? How do cells get rid of misfolded proteins? These are a few of the problems we would like to understand. Elucidation of the molecular mechanisms underlying protein quality and quantity control will ultimately define new therapeutic strategies to human diseases such as cancer, diabetes, and neurodegenerative disorders.

Plant Biology

Leon Kochian
My research program focuses on crop mineral nutrition and plant responses environmental abiotic stresses in the soil. My research approach involves the interdisciplinary application of methodologies from molecular biology, genomics, genetics, biochemistry and plant physiology to identify genes that control important plant traits related to mineral nutrient acquisition and abiotic stress tolerance, in order to facilitate crop improvement in these areas.

Plant Pathology & Plant Microbe-Biology

Rebecca Nelson
Exploring natural genetic diversity for quantitative disease resistance in maize.

Jeremy Thompson
Plant Pathology and Plant-Microbe Biology. Virus diagnostics and characterization.

Shawn Kenaley
Switchgrass susceptibility by point of inoculation (e.g., foliage, roots, tiller buds) and, 2) the affect(s) of light, free moisture, spore concentration, and temperature on teliospores germination.

Gary Bergstrom
The goal of my research/extension program is to improve the management of crop diseases affecting food grain and forage production systems in New York. Educational programs are aimed at increasing the plant pathology expertise of extension educators and certified crop advisors, and ultimately, field crop producers. I work closely with agronomists, plant breeders, and other plant scientists to evaluate cultural, biological, and chemical disease control strategies as a component of integrated crop management of corn, forage legume, small grain cereal, oilseed, and bioenergy feedstock crops.

Adam Bogdanove
Computational Biology, Microbiology, Plant Biology. TAL effector biology for durable plant disease prevention and DNA targeting applications; Molecular interactions of plants with fungal pathogens.

Plant Science

Marvin Pritts
My research is focused on developing sustainable production methods for berry crops. A major focus is on environmental modifications, primarily using high and low tunnels, to produce tender crops (e.g. blackberries) in colder climates, and to extend the season into fall for strawberries and raspberries. Managing weeds is a major challenge for berry growers and using non-herbicidal approaches (such as integrating cover crops and reduce tillage planting systems) is a significant component of my research program. Also, using cultural practices to reduce damage from pests (e.g. black root rot, Phytophthora root rot, tarnished plant bug) is another facet of my research. Finally, I am interested in better understanding some of the basic physiological responses of berry crops to the environment and developing ways to improve plant growth and productivity.

Plant Breeding Genetics

Donald Viands
My research/extension objectives are to breed improved forage cultivars (primarily alfalfa and birdsfoot trefoil) for Northeast USA and promote their use by growers and seed companies. Although private breeding companies now provide most of the alfalfa cultivars in the USA, none of them focuses on traits specifically needed in the Northeast. Because there are few forage breeders in North America, a large proportion of my research is cooperative, facilitated through the NE1010 Multistate Cooperative Research Project. This project includes research to improve forage species, compare breeding methods, evaluate new cultivars of several forage species for yield, and conduct QTL analyses.

Psychology

Khena Swallow
Cognitive Science, Psychology.
1. Eye tracking and pupillometry of goal-relevant events
2. fMRI of temporal selective attention
3. Spatial learning and memory
4. The role of culture in event segmentation

Alex Ophir
Behavior, Development, Evolution, Neurobiology

Mike Goldstein
How do infants learn to talk? My research focuses on the developmental processes by which knowledge of speech and language is acquired from the social environment. I use a comparative approach, studying vocal learning and development in young songbirds and humans, though all of my research at Cornell is currently focused on humans. To investigate the processes by which infant development is constructed from interactions with caregivers, I take a micro-analytic approach to social learning. I observe and manipulate parent-offspring interactions at small time scales to understand mechanisms of developmental change. My primary research goal is to identify parameters of social interaction that are crucial for infant learning to better understand causal forces of development.

David Field
Theories and models of sensory coding and visual processing. Visual perception. Emphasis on understanding the relations between the structure of the natural environment and the representation of that environment by sensory systems. Models of the visual system. We develop computational model that process information using algorithms developed from neurophysiology. Anyone with programming experience would be great. However, we are also involved with experiments using human observers and would be happy to have the students work in that area as well.

Writing An Essay for Admittance to a Research Program

After a student has browsed the SAF program materials, visited the department webpages and familiarized his/herself with the program and research labs/topics to which they are applying, then he/she should write an essay totaling about 700 words. Below is a guideline for the content of a Statement of Purpose/Personal Statement.

Part One- In about 500 words describe:
Your reason for applying to the program
What you hope to gain from this experience
Your short and long-term career goals
The PhD Programs that interest you

Part Two- In about 200 words describe:
Previous research experience (briefly and if applicable)
General research topic(s) that interest you. (You may list more than one, no more than three)
Area(s) you would like to focus on this summer.

Note: Students do not need to name a specific faculty member in the essay, as the university may use the essay to match successful candidates with mentors they believe would be the best fit. In this case, a description of the kind of research they are interested in and why would suffice (see content guidelines above and the sample essay below). Again, please discourage students from contacting professors directly, as this will not help their chances of admission.