Mentor: Dr. Yanzhang Wei  
Department: Biological Sciences

Project Title: Anti-inflammatory activity of plant derived compounds

Project/Faculty URL: https://www.clemson.edu/cafls/faculty_staff/profiles/ywei

Required Skills:
Some basic biological knowledge and lab experiences are preferred.

Project Description:
P. peruviana L., the Poha Berry, origins lie in South America and has become a naturalized plant in Hawaii. This berry possesses Vitamin C, carotenoids, bioflavonoids, and antioxidant properties. The local people of Hawaii use P. peruviana L. for aid in inflammation, digestive ailments, and pain. Our collaborators at U. Hawaii have identified and purified some compounds from the plant. The purpose of this study is to investigate if those compounds possess anti-cancer and anti-inflammatory activities. Human lung carcinoma line A549, human cervical carcinoma line Hela cells, and a macrophage line RAW-264.7 will be used in the study. MTS based cell proliferation and a Griess reagent assay for Nitric Oxide (NO) production will be performed.

CAT Bus Transportation Required: N  Off-Campus Research Location: N

Mentor: Dr. Mark Blenner  
Department: Chemical & Biomolecular Engineering

Project Title: Efficient Production of Sustainable Fuels and Specialty Chemicals Using A Novel Yeast

Project/Faculty URL: http://www.clemson.edu/proteinengineering

Required Skills:
Interns do not need any specific skills or experiences, but the intern should be highly motivated and interested in biomolecular engineering, genetic engineering, chemical engineering and/or biochemistry.

Project Description:
Our society uses chemicals in the production of essential products such as fuels, materials, food, and medicine. Producing these chemicals in a more sustainable manner will be important for preserving the environment and our natural resources. Our lab is pioneering the effort to establish a new yeast platform for production of lipids for sustainable fuels and specialty chemicals. We are developing novel tools that allow us to manipulate its genetics and metabolism and enable high amounts of product to be made. This project facilitates high-throughput strain development based on expression of a fluorescent protein coupled to novel fatty acid synthesis genes.

CAT Bus Transportation Required: N  Off-Campus Research Location: N
### Mentor: Dr. Mark Blenner  
**Department:** Chemical & Biomolecular Engineering  
**Project Title:** Engineering Therapeutic and Enzyme Production Using Nonconventional Yeast  
**Project/Faculty URL:** [www.clemson.edu/proteinengineering](http://www.clemson.edu/proteinengineering)  
**Required Skills:** Interns do not need any specific skills or experiences, but the intern should be highly motivated and interested in biomolecular engineering, genetic engineering, chemical engineering and/or biochemistry.  
**Project Description:** Our society uses proteins and enzymes in a variety of applications from laundry detergent to therapies for debilitating disease. Producing these molecules in a more efficient manner will be important driving down the price of enzymes and therapeutics. Our lab is pioneering the effort to establish a new yeast platform for production of industrially relevant enzymes. We are developing novel tools that allow us to manipulate its genetics and metabolism and enable high levels of protein secretion. This project uses a CRISPR-Cas9 library to identify genetic modification leading to increased protein secretion from nonconventional yeast.  
**CAT Bus Transportation Required:** N  
**Off-Campus Research Location:** N

### Mentor: Dr. Rachel Getman  
**Department:** Chemical and Biomolecular Engineering  
**Project Title:** Integrating Experiments and Simulations to Explore Catalytic Chemistry at the Molecular-Level  
**Project/Faculty URL:** [http://computationalcatalysis.sites.clemson.edu](http://computationalcatalysis.sites.clemson.edu)  
**Required Skills:** Students should have taken at least one high school chemistry class, and preferably, earned an A. They should also have basic computer skills, such as web browsing and basic Microsoft Excel. They should be open to learning how to use new software (given a set of instructions and ample help from others), as we use a variety of different pieces of software in this project. They should also be mature and demonstrate good listening skills, as they will be expected to learn about and practice safety in the lab.  
**Project Description:** The ultimate objective of this project is to elucidate the catalytic mechanisms involved in either H2 production from sugar alcohol molecules or NH3 production from air and water. These reactions are related to the fields of sustainable energy and food production. Specifically, sugar alcohol molecules are useful models of chemicals that have been derived from cellulosic biomass, such as cellulose and glucose, and they can be converted into fuels (including hydrogen and liquid alkanes) and also specialty chemicals. When these products can be produced from sustainable biomass, it lessens demands for petroleum. Ammonia is an important ingredient in fertilizer and imperative to meeting the world's food demands. Our motivation to produce it from air and water (through the process of electrocatalysis) is to decrease the cost of production, which would expand access to food to the regions of the world that need it the most. Interns will be able to select which project they want to work on. The aim of both projects is to understand the catalytic chemistry, so that we may design catalysts for these processes. Catalysts presently exist for these applications, but they are comprised of Pt and other expensive materials. Our goal is to design Pt-free catalysts for these and other industrial processes. To do this, we are simulating chemical reactions occurring over catalyst surfaces, and we are using experiments to validate and improve our models.  
**CAT Bus Transportation Required:** N  
**Off-Campus Research Location:** N
Mentor: Dr. Chris Kitchens  
Department: Chemical and Biomolecular Engineering  
Project Title: Sustainable Building Materials for Energy Efficient Housing  
Project/Faculty URL: https://www.clemson.edu/cecas/departments/chbe/people/kitchens_c.html  
Required Skills: Qualified students should be interested in science and comfortable working in a chemistry laboratory. Students should be comfortable working with other students as well as independently. Enthusiasm, scientific creativity, and a love of science are a must.

Project Description: Sustainable Building Materials for Energy Efficient Housing  
This project is focused on the development of greener alternatives to current residential housing building materials. Structural Insulated Panel Systems (SIPS) are emerging as an alternative form of residential construction that can significantly increase energy efficiency and decrease build time. Currently the SIPS materials consist of oriented strand board (OSB) as the structural component. OSB is composed of wood chips and often a phenyl formaldehyde resin which have health concerns and are very flammable. We are working with a company, Jet Products, to develop new magnesium oxide based cement wallboards for structural applications. The focus of this research will be to make these cement boards and test their properties for building applications, including strength, chemical composition, and fire retardant properties.

CAT Bus Transportation Required: N  
Off-Campus Research Location: N

Mentor: Dr. Chris Kitchens  
Department: Chemical and Biomolecular Engineering  
Project Title: Gold Nanoparticles for Catalysis Applications  
Project/Faculty URL: https://www.clemson.edu/cecas/departments/chbe/people/kitchens_c.html  
Required Skills: Qualified students should be interested in science and comfortable working in a chemistry laboratory. Students should be comfortable working with other students as well as independently. Enthusiasm, scientific creativity, and a love of science are a must.

Project Description: More than 60% of all chemical products (including fuels, commodity and fine chemicals) and 90% of chemical processes rely on catalysis. It is also estimated that more than 35% of the global GDP is tied to catalysis. The field of nanoscience is defined by the fact that when materials are reduced to the nanoscale, the nanomaterials possess properties that are different than their bulk material. Case in point, metals like gold that are thought of as inert become catalytically active in the nano-regime. The past 30+ years has seen an explosion in the number of nanomaterials that have been synthesized with different sizes, shapes, crystallinity, and atomic composition; all with unique properties. A majority of these methods rely on solution based methods and colloidal chemistry to obtain the desired materials, and thus, surface bound ligands are required. Herein is the dilemma: surface bound ligands are required to synthesize and preserve unique nanomaterials that are potential catalytic materials but the binding of these ligands to the surface can block the reactive surface sites and eliminate catalytic activity. To circumvent this dilemma, the nanomaterials can be deposited onto a support and treated to remove the bound ligand, but this results in potential changes in the surface properties, significant decrease in the available surface area, and influence of the support material on the activity, which can be advantageous or detrimental. The focus of this research is to compare the catalytic activity of gold nanoparticles in solution and deposited on a support for relevant chemical reactions.

CAT Bus Transportation Required: N  
Off-Campus Research Location: N
Mentor: Dr. Dev Arya  Department: Chemistry
Project Title: Development of novel antibacterial
Project/Faculty URL: http://www.clemson.edu/science/departments/chemistry/people/faculty/arya.html
Required Skills: basic chemistry, biochemistry, microbiology.
Project Description: The emergence of resistance to anti-bacterials has necessitated the search of novel molecules that could help tackle these issues. Small molecules will be designed to poison the functions of bacterial enzymes. Team members will learn about the bacterial targets and work towards investigating small molecules that can inhibit bacterial growth.
CAT Bus Transportation Required: N  Off-Campus Research Location: N

Mentor: Dr. George Chumanov  Department: Chemistry
Project Title: synthesis and characterization of plasmonic nanostructures
Project/Faculty URL: https://www.clemson.edu/science/departments/chemistry/
Required Skills: The interns are required to have basic chemical laboratory skills and not to be afraid of modern optical and microscopic instrumentation.
Project Description: The project involves the synthesis of silver nanoparticles and their characterization using optical and microscopic methods.
CAT Bus Transportation Required: N  Off-Campus Research Location: N
Mentor: Dr. Carlos Garcia                    Department: Chemistry
Project Title: Microfluidics meet Nanomaterials
Project/Faculty URL: https://chemistry.sites.clemson.edu/garcia/
Required Skills:
Basic chemistry skills, preparation of solutions, and basic software (word, excel, etc)

Project Description:
Nanomaterials, materials with sizes or features ranging from 1 to 100 nm in one or more dimensions, are the core of an emerging technological revolution. The main advantages of these materials are unique thermal, mechanical, electronic, and biological properties not found in conventional materials. Combining these properties with their remarkable recognition capabilities has resulted in analytical systems with significantly improved performance and novel applications across physics, chemistry, biology, and engineering. Although a number of nanomaterials have been used in conjunction with traditional separation techniques, the small volumes and low analysis time offered by microfluidic devices represent an open field for innovation with unique opportunities in terms of research and training. Owing to these opportunities, our group is interested in the development, characterization, and application of nanomaterials into analytical strategies, and in particular those that could provide significant advantages in the biomedical field.

Inspirited in these developments, we propose to develop sub-nL microarrays to perform biochemical assays. In order to keep the cost to a minimum, the arrays will be developed using standard glass slides. As envisioned, the process would start with the deposition of a hydrophobic layer of DDS to anchor a polymer brush (to prevent the adsorption of enzymes or proteins to the surface), engraving the wells, and finally placing the desired reagents in the hydrophilic wells. This strategy is based on hydrophobic and hydrophilic interactions to produce devices by a sequence of simple procedures. More importantly, the surface of the resulting device is moderately hydrophobic and enables "rolling" a drop of sample across the array and using only 0.25nL per well. Preliminary experiments show the great promise of this strategy for the analysis of dengue using antibodies.

CAT Bus Transportation Required: N        Off-Campus Research Location: N

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Mentor: Dr. Bill Pennington                    Department: Chemistry
Project Title: Biochromatic Sensors for Detection of Pathogens in Food
Project/Faculty URL: http://www.clemson.edu/science/departments/chemistry/people/faculty/pennington.html
Required Skills:
Students will learn techniques for preparing paper, cotton, and other substrates for incorporation of PDAs, and then will characterize the resulting sensor device. Very basic synthetic techniques, such as evaporation of solvent and preparation of liposomes, will be taught. Students will also learn characterization techniques such as powder X-ray diffraction analysis, visible spectroscopy and color analysis, and thermal analysis methods. No prior knowledge or experience is necessary, as all can be easily and quickly learned.

Project Description:
Polydiacetylenes (PDAs) are unique polymers that change color from deep blue to bright red when exposed to heat, certain chemicals, and mechanical impact. Our goal is to modify these materials so that the color change is triggered by the presence of bacteria and other pathogens. We have worked toward developing a set of sensors to be used to monitor the sanitation of a poultry processing plant, and are developing smart wound dressings that change color at the onset of infection.

CAT Bus Transportation Required: N        Off-Campus Research Location: N
Mentor: Dr. Sourav Saha  
Department: Chemistry
Project Title: Stimuli-Responsive Functional Materials
Project/Faculty URL: https://souravs.people.clemson.edu/Home.html
Required Skills: Basic chemistry knowledge (e.g. acid-base reactions, oxidation/reduction). Microsoft word, excel, and powerpoint.

Project Description: The intern(s) will be involved in a project focused on developing porous coordination polymers that can harvest light to generate electricity. Composed of metal ion clusters acting as nodes and organic ligands as beams, pillars, walls, and floors, hybrid porous MOFs emerged as one of the most fascinating and versatile functional materials of this century. Although their separation, storage, and delivery capabilities are well-documented, electronic and photonic MOFs capable of solar energy conversion, charge transport, and storage are few and far between, chiefly due to the scarcity of redox and photoactive building blocks, difficulties of integrating them into devices, and the lack of intrinsic charge transport pathways within these porous materials. To address these challenges and transform MOFs into next-generation electronic and photonic materials, we are constructing stimuli-responsive MOFs using electronically and optically active ligands, growing robust, oriented MOF films on metal oxide substrates that can be easily integrated into devices, and investigating how they adapt to guest molecules and ions, applied electric field, and light. The guest-induced color and conductivity changes lead to sensing, while those triggered by electric field and light would expand their utility in electronic devices, batteries, solar cells, and energy efficient lights.

CAT BUS Transportation Required: N  
Off-Campus Research Location: N

Mentor: Dr. Qiushi Chen  
Department: Civil Engineering
Project Title: Visualizing and mapping earthquake hazards
Project/Faculty URL: http://cecas.clemson.edu/geomechanics
Required Skills: The interns should be familiar with basic MS Office tools and be motivated to learn new methods and tools. Training on GIS-based visualization tools, in particular, ArcGIS, will be provided to the interns.

Project Description: Earthquake is one of the most destructive natural hazards and poses a significant risk to over 70 million Americans in 39 states according to the U.S. Geological Survey. Accurate assessment and mapping of earthquake hazards are essential to protect life and infrastructure, to mitigate risk cost-effectively and to guide post-earthquake recovery. The objectives of this project are: (1) to collect and compile a database of earthquake hazards in the U.S. and selected regions around the world; (2) to apply GIS-based tools to visualize and map earthquake hazards in selected earthquake-prone regions. The interns will work within a research team consisting of faculty mentor, postdoc and graduate students. The interns will receive trainings in research methods and research tools to needed to successfully complete this project.

CAT Bus Transportation Required: N  
Off-Campus Research Location: N
Mentor: Dr. Gregory Cranmer
Department: Communication
Project Title: Collegiate Athletes' Early Exit Announcements and Fan Reactions
Project/Faculty URL: https://www.clemson.edu/cbshs/departments/communication/
Required Skills: The interns need only to possess a strong work ethic, ability to follow instruction, and be highly organized. I will work with them to teach them any needed thematic coding skills or statistical elements that we may use in this project.
Project Description: This project will be a content analysis of announcements and reactions to Division-I student-athletes' early exit (i.e., leaving a team with eligibility remaining). Early exit is an increasingly common phenomenon in collegiate athletics. Given the high profile nature of collegiate athletics, this process now plays out in the public. Understanding how student-athletes frame their exits and how the general public responds to these situations may provide insight into the construction of social understanding of the process itself and the athletes who engage in it. As such, there may be value for strategic communication/public relations research and athlete wellbeing literature.
CAT Bus Transportation Required: N Off-Campus Research Location: N

Mentor: Dr. Andrew Pyle
Department: Communication
Project Title: #Values: Communication Analysis of Enacted Institutional Values on Social Media Platforms
Project/Faculty URL: https://www.clemson.edu/cbshs/departments/communication/
Required Skills: The intern needs to be engaged, motivated, and willing to learn. The intern should be ready to come to the table with ideas. No other prior training is required.
Project Description: This year's Communication project will analyze institutions' communication on social media platforms, particularly as an issues management process (or in response to and following crisis events). EUREKA interns will use Clemson's Social Media Listening Center to study organizational responses to a series of timely cases that will be determined at the beginning of the study period (in the interest of exploring issues that are timely and relevant, we will not select issues until the project launches).
CAT Bus Transportation Required: N Off-Campus Research Location: N

Mentor: Dr. Yongqiang Wang
Department: Electrical and Computer Engineering
Project Title: Swarm robotics
Project/Faculty URL: https://cecas.clemson.edu/ndcl/
Required Skills: none
Project Description: Biologically-inspired swarm robotics communication/control strategy. Neurons can achieve synchronized firing with amazing robustness and scalability via exchanging simple identical pulses. Using a similar mechanism fireflies can achieve synchronized flashing. Our group have systematically studied the cooperation mechanism of interacting neurons and designed a bio-inspired cooperation mechanism for swarm robotics. Based on the developed mechanism, students will use six ground robots in the lab to achieve various cooperative tasks. Such multi-robot based cooperative tasks have broad applications in flight formation, industrial automation, surveillance, intelligent transportation, to name only a few.
CAT Bus Transportation Required: N Off-Campus Research Location: N
Mentor: Dr. Yongqiang Wang
Department: Electrical and Computer Engineering
Project Title: Video game development
Project/Faculty URL: https://cecas.clemson.edu/ndcl/
Required Skills: none
Project Description:
Video game development for fun learning of distributed control, robotics, and auto engineering. The project will be built upon existing work which already realized a sophisticated vehicle simulator, a game framework, and graphics engine. The students will focus on implementing a cooperative control algorithm for multiple driver-less cars such that the cars can talk to and cooperate with each other to achieve and maintain a platoon with high accuracy and robustness to disturbances. Such cooperative control techniques can prevent collision, improve road capacity and fuel efficiency, and are crucial for the next generation intelligent transportation systems.

CAT Bus Transportation Required: N Off-Campus Research Location: N

Mentor: Dr. Nicole Martinez
Department: Environmental Engineering and Earth Science
Project Title: Effect of radiological and endocrine-disrupting contaminants on seed growth
Project/Faculty URL: https://www.clemson.edu/cecas/departments/eees/people/facultydirectory/martinez.html
Required Skills: None, a basic understanding of statistics and excel will be helpful but not necessary prior to starting the internship. Experience or interest in biology is a plus.
Project Description:
Artificial human hormones and radioactive materials that are given to patients for nuclear medicine procedures are excreted from the human body in urine and often end up in the discharge of waste water treatment effluent to the environment. The effect of contaminants in combination can often be greater than the combination of each contaminant's effect individually, and the effect of these contaminants on plants has the potential to impact the entire ecosystem. In this project, a student will perform a root-length assay of seeds as they begin to grow, examining the impact of synthetic estrogen and low levels of radiation, both individually and in combination, on the growth and development of various plant seeds. This provides insight into the potential effect of these contaminants in the environment.

CAT Bus Transportation Required: Y Off-Campus Research Location: Y

Mentor: Dr. Nicole Martinez
Department: Environmental Engineering and Earth Sciences
Project Title: Detecting Nuclear Weapons with Bacteria and Yeast
Project/Faculty URL: https://www.clemson.edu/cecas/departments/eees/
Required Skills: No specific skills required, however student with an interest in biological science, epigenetics, and/or radiological science will benefit most from the project.
Project Description:
Global efforts to halt the proliferation of nuclear weapons are dependent on the detection of nuclear material. This project investigates the potential for common environmental bacteria and yeast to act as detectors of nuclear materials. The project's goal is to determine if changes in gene expression can be used to develop a biosensor for differentiating between radiological sources. We will test our hypothesis using traditional genomic tools as well as modern epigenetics assays. The intern involved in this project will provide supporting data to the project by investigating changes to cultures of bacteria or yeast caused by low doses of radiation. The intern will also learn about current methods used for RNA extraction and analysis as well as basic principles of exposure to radiation.

CAT Bus Transportation Required: Y Off-Campus Research Location: Y
**Mentor:** Dr. Sudeep Popat  
**Department:** Environmental Engineering and Earth Sciences  

**Project Title:** Peroxide production in microbial fuel cells  
**Project/Faculty URL:** http://www.popatlab.com  

**Required Skills:** Intern(s) should be interested in pursuing their B.S. in Biosystems Engineering, Chemical Engineering, Chemistry, Civil Engineering, Environmental Engineering, and Materials Science and Engineering. Intern(s) should have a strong background in chemistry, physics and mathematics.

**Project Description:** Microbial fuel cells (MFCs) represent an emerging waste-to-energy technology. In MFCs, waste organics are broken down by specialized bacteria, called anode-respiring bacteria (ARB), that respire to electrodes, generating an electrical current. Thus, the chemical energy in waste organics is converted directly to electrical energy. We work on a variation of MFCs, in which electrons respired by ARB are used in catalyzing the partial oxygen reduction reaction (ORR), via which hydrogen peroxide is produced. Potential applications of MFCs treating waste organics and generating peroxide are plenty - most notably, such systems could be used to treat specific industrial wastewater, where there is an on-site need for peroxide. In this project, the research intern(s) will work on improving the efficiency of the partial ORR. More specifically, we will explore different catalysts and loadings to determine the effect on the efficiency of peroxide production.

**CAT Bus Transportation Required:** Y  
**Off-Campus Research Location:** Y

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**Mentor:** Dr. Miriam Konkel  
**Department:** Genetics & Biochemistry  

**Project Title:** Identification and characterization of Alu-mediated deletions in Old World monkeys  
**Project/Faculty URL:** http://www.clemson.edu/cafls/faculty_staff/profiles/mkonkel  

**Required Skills:** The student(s) should be interested in the investigation of genomes, should bring a high level of curiosity, and have an eye for detail. While programming experience is a benefit, it is not required.

**Project Description:** Alu elements are a kind a mobile element that is unique to primates. In other words, if you have an Alu element, you are a primate. Alu elements have been extraordinary successful, with most primate genomes containing about 1 million Alus. This translates to about 10% of the human genome being occupied by Alu elements. A full-length Alu element is about 300 bp in length. Due to the abundance and high sequence similarity between Alu elements non-homologous recombination occurs frequently involving these elements. If two Alu elements that are at different locations on the same chromosome recombine, the sequence in between is either deleted or duplicated. In recent history, Alu elements appear considerably more active in rhesus macaque and baboon (both species are Old World monkeys) compared to other primates including human. Thus, the recombination rate may also be higher in these Old World monkey species, which may have resulted in a higher number of structural variations (e.g. deletion and duplication). To investigate this, we will compare Alu elements in rhesus macaque and baboon.

**CAT Bus Transportation Required:** N  
**Off-Campus Research Location:** N
**Mentor:** Dr. Hong Luo  
**Department:** Genetics and Biochemistry  
**Project Title:** Cloning and functional characterization of novel candidate genes involved in plant stress response  
**Project/Faculty URL:** http://www.clemson.edu/cafls/faculty_staff/profiles/hluo  
**Required Skills:** No specific skills are required for the intern to start the project. The interns will be trained in the lab and learn basic molecular and cell biology techniques including DNA RNA extraction, DNA cloning, plasmid construction, PCR, plant tissue culture and plant genetic transformation.  
**Project Description:** Environmental stress is one of the most important factors impacting agriculture production. Understanding molecular underpinnings for plant response to environmental stress will provide information for development of novel strategies for crop improvement using biotechnology approaches. This project focuses on identification, cloning and characterization of novel candidate genes from a highly salt tolerant grass species, seashore paspalum that are potentially involved in plant response to abiotic stress, particularly salt and drought stress. These candidate genes have been identified from our previous research analyzing differential gene expression at the whole genome level in response to various environmental stresses. In this proposed project, we plan to clone and functionally characterize several candidate genes and investigate their roles in determining plant stress response, and manipulate their expression in transgenic plants to develop novel molecular strategies to improve food and economically important crop species, rice and turfgrass using biotechnology approaches.  
**CAT Bus Transportation Required:** N  
**Off-Campus Research Location:** N
**Mentor:** Dr. Liangjiang (LJ) Wang  
**Department:** Genetics and Biochemistry

**Project Title:** Genomic Data Mining for Identification of Novel Candidate Genes Associated with Autism

**Project/Faculty URL:** http://www.clemson.edu/cafls/faculty_staff/profiles/liangjw

**Required Skills:**
- Research interns are expected to have good computer skills and understand the basic concepts of genetics. Familiarity with Linux platform and experience of basic computer programming are preferred, but not required.

**Project Description:**
Autism spectrum disorders (ASD) are clinically and genetically heterogeneous, probably with 1,000 or more genes contributed to the susceptibility of ASD. Although many ASD risk genes have been identified, the molecular etiology of ASD is still poorly understood. Growing evidence suggests that transcriptional regulation of many genes during early cortical development is critical for ASD manifestation. However, previous studies on ASD are biased toward protein-coding genes. Since non-coding RNAs (ncRNAs) are more abundant than protein-coding RNAs in the human brain, it is possible that some regulatory ncRNAs affected may cause the aberrant expression of many other genes in ASD.

This project investigates the potential involvement of two new classes of ncRNAs in ASD. First, long non-coding RNAs (lncRNAs), each with >200 nucleotides in length, constitute a large portion of the human ncRNA repertoire. Recent studies indicate that lncRNAs play key roles in gene regulation, development and disease. Although multiple lines of evidence suggest that lncRNAs are involved in neurodevelopmental disorders, their role in ASD is still unclear. Second, circular RNAs (circRNAs), formed by head-to-tail splicing of exons, are a large new class of ncRNAs expressed by the human genome. Recent studies suggest that circRNAs can regulate gene expression, and appear to be enriched in the brain. However, it is still unknown whether circRNAs are involved in ASD.

We have generated a large RNA-seq dataset to investigate the expression changes of lncRNAs and circRNAs in ASD patients. Lymphoblastoid cell lines from representative ASD patients and normal individuals with matched age and ethnic background were used to prepare the RNA samples. The RNA-seq data will be analyzed in this project to identify candidate lncRNAs and circRNAs that show differential expression between the ASD and control samples. We will also utilize the available genetic and genomic data to further evaluate and prioritize the candidates. For instance, the publicly available BrainSpan dataset can be used to examine the developmental brain expression patterns of these candidates, and the use of genetic data may identify high-priority candidates that are located within ASD-associated loci or contain rare sequence variants in the autistic genome. Such high-priority candidates can not only provide new insight into the role of ncRNAs in ASD pathogenesis, but may also be further developed as ASD biomarkers.

**CAT Bus Transportation Required:** N  
**Off-Campus Research Location:** N

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**Mentor:** Dr. Eric Touya  
**Department:** Languages

**Project Title:** "God in Post-Secular France: Christianity, Islam, Judaism."

**Project/Faculty URL:** http://www.clemson.edu/caah/departments/languages/

**Required Skills:**
- The first "skill" would be to have a strong interest in the study of religion and its relation to political discourse in a Western democracy like France. No scientific knowledge is required, only the willingness and ability to raise questions, think critically, and read, analyze, and discuss material related to the topic.

**Project Description:**
The book project on which I will be working focuses on the implications of post-secularism in France today. It explores the following questions: What are the ramifications of the emergence of post-secularism? Should France, as a democratic secular society, remain open to religious influence and be engaged in a dialogue with religion? What are the limits of French secularism? What role should religion play in the future of French politics, culture, and society?

In contrast to existing publications on secularism in France that focus entirely on Islam, this study seeks to deepen and broaden the question of religion in French public life through the following approaches: first, a theoretical inquiry about the continued relevance of God and religion in France and their impact in a society marked by postmodernity, scientific rationality, and atheism; second, an analysis of how the problematic of secularism and post-secularism is perceived and understood among thinkers, leaders and practitioners of different faiths in France (Christianity, Islam, Judaism), but also among agnostics and atheists; third, an examination of how political leaders in France interpret the resurgence and influence of religious discourse in society, and their view on the extent to which the political and religious realms may overlap in French culture and society.

**CAT Bus Transportation Required:** N  
**Off-Campus Research Location:** N
Mentor: Dr. M. Gabriela Sava       Department: Management
Project Title: A longitudinal assessment of the impact of wellness programs on healthcare costs
Project/Faculty URL: https://www.clemson.edu/business/about/profiles/msava
Required Skills: Students involved in this project should have already taken a Statistics course and be familiar with statistical packages like Excel (with his extension Data Analysis), Minitab, JMP or SPSS.
Project Description: The purpose of this study is to analyze how employees' life style characteristics could predict future healthcare costs faced by the employer. The wellness program currently designed provides assessments of the employees' health and is guiding them on how to improve their life style in order to avoid unnecessary health costs. The purpose of this study is to identify the key life style characteristics of the employees that could predict future behavior. The results of the study will also be used to improve the current wellness program in order to better address the needs of the population analyzed and to achieve the ultimate goal - the minimization of future healthcare costs.
CAT Bus Transportation Required: N       Off-Campus Research Location: N

Mentor: Dr. Luiz Jacobsohn       Department: Materials Science and Engineering
Project Title: Light-Emitting Materials: phosphors, scintillators and dosimeters
Project/Faculty URL: https://www.clemson.edu/cecas/departments/mse/people/faculty/jacobsohn.html
Required Skills: None. The student will receive all the training in my laboratories and no previous experience is required.
Project Description: Light-emitting materials find application in many fields including national security, displays, lighting, medical imaging, and radiation dosimetry. The goal of this project is to establish the relationship between synthesis conditions, microstructure, dopants, defects, and luminescence (i.e., emission of light) of ceramic materials.
CAT Bus Transportation Required: N       Off-Campus Research Location: N

Mentor: Dr. Konstantin Kornev       Department: Materials Science and Engineering
Project Title: Magnetic nanorods for probing viscosity of complex biofluids
Project/Faculty URL: https://cecas.clemson.edu/kornevlab/
Required Skills: A general knowledge of computer programming is preferred although not required.
Project Description: The project would involve working with unconventional materials characterization techniques that we developed in our research group. These techniques involve characterization of material properties and microstructure by tracking motion of nanorods. We employ these techniques specifically for characterization of complex biofluids and biopolymers including insect blood and studying sol/get transition in thin films of ceramic precursors. The intern will learn how to operate with a magnetic stage for optical microscopy study of nanorod rotation in a complex fluid, will collect data and be involved in fabrication of magnetic nanorods.
CAT Bus Transportation Required: N       Off-Campus Research Location: N
Mentor: Dr. Thompson Mefford  
Department: Materials Science and Engineering  
Project Title: Synthesis of magnetic nanoparticles for biomedical applications  
Project/Faculty URL: https://meffordresearch.com  
Required Skills: A successful student will have a strong background in chemistry and an eagerness to learn. In addition, the student must be willing to work individually as well as in a team. Good communication skills (both speaking and writing) are also important.  
Project Description: We are currently developing a therapeutic technique for the treatment of cancer and bacterial infections. This technique is based upon the introduction of magnetic nanoparticles to the disease. These particles are then irradiated with an alternating magnetic field causing the particles to convert this energy, resulting in cell death. Students working on this project will be synthesizing ferrite nanoparticles that are efficient in converting this energy and have the necessary polymer coating for biocompatibility.  
CAT Bus Transportation Required: Y  
Off-Campus Research Location: Y

Mentor: Dr. Tatiana Stepanova  
Department: Materials Science and Engineering  
Project Title: Coiling/uncoiling mechanism of the proboscis of the butterfly  
Project/Faculty URL: https://cecas.clemson.edu/kornevlab/  
Required Skills: Labview, Matlab  
Project Description: How do the butterflies get the nectar inside their bodies? What is mechanism of cooling/uncooling process? Butterfly flies up to a flower unrolls its proboscis and immerse it into the flower. How do the butterflies get the nectar inside their bodies? What is mechanism of cooling/uncooling process? We work with butterflies, but for us is very important properties of these biological specimen  
CAT Bus Transportation Required: N  
Off-Campus Research Location: N

Mentor: Dr. Rodrigo Martinez-Duarte  
Department: Mechanical Engineering  
Project Title: Manufacturing with Bacteria  
Project/Faculty URL: https://cecas.clemson.edu/~rodrigm/  
Required Skills: Interns must come with an ambitions attitude ready to work regularly in the lab with a team of graduate and undergraduate researchers. No knowledge of technical software or topics relating to our specific research is required.  
Project Description: In nature you can find many microorganisms that naturally manufacture unique materials. For example, microbes that exist in seawater have the natural ability to grow biofilms that can lead to the growth of barnacles and other shells. Our lab has access to a unique bacteria that has the ability to grow cellulose fibers. Through a heat treatment process the cellulose fibers can be transformed into carbon fibers. We are optimizing a technique to control a single bacteria cell and ultimately develop a platform that gives us the ability to pattern the fibers created by the bacteria. When this platform is developed it will allow for the creation of carbon fiber structures much smaller than is possible with the current state of the art techniques.  
CAT Bus Transportation Required: N  
Off-Campus Research Location: N
Mentor: Dr. Xiangchun Xuan  
Department: Mechanical Engineering  
Project Title: Field-induced microparticle manipulation in complex fluids  
Project/Faculty URL: http://www.clemson.edu/cecas/departments/me/people/faculty/xuan.html  
Required Skills: Need to know how to use Microsoft Word and Power point.  
Project Description:  
The motion of microparticles in the flow of simple fluids like water or water-based electrolyte solutions has been well studied in microchannels and found extensive applications in lab on a chip devices. However, biological fluids like blood and saliva are complex fluids with significantly different properties from simple fluids. It is thus important to understand the effects of complex fluids on particle motion in microchannels.  
CAT Bus Transportation Required: N  
Off-Campus Research Location: N

Mentor: Dr. Ethan Kung  
Department: Mechanical Engineering & Bioengineering  
Project Title: Design and Prototyping of Blood Pressure Generator  
Project/Faculty URL: www.cmerl.com  
Required Skills: Students must have the ability to learn to use new engineering software and hardware, and be able to learn basic data processing and coding in Matlab.  
Project Description:  
In this project students will design, construct, and test a device that can generate realistic pressure waveforms mimicking human blood pressure in a benchtop experiment. The ultimate purpose of this device is to provide a realistic benchtop environment that can be used to test cardiovascular medical devices.  
CAT Bus Transportation Required: N  
Off-Campus Research Location: N

Mentor: Dr. Kelly Smith  
Department: Philosophy, Biology  
Project Title: Social and Conceptual Issues in Astrobiology  
Project/Faculty URL: http://kcs098.wixsite.com/socia  
Required Skills: You do not have to have any specific knowledge to do well in this project. What you need is 1) an interest in the subject matter, 2) good organizational skills and 3) a willingness and ability to work independently. The latter two are especially important because this will be set up differently from many of the other projects. There is no lab space to which you will report each day, for example. Instead, I will meet with the students 2-3 times a week to review your work, discuss issues, and make new assignments. If you are a responsible, organized person, this can work really well as you have a lot of freedom to work as and when you wish.  
Project Description:  
NASA predicts that we will likely find evidence of life beyond Earth with the next 20 years! If they are right, this will count as one of the most important scientific discoveries of all time. It will also transform our view of ourselves and our place in the universe in ways that may even surpass Darwin's introduction of evolution. But so far, almost all the effort has been focused on the science - finding exoplanets, trying to synthesize life in the lab, figuring out how to test for life on other planets, etc. I have spent the last 3 years working with NASA, the European Space Agency and others to begin the process of thinking through some of the big picture, "extra-scientific questions." For example, just what is life and how would we know it when we find it, given that the textbook definitions one sees are all hopelessly biased towards terrestrial life? If we do find life on another planet, what are our moral obligations towards it? For example, if we find microbial life on Mars should we, as Carl Sagan famously argued, "Leave Mars to the Martians" forever and always? What sorts of public policies should we enact? There is currently a private individual whose Interstellar Beacon Project aims to begin beaming the entire contents of wikipedia to all nearby star systems just in case someone is listening - should we have laws about who can do this and what they should say on humanities' behalf?  
CAT Bus Transportation Required: N  
Off-Campus Research Location: N
Mentor: Dr. Joshua Alper  Department: Physics and Astronomy
Project Title: Molecular Biophysics of Cellular Dynamics
Project/Faculty URL: http://alperlab.sites.clemson.edu/
Required Skills: High school biology and a physics. We will provide the specific training necessary to perform the experiments, analyze the data, and/or preform the tasks necessary to succeed.
Project Description:
There are multiple possible projects the intern could choose to work on. These include the following:

Project 1: Quantify the contribution of electrostatic forces on how molecular motor proteins do mechanical work. Interns would learn to use high resolution light microscopes (total internal reflectance fluorescence), ultra-sensitivity force gauges (optical tweezers), and/or intermolecular thermodynamics measurements (microscale thermophoresis) to characterize how electrostatics affects the intermolecular binding fundamental to the biophysical properties of motor proteins.

Project 2: Study the unique motility properties of Trypanosoma brucei, a pathogenic parasite that causes Human African Trypanosomiasis (sleeping sickness). Interns would reconstitute the motility of the motor proteins that drive flagellar motion and use fluorescence microscopy and optical tweezers to measure how external loads affects the motor proteins' biophysical properties.

Project 3: Design, develop and characterize new functionality into our home-built optical tweezer instrument. Students would learn to program in LabView (a programing language specially designed to control and collect data in custom scientific instruments) and use it to develop a closed-loop feedback-control system that enables testing novel biophysical models of how molecular motor proteins work together in teams.

CAT Bus Transportation Required: N  Off-Campus Research Location: N

Mentor: Dr. Carmen Blubaugh  Department: Plant and Environmental Sciences
Project Title: Ecology of fear in animal foodwebs
Project/Faculty URL: https://carmenblubaugh.com
Required Skills: Interest in biology and community ecology (multi-species interactions) and basic quantitative skills are critical; some experience using Excel and and Google scholar will be helpful.
Project Description:
Animals change their behavior in many ways when they face risk of predation, particularly their strategies for finding food. We will use direct observations and video surveillance to examine how omnivorous mammals and insects shift their diets under safe and risky conditions. Once we understand how the "fear diet" changes feeding patterns, we will evaluate how predation risk alters food webs in agricultural ecosystems, identifying potential consequences for natural pest suppression.

CAT Bus Transportation Required: Y  Off-Campus Research Location: Y
Mentor: Dr. Sruthi Narayanan
Department: Plant and Environmental Sciences
Project Title: Climate resilient crops for food security
Project/Faculty URL: http://www.clemson.edu/cafls/departments/plant-environmental-sciences/index.html
Required Skills: Passion for plant science, ability to work as a team, and interest to work in the field and grow crops
Project Description: Climate models predict continued warming and increased frequency, duration, and intensity of droughts across the southeast U.S. In South Carolina, 35 counties were declared as primary disaster areas due to drought by the U.S. Department of Agriculture in 2015. Our research focuses on understanding crop response and adaptation to changing environmental conditions (water and temperature) in order to develop climate resilient crop varieties. In this summer, we will be evaluating peanut varieties for their performance under drought and heat stress conditions. We will also evaluate the effect of cover crops (crops that provide a ground cover and improve soil organic matter content) on conserving soil water.
CAT Bus Transportation Required: N Off-Campus Research Location: N

Mentor: Dr. Marissa Shuffler
Department: Psychology
Project Title: Supporting Healthcare Superheroes: Leadership and Team Development through Simulation and Technology
Project/Faculty URL: http://academy.ghs.org/collaborative-research-on-leadership
Required Skills: Reading and writing comprehension abilities, attention to detail, and conscientiousness are required to participate. Other statistical software techniques will be trained.
Project Description: Soaring healthcare costs, staffing shortages, and legislative changes have contributed to surge of interest in the ways healthcare organizations manage their leaders and teams to better impact the bottom line. As a research initiative of the DIGITAL lab, we are interested in better understanding the impact of leadership development on multiple levels of analysis within the healthcare industry: this includes, but is not limited to, leader health and burnout, team effectiveness, employee engagement and health, patient safety and experiences, and objective business outcomes. The purpose of this research project is to examine leadership structures within Greenville Health System and the impact of leadership on various GHS outcomes. If you are interested in healthcare management, employee engagement, leadership and team development, patient experience, applied statistics, or any combination of the above, this research team is likely to be a great fit for you.
CAT Bus Transportation Required: N Off-Campus Research Location: N

Mentor: Dr. Brygg Ullmer
Department: School of Computing
Project Title: Tangible Interactive Posters
Project/Faculty URL: https://www.clemson.edu/cecas/departments/computing/people/faculty/hcc_faculty.html
Required Skills: Student(s) should be interested interface design and programming. They should bring a high level of curiosity and enjoy interdisciplinary research. Some prior experience in programming will be particularly helpful. Unity, Python, and/or JavaScript skills are of closest relevance, but these are not prerequisites.
Project Description: This project investigates new approaches for interactive posters that engage multiple displays (including vertical and horizontal orientations). We will investigate multiple interaction styles (e.g. multitouch, tablet, phone, and tangibles). Part of this project investigates interactive figures and varying content for different audiences. Toward this, we are both developing new tools and working in collaboration with a variety of parties to cultivate content for our platforms, and evaluate human interactions with these “in the wild.”
CAT Bus Transportation Required: N Off-Campus Research Location: N