The Office of Undergraduate Research and Creative Activities is pleased to announce the Summer Undergraduate Research with Faculty (SURF) award recipients for Summer 2023. Please join us in congratulating these students and their faculty mentors.

**Summer Undergraduate Research with Faculty (SURF)**

**Student:** Kayce Browder  
**Mentor:** Barbara Beckingham  
**Major:** Environmental Geosciences  
**Department:** Geology & Environmental Geosciences

**Investigating the Toxic Tire Additive Chemical 6-PPD in Sediments of Charleston Harbor Watershed**

Tire road wear particles (TRWPs) are rubber fragments generated by the friction of vehicle tires on roadways that include embedded or encrusted road and mineral materials. They are classified as a type of microplastic and contain various chemical additives that are potentially toxic. Global estimated emission is between 0.2 and 5.5 kg/year per capita. TRWPs have been reported to comprise 17% of all MPs in sediments from the main river tributaries of Charleston Harbor and were identified in local fish. In laboratory and field studies, tire pollution has been shown to affect growth, reproduction, behavior, and survival of aquatic organisms and even shift the microbial community composition and function of coastal sediments. The aim of this project is to measure mass concentrations of a tire additive chemical of concern, 6PPD, in roadway impacted sediments in the Charleston Harbor watershed that will provide two main benefits: 1) inform the community and environmental managers on present levels of this potentially harmful chemical, and 2) test correlations between the tire additive chemical and TRWP abundance to develop alternative proxy measures for environmental monitoring. Improved monitoring can facilitate future studies on pollution management.

**Student:** Harrison Caspino  
**Mentor:** Vijay Vulava  
**Major:** Environmental Geosciences  
**Department:** Geology & Environmental Geosciences

**Floodwater as a Vector for Contaminant Discharge into Charleston Harbor**

Flooding is common in the Charleston peninsula given its geographic location and the environmental history of the development of this region. Modern climate change is impacting the intensity and frequency of this flooding. This flooding is driven by increased tropical storm activity, high-intensity short-duration rainstorms, rising sea levels, and the associated “sunny day” coastal flooding. Our research indicates that bulk floodwaters contain high levels of contaminants, including trace metals, fecal bacteria, and other pathogens. We have not examined how much of this contamination is associated with suspended sediment in the floodwaters. In other environmental settings, bacteria are known to mutate and develop resistance to commonly used antibiotics. Our recent research has shown the prevalence of certain types of antibiotic-resistant bacteria (ARB) in floodwaters. This study aims to determine the presence of contaminants, including fecal bacteria, ARBs, and trace metals in bulk floodwaters as well as the suspended sediment.
associated with floodwaters in the Charleston peninsula. This study will generate data that may have public and ecosystem health implications.

**Salivary Cortisol and Oxytocin in Relation to Socially Salient Memory Cues**

The goal of this project is to measure changes in salivary cortisol and oxytocin in relation to a memory recall task. We will determine if word recall, primed with images of positive or negative social valence, will cause changes in either salivary cortisol or oxytocin. Cortisol is a hormone involved with both stress and attention. Oxytocin is a hormone generally involved with affiliative social responses. We anticipate that different emotional cues primed by specific images will result in different recall reflected in changing cortisol and oxytocin in saliva. Running a preliminary version of this experimental protocol we have collected pilot data for salivary cortisol and determined our assay to be reliable. Our goal over the summer is to optimize our protocol (memory recall task), and assay techniques (salivary oxytocin) to collect experimental data efficiently in the fall using the Psychology Department Participant Pool of subjects. We will use E-prime software to develop a precise and controlled prompt of our images associated with memory recall task. Salivary oxytocin can be a technically challenging technique and therefore requires more time over the summer months to determine its validity and reliability using our previously collected samples. Additionally, we will use the summer to draft a targeted IRB proposal to allow us to collect experimental samples in the fall. This grant is intended to fund the purchase of assay kits for oxytocin as well as stipends.

**An Observational Investigation into the Impact of Stellar Activity on Planet Evolution**

Of the diverse stars in our universe, what fraction are capable of hosting earth-like planets, including those with moderate thickness atmospheres like that of earth, which help enable life cycles and protect life forms from dangerous radiation? To help answer this overarching question, I will participate in a project whose scientific goals are to answer the question of how stellar activity (like the storm we see on our own Sun) may impact the evolution of orbiting planets. Specifically, we are interested in how the types of intents stellar activity that is common among many young stars (less than a few 100 million years old) may strip away the atmosphere of an orbiting planet. I and collaborators will address this knowledge gap by carrying out telescope monitoring of a small sample of nearby young stars, using advanced telescopes at one of the world's best observing sites, in the Chilean Atacama Desert. The observational results will be provided as inputs for computer simulations, already under development by collaborating faculty member Dr. Ana Uribe, to show how stellar activity may lead to atmospheric loss of on an orbiting planet.

**Seeking the Snail Intermediate Host of a Fish Brain Parasite in the Charleston Harbor Watershed**

Atlantic tripletails were recently found in Charleston harbor to be infected in their brain by parasitic flatworm larvae. The fish displayed abnormal swimming behavior, which may have resulted from the parasites’ damage to the brain. In the wild, such behavior would make fish prone to predation by birds. The parasites were identified as *Car diocephaloides medioconiger*, a little-known worm whose adults infect the intestine of gulls. It has been only reported from the Caribbean, the Gulf of Mexico, and the Republic of Korea. Status of infection in South Carolina is not known. Such worms
typically have larvae that multiply in snails before infecting fish, then birds. There are two references of mud snails being possible such intermediate hosts for this parasite. However, when these studies occurred (1945 and 1960), scientists could only use morphology to identify worms, which was approximate at best for these larvae that have few, if any, distinctive morphological traits. DNA sequencing is now the most reliable identification tool for parasitic larvae. The purpose of this study is to find the snail(s) used by this parasite. Because we expect to find a variety of species, not just this one, we will also be able to determine how common each parasite that infects snails is in the Charleston area. We aim at screening ~4000 snails over the summer from 10 sites around the Harbor. Snails will be dissected to collect parasites, which will be identified using DNA sequencing. This research is significant because no snail host of parasites of this genus is yet known in the US and because tripletail fish are aquaculture candidates and reconstructing the life cycle of the brain parasite would allow for mitigation of infection.

**Examining the Roles of BDNF and Estrogen Signaling in Preventing Synaptic Loss on Motor Neurons after Peripheral Injury**

Peripheral nerve injury impacts hundreds of thousands of people each year. This type of injury can produce many debilitating physical effects such as muscle weakness or loss of sensation that require long-term rehabilitation. These deficits are caused at least in part by reorganization and loss of synaptic connections onto injured motor neurons within the spinal cord. Exercise is known to mitigate synaptic reduction in neurons after injury; however, exercise is often infeasible after injury. Previous research has shown that treatment with BDNF, a protein necessary for the health and survival of neurons, and estradiol, an estrogen steroid hormone, can decrease the reduction of synaptic coverage after injury. Our current study proposes to examine whether BDNF and estrogen signaling are part of a common pathway that can support the stabilization of synapses after injury to motor neurons. Using a mouse model of sciatic nerve injury, we will examine whether pharmacologically blocking BDNF during estradiol treatment will change the ability for estrogen signaling to prevent the loss of synapses seen in untreated mice. If we discover that the effects of estradiol change based on BDNF signaling, then we may be able to apply these findings to novel pharmacological treatments for patients suffering from peripheral nerve injury during periods when they are unable to engage in exercise.

**Medicinal Illegality: Folk Magic, Witchcraft, and Infanticide**

In early modern England, witchcraft was heavily prosecuted, yet folk magic and domestic healing thrived. Recent scholarly work suggests that practitioners of folk magic were trusted members of the community, and folk magic was even present in household remedies. Interestingly, the legal line between folk magic and witchcraft was not always clearly defined, and there was a wide gulf between elite healing by male members of the Royal College of Physicians and everyday domestic female practitioners. What separated the gendered distinctions in medicine at this time was that, for female healers, requests for remedies could quickly morph into accusations of witchcraft. The problem of delineating the relationship between licit and illicit forms of magic comprises the first facet of this research. Few scholars have examined the relationship between folk magic, witchcraft, and healing in early modern England, so this project promises unique insight into early modern conceptions of medicine. The second component involves the link between infanticide and witchcraft prosecutions in early modern England, which recent historians have recognized but not explored in-depth. Examining that connection is critical for the field of medical and gender history, especially because historians have rarely addressed the gendered component of witchcraft. Understanding why certain medical practices were
considered illegal is critical to medical history, and to the broader practices of how medico-legal frameworks engendered health, disease, and the body in the early modern and modern periods. Using recipe books, trial records, and witchcraft pamphlets, this project aims to gain insight into early modern morality and gendered perceptions of medicine.

**Student: Rebecca Hauser**
**Mentor: Craig Plante**
**Major: Biology**
**Department: Biology**

**Influence of Relic DNA on Molecular Characterization of Marine Microphytobenthos**

Microphytobenthos are photosynthetic, single-celled algae that live on the ocean bottom and provide much of the energy for estuarine food webs. Our previous research based on DNA sequencing suggests that free-floating planktonic algae might also comprise much of the algal food to mudflats and other shallow habitats. However, the DNA data could be misleading. Other investigators have shown that marine sediments can contain large amounts of “relic” DNA, i.e., free DNA or DNA associated with dead cells. This relic DNA can confuse the characterization of microbial communities because assumptions about live cells from the DNA signal are invalid. Intact, living microalgae are important nutritional sources to animals, whereas free DNA is not. This study will test whether the planktonic algal signal in sediments is real or an artifact of widely used molecular genetics techniques. Second, we will compare the amount of relic DNA in areas of varying water movement and deposition (mudflat vs. sandflat vs. beach). Finally, we will ask whether planktonic cells are more easily digested by sediment-eating animals, which would indicate a greater contribution to estuarine food webs. In addition to typical DNA sequencing techniques to reveal the species of microalgae in sediment and fecal samples, we will use enzymes to destroy DNA not associated with intact algal cells to distinguish relic DNA from DNA associated with live, whole cells. This research will increase our understanding of photosynthetic single-celled, seafloor-inhabiting organisms as a food source for animals in coastal ecosystems. It will also determine the accuracy of common molecular methods used to characterize microbial communities and the possible need for modernized methods.

**Student: Christian Herring**
**Mentor: Michael Guiliano**
**Major: Biochemistry**
**Department: Chemistry & Biochemistry**

**Searching for Biophysical Crosstalk in Human Neuropeptides**

Neuropeptides are an essential type of small peptide - a chain of amino acids - that occur within the human body. They bind proteins on cell surfaces to produce effects ranging from mood alteration and pain sensation to controlling appetite. One of these neuropeptides, Somatostatin (SST) coming in the form of SST-14 and SST-28, is well-studied for its ability to inhibit signaling of hormones and has been targeted for developing therapies for cancers of the endocrine system. SST-14 is a 14-unit long peptide, with a cyclic shape caused by a bond between 2 sulfur atoms (disulfide bond). SST-28 has that same cyclic structure with an additional 14 amino acid-long “tail” extending from it. In the human body, there are 5 SST receptors (SSTRs) which SST binds with. It is believed that the “tail” of SST-28 will have implications on the shape rigidity of the structure, which in turn will affect its overall shape and therefore how it interacts with different SSTRs. This project will use Nuclear Magnetic Resonance (NMR) spectroscopy to determine the differences in shape between SST-14 and SST-28, while also calculating SST-28’s 3D structure from these measurements for the very first time. This will be done by first chemically synthesizing SST-14 and SST-28, combined with the use of an iodine-based reaction to make the disulfide bond in SST. Once the peptides are successfully synthesized, 2D NMR will be used to compare their three-dimensional shapes and determine SST-28’s 3D structure. Future work will involve comparing these shapes to those of models of SST and its related peptide family members with the hope of better understanding how they collectively function.
Laypeople’s Perceptions of Child Abuse Disclosures to Parents

Forensic investigations involving children carry heavy consequences and present immense challenges. In most child maltreatment cases, such as those involving allegations of sexual abuse, children’s testimony serves as the sole piece of evidence. Often, allegations first arise during interactions between the child and a parent. Research demonstrates (see Principe & London, 2022, for a review) that these conversations have the power to shape the formal statements that children later make when questioned by professionals. Specifically, this work shows that false information unwittingly incorporated into parents’ questions not only can intrude into children’s later independent accounts but also lead children to make novel reports of entire events that never happened. Because these false accounts triggered by parents’ suggestions can be as elaborate and compelling as reports of true experiences, understanding laypeople’s perceptions of parental influence is paramount to arriving at accurate and just conclusions in legal cases involving young witnesses. As such, in the proposed study, we will examine various aspects of laypeople’s perceptions of parent-child conversations where abuse is disclosed. To do so, participants will read exchanges modeled after those in real cases where a child makes a singular disclosure of sexual abuse to a parent. Of particular interest is participants’ ability to recognize and remember the structure of parent-child conversation – that is, how the information from the child was obtained and the types of questioning techniques that were used to obtain that information. Our findings will have implications for young children’s treatment in legal cases involving allegations of maltreatment.

Investigating Cancer Cell-Immune Cell Interactions Using Novel Mathematical Model Discovery Tools

Chimeric antigen receptor (CAR) T-cell therapy is a promising development in the world of cancer treatment. This approach, which leverages genetically engineered immune cells, is one of very few to demonstrate eradication of malignant tumors associated with glioblastoma in experimental trials. Mathematically modeling the interactions between CAR T-cells and cancer cells is necessary to further translate this therapy into clinical use. For this project, we aim to create an accurate and applicable mathematical model for these cellular interactions using the Sparse Identification of Nonlinear Dynamical Systems (SINDy). This AI-inspired tool uses techniques from applied mathematics and computer science to match and test experimental data against a library of different possible functions to assemble a biologically interpretable mathematical characterization. This approach has the potential to revolutionize model discovery. Despite this potential, SINDy has only ever been tested on simulated data. We attempt to fill this testing gap by applying SINDy to our experimental CAR T-cell data across a variety of clinically relevant conditions, which we hope will affirm the usefulness of this tool.

Gender, Race, and Violent State Intervention

It is frequently claimed that women are less aggressive than men. Such claims are prevalent in not just regular day-to-day discourse, but academic research as well. For example, in political science, international studies, women’s and gender studies, and related fields, research has shown that women support state intervention—the often-violent involvement of military forces in the affairs of another country —less than men. Scholars often refer to this as the “gender gap.” However, women are not a monolith, as research also shows that there are contexts that alter women’s
support or opposition to state intervention. In some contexts, women are actually more likely to support intervention. Although these studies theorize as to why this variation exists, one factor has been largely ignored: race. Our study seeks to fill this gap by discerning which factors motivate women of differing racial groups to support violent state intervention. By doing so, we hope to shed light on which of the existing theories perform best when race and gender are considered simultaneously. We will do so by analyzing a survey which asks a large representative sample of Americans in which contexts they support U.S. intervention in the affairs of another country. We hypothesize that feminist theories—which emphasize the unique victimhood and political alienation of women—will outperform theories based on gender socialization.

Student: Florence Manlapas
Mentor: Andrew Alwine
Major: Political Science
Department: Classics

The Ruler and the Ruled: Ancient Greece, Ancient Rome, and Revolutionary America
Understanding who rules and who is ruled is essential to understanding all political systems. Governance is the organization of systems within a society. The rulers are tasked with the organization of these systems and the ruled are subject to them. The role of the citizen and the role of the governor, particularly in contrast with one another, are essential to understanding the fabric of any political regime. The relationship between the ruler and the ruled varies widely, making for a diverse array of regimens with differing levels of power concentration, social mobility, wealth accumulation, and cultural perspectives. Ancient Greece and Rome demonstrate the potential of this variety, from democracy to oligarchy to tyranny, including substantive evidence regarding the practical function of each. In addition, the Classical Age hosted a variety of excellent political philosophers, all of which make significant contributions to modern understandings of governance throughout history. Together, they form an extensive political science lab. The relationship between the ruler and the ruled was reframed by social contract theory, beginning in the 17th century. America's revolutionaries were substantially impacted by contractarianism and Classical government, as is evident in coeval literature. This research project will review classical forms of government through the lens of the ruler and the ruled to create a comprehensive analysis using historical and political research techniques. Specifically, democratic, republican, and oligarchic regimes will be examined using primary and secondary literature. In addition, the information gathered will be used as a reference to understand early modern political systems, with a focus on the American Revolution.

Student: Sophia Mucci
Mentor: Norman Levine, Lancie Affonso
Major: Environmental Geosciences
Department: Geology & Environmental Geosciences

Climate Disruption on South Carolina Agriculture: How Storms, Drought, and Heat Stress will Impact Farming Across the State
Anthropogenic-induced climate change, with predicted increases in temperatures and occurrences of volatile weather events, poses a threat to global architecture. Events stemming from climate change are likely to result in decreases in plant productivity and the profitability of agribusiness. This holds true for South Carolina agriculture, one of the top 3 sectors in the SC economy. Plant Hardiness zones are expected to shift within our region, and extreme drought and rainfall events will become more common. This could result in devastating health and economic impacts for the Palmetto state. Locally grown food could become less available, and prices would increase, impacting the health and welfare of SC citizens. However, little research has focused on climate impacts on agriculture in the state of South Carolina. Using a Geoinfographic Information System (GIS), I will develop scenarios of how climate variability will affect the agriculture sector. Allowing me to model the potential changes to the types of plants and growing environments
across the state and will provide suggestions for adaptation to climate disruption. The use of a GIS allows for the layering of information important to plant health. Finding and coordinating datasets such as rainy days, dry days, and temperature measurements will result in maps portraying how agriculture across the state will be impacted by climate change. The map will show the best and worst places to farm moving forward and will provide vital information to a wide audience. With the data collected, we hope to form proposals to local governments and business officials detailing the best ways to adapt for the future.

**Student:** Lizzie Petagna  
**Mentor:** Gabrielle Principe  
**Major:** Psychology  
**Department:** Psychology

**2023 Glenrock Expedition: The Fossil Flora of the Glenrock Exposure**

Global climates are changing rapidly due to human causes. One symptom of this environmental change is the salinization of freshwater. For example, low lying areas such as Charleston, SC experience large amounts of flooding due to rising sea levels and increasingly severe storm surge. These sudden influxes of salt water can change the levels of salinity in freshwater habitats along the coast. Amphibians are particularly sensitive to elevated salinity due to their semi-permeable skin and their life cycle, which begins in completely aquatic environments. Despite this vulnerability, amphibians are able to make choices that can improve their own and their offspring’s success. Mate choice and choice of a habitat for egg-laying are two behaviors that can specifically impact the offspring. We propose to study the impact of freshwater salinization on mate choice and habitat choice in a common South Carolina amphibian. Female squirrel treefrogs will be collected when they are ready to mate and placed inside a sound-insulated chamber containing two separate dishes of water, each associated with a speaker that can broadcast simulated frog calls. The dishes will either contain freshwater or a solution with elevated salinity. Which dish and speaker the female approaches will reveal her ability to choose a suitable offspring habitat. We predict that female frogs will sacrifice mate quality, as indicated by features of the mating call, for improved habitat quality due to the strong impact salinity has shown to have on
amphibian tadpoles. This research will improve our understanding of how environmental change can impact behaviors that help determine the success of vulnerable animal populations.

Student: David Robinson  
Mentor: Behrang Forghani  
Major: Mathematics  
Department: Mathematics

**Random Walks on Networks with Zero Entropy**
This proposal aims to establish deeper connections between the probabilistic and geometric aspects of a network. In particular, the proposal will yield new results regarding quantitative behavior of random walks at infinity. The theory of random walks employs mathematical concepts at the intersection of probability, analysis, geometry, and dynamical systems to investigate random movements of objects. Consequently, applications of random walks emerge in different branches of science and our daily lives. In game theory, random walks can model shuffling a deck of cards to find an optimal number of shuffle iterations [1]. In finance, the unpredictability of price changes of stocks can be modeled by random walks [2]. In biology, random walks devise methods to understand the spread of cancer cells from one part to other parts of the body, see [3] and the references therein. In computer science, the theory of random walks plays a vital role in identifying communities in a given network (for example, identifying a group of people with similar interests in Facebook for the sake of advertising a product) see [4]. This project aims to study random walks rigorously by using abstract mathematical tools. Mainly, it concerns the long-term behavior of random walks on networks (groups), which is an active and cutting-edge line of research. We propose to explore which random walks on a geometric structure will have a predictable behavior, mathematically speaking, it has zero asymptotic entropy.

Student: Dorian Steele  
Mentor: Tim Carens  
Major: English  
Department: English

**The Angry Woman in Gothic Narratives**
In this project I will focus specifically on the recurring figure of the angry and dangerous woman in classic Gothic novels and contemporary Gothic films. I will argue that the Gothic genre uniquely allows female characters to be unapologetically angry. My work will follow feminist critic Barbra Creed, who observes that the Gothic woman’s expression of anger represents “an inherently destructive process” (46). Often, Gothic women murder, destroy houses, and descend into monstrosity to express their long-repressed anger. Though this rage is grotesque and sometimes counterproductive, it functions as a political statement by subverting expectations of docile femininity. The texts I am drawn to feature anger as a woman’s expression of power against patriarchal oppression. The feral, angry heroines who rampage throughout Gothic works represent a constant threat to the status quo. I aim to investigate the extent to which this anger pushes feminist objectives forward and, on the other hand, the extent to which it hinders feminist objectives.

Student: Cole Thornsberry  
Mentor: Scott Persons  
Major: Geology  
Department: Geology & Environmental Geosciences

**3 Glenrock Expedition: The Fossil Turtles of the Glenrock Exposure**
This project aims to scientifically describe two exceptionally well-preserved fossil turtle shells. These turtles date back 66 million years and were dinosaur contemporaries. Both come from the Glenrock Exposure of the Lance Formation – the site of the College of Charleston’s summer paleontology field course. The largest of the two shells (over two meters in circumference) was preserved at the base of a steep valley wall, surrounded on three sides by mire. Its cumbersome size, combined with the awkwardness of its excavation, earned it the nickname “Lord Voldetort.” Lord Voldetort is
scientifically important for three main reasons: 1) it is the largest and the most complete specimen ever found of the rare Cretaceous turtle species Basilemys praeclara; 2) it shows new distinctive features not observable on previous less-complete B. praeclara specimens; and 3) it records evidence of a possible bite mark from a tyrannosaur. The second, and more easily managed shell, was discovered by the 2022 College of Charleston field course and was christened “Donatello”. Much less is known about the Donatello shell, which will be transported to the College of Charleston’s Mace Brown Museum to be fully cleared of the sediments that still encrust it. Turtle shell fragments are common throughout the field site, but nearly complete shells that can be identified as a particular species are rare, and this makes both specimens important in reconstructing the full paleoecology of the area.

Student: Rachel Webster  
Mentor: Teddy Them  
Major: Environmental Geosciences  
Department: Geology & Environmental Geosciences

**Dating the Early Jurassic Pliensbachian-Toarcian Boundary**

The Early Jurassic Pliensbachian-Toarcian boundary (PTB) has yet to be clearly defined on the geologic timescale. This is due to a dearth of locations that contain both fossilized ammonites and volcanic ash layers that can be dated. The current age of the PTB is estimated to be 182.7 million years, but the errors are extremely large (Walker and Geisman, 2022). Importantly, the PTB is associated with the initial phase of severe environmental change and a marine mass extinction (Early Jurassic P-T mass extinction). A major volcanic province, known as the Karoo-Ferrar large igneous province (K-F LIP), began erupting around 184 Ma, which some suggest is synchronous with the PTB. The Early Jurassic mass extinction is suggested to have been driven by volcanic activity and a subsequent increase in low oxygen levels in the oceans. Although the link between the emplacement of the K-F LIP, environmental change, and mass extinction seem straightforward, there are no high-resolution studies that combine ammonite fossils and absolute dates of the rocks in which they are found. The most suitable study site to combine ammonite occurrences with absolute ages of volcanic ash layers is the Kings Mountain section in Southcentral Alaska. These ancient ash beds contain both zircon minerals that can be dated by absolute dating techniques as well as ammonite fossils, which are used to delineate the PTB. Additionally, sediment samples from this section will be analyzed for mercury concentrations to track volcanic activity associated with the K-F LIP. This study will result in the first high-resolution absolute age date of the PTB and be the first open-ocean location studied for sedimentary mercury geochemistry during the P-T transition.

Student: Gabe Wohlfarth  
Mentor: Michael Larsen  
Major: Astrophysics  
Department: Physics & Astrophysics

**Developing a System to Examine Aerosol Particles Clustering**

One of the reasons that airborne particulates are important is because they provide places for cloud processes to occur; no clouds can form in perfectly clean air. Most studies of atmospheric particulates focus on the number, size, and/or chemical composition of the airborne materials but other properties matter as well. In this study, we will be laying the groundwork to help determine the degree to which airborne particulates cluster in space and time. This is important because several cloud processes (e.g., the transmission of light through clouds, the rate at which cloud droplets grow, and the lifetime of the cloud itself) depend on the immediate environment around each airborne particle. To measure how much airborne particles cluster, we propose to adapt an existing piece of equipment that is designed to observe individual aerosol particles as they are pulled through a device. This instrument is designed to monitor the cleanliness of air by continually sucking a large volume of air through the instrument and then set off an alarm when the number of detected particles exceeds a certain number. Our adaptation will be to adjust the internal flow properties of the
instrument so that it pulls air much more gently than normal and then examine the statistics of particle detections to determine if the detected particles are bunched together in time. This work builds on previous published work that shows that airborne particles are clustered, but the method in that previous study used a non-modified detector where there is some concern that the clustering may have been caused by the measurement process itself since the sensor significantly changes the airflow near the instrument.