

2021-22 ABI Undergraduate Research Scholar Mentor List

Kyle Gustafson - Phone Number 8709723174; Email kgustafson@astate.edu

Department: Biological Sciences

Please provide a short paragraph describing the research/project/creative work that you do (in la...

If you are a student interested in exploring biological research, the Gustafson lab studies parasites and is seeking an undergraduate to examine the effects of parasitism on several different species. This project will involve students sampling for parasites, using state of the art microscopes, and running parasite life cycles in the laboratory. The student will carefully expose different species to parasites, examine reproductive effects, survival effects, and if the parasite life cycle continues. By studying these metrics, we can clearly discover how specific the parasite is to certain species and which species the parasite uses in its life cycle. Additionally, we can test if parasitism is a mechanism for community competition among the multiple host species.

Please provide details of how your research/project/creative work adheres to the ABI Mission Stat...

This research focuses on understudied parasitic diseases in snails that could potentially be used as a biocontrol agent for channeled apple snails and snails important in Schistosomiasis. By understanding the damage of certain parasites to certain hosts, we may be able to help control the channeled apple snail when it arrives in Arkansas rice fields, and *Biomphalaria glabrata* which is the major transmitter of *Schistosoma mansoni*. Therefore, this project directly relates to the ABI mission to improve the health of Arkansans through agricultural and biomedical research initiatives.

Please provide details of how this will contribute to the scholarly and/or creative community (ma...

This student will be embedded within an active research lab which focuses on parasitism in many different taxonomic groups. This student will get direct training from Dr. Gustafson and will be integrated into the laboratory of PhD, MSc, and undergraduate students. This project will produce results that will be presented at A-State conferences as well as regional and/or national parasitology conferences. Notably, the student will be trained in study design, microscopy, statistical analysis, literature critiques, presenting, and writing.

Mohammad Alam - Phone Number 870-970-3319; Email malam@astate.edu

Department: Chemistry and Physics

Please provide a short paragraph describing the research/project/creative work that you do (in la...

In my group, we synthesize small molecules such as pyrazole, thiazole, imidazole, and androstane derivatives by using readily available starting material and mild reaction conditions. We have generated a library of small molecules to test their potential to treat different diseases. Several lead compounds are potent antibacterial and antimelanoma agents.

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Finding new antibiotics and anticancer agents is extremely important to save lives and alleviate the suffering of millions of people. My group's research is consistent with the ABI mission to improve the health of Arkansans through medical research initiatives.

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Students doing their research in my group will get the opportunity to learn to synthesize new molecules by using commercially available substrates and reagents under mild reaction conditions. Based on their interest, students will also get the opportunity to test the compounds against different bacterial strains and several cancer cell lines. We present our findings at regional and national level conferences., and publish our results in peer-reviewed journals.

Lori Neuman-Lee - Phone Number 8709723111; Email lneumanlee@astate.edu

Department: Biological Sciences

Please provide a short paragraph describing the research/project/creative work that you do (in la...

The innate immune system clears the majority of potential pathogens and is required for complete immune system activation, but it is still poorly studied. One way to learn more about the innate immune system is to examine its functioning in reptiles, which rely almost exclusively on this arm of immunity. The Neuman-Lee lab focuses three primary objectives: 1) isolating and identifying reptilian immune cells, 2) examining functional immune responses in reptiles, and 3) testing the influence of different endocrine and environmental factors on the immune response. Students working in the Neuman-Lee lab would expect to gain experience using the flow cytometer and cell sorter, making and processing blood smears, and conducting immunological assays on blood samples.

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The intern would join an active lab group that emphasizes the benefits of collaboration and teamwork. Any intern would have opportunities to learn skills and techniques outside their direct project, such as handling reptiles, processing blood, sonography, and hormone analyses. The intern would learn about the scientific process, the value of presentation skills, and basic statistical analyses.

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This work addresses ABI's mission by using innovative methods to study the innate immune system, which can be very difficult in mammalian models. By increasing our understanding of this arm of the immune system, we may be able to better develop therapies and novel approaches to improve health outcomes.

Andrew Sweet - Phone Number 870-680-8480; Email asweet@astate.edu

Department: Biological Sciences

Please provide a short paragraph describing the research/project/creative work that you do (in la...

My research focuses on the relationships between hosts and their parasites. What types of factors are most responsible for shaping these interactions (environment, human activity, etc.)? How do these relationships change over time? To answer these questions, my lab combines field, genetic, and lab techniques. One of our specific interests is on the parasitic mites of insects. These small arthropods are often overlooked, but can be very important for understanding how parasites and pathogens are transmitted among different hosts and habitats. Students involved with this project will have the opportunity to collect insects and their mites from different locations in northeast Arkansas, identify and observe the behavior of mites using microscopes, work with the insect collection at Arkansas State, and learn molecular techniques to sequence genes in mites collected from different species of insects.

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This project is consistent with ABI's mission in several ways. First, the project focuses on mites and insects that are native to Arkansas. Second, the project focuses on the diversity and transmission of parasites, which can have direct implications for understanding how zoonotic diseases and parasites are transmitted to humans. Third, the results from this project links to understanding how agricultural land use effects parasite diversity and transmission.

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Parasitic mites from insects are relatively understudied, despite being highly abundant and a useful system for understanding parasite transmission, abundance, and biodiversity. Our study will help close this knowledge gap in three specific ways. First, we will get a better understanding of the biodiversity and basic biology of parasitic mites using field collections and genetic information. For example, it is highly likely we will discover new species of mites, right here in northeast Arkansas. Second, we will learn more about how parasites are

transmitted to different hosts. Are mites moving around to different hosts, or are they specific to a certain type of host? Finally, we will learn about how habitat can affect the abundance of parasites. Are there fewer mites in certain types of habitats (agricultural, forest, city, etc.)?

Jay Xu - Phone Number 8706804812; Email jxu@astate.edu

Department: ABI

Please provide a short paragraph describing the research/project/creative work that you do (in la...

Research in the Xu lab aims to effectively produce recombinant proteins of potential pharmaceutical or industrial applications (e.g., vaccines, interleukins and enzymes) with plant cell/tissue culture. Specifically, there are three projects ongoing. One is to develop a new class of low-cost and effective plant cell-produced oral biologic drugs to treat inflammatory bowel disease (IBD) in human. The second is to engineer novel antigen molecules in plant cells to create a new class of edible vaccines for poultry disease. The third one is to leverage the genome editing technology to generate novel cell wall-deficient or even cell wall-free plant cell lines for enhanced therapeutic protein production.

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My research exploits plant cell/tissue culture as a safe and cost-effective bioproduction “factory” to produce protein therapeutics, such as antibodies, vaccines, interleukins and enzymes. It supports the ABI Mission Statement to “improve the health of Arkansans through new and expanded agricultural and medical research initiatives”. Successful completion of ongoing or upcoming projects will facilitate availability of high-quality low-cost protein therapeutics to the state and to the country. Particularly, ABI at A-State selects “Plant-based production of medicinal molecules” as one of major research growth areas and my research projects dovetails nicely with this effort.

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The research conducted in the Xu lab has great potential of creating new biologics with improved efficacy and/or better suited for oral administration, which improve and expand the current applications of the plant cell-derived bio-pharmaceuticals.

Amanda Carpenter - Phone Number (870) 972-3894; Email acarpenter@astate.edu

Department: Occupational Therapy

Please provide a short paragraph describing the research/project/creative work that you do (in la...

My background is in public health and I have completed research studies focused on substance use prevention, mental health, and rural health. I am currently conducting a couple of studies in rural health that examine how being situated in a rural area impacts our health. Poorer health outcomes have been observed in rural communities and include healthcare access, nutrition, diabetes, mental health, substance use heart disease, physical activity, aging, maternal infant and child health, and tobacco use. Given all of these issues, there is work to be done in terms of using data-driven methods and evidence to identify health priorities. According to rural classifications, Arkansas is one of the most rural states, and we will focus on examining how rurality relates to the highest priority public health concerns in the state. We will read and learn about current rural public health priorities and issues, in addition to using publicly available data to examine trends in rural health and focus specifically on Arkansas.

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This research aligns with the mission of the ABI to improve the health of Arkansans by examining public use data to consider how to prioritize public health research and efforts in the state. Arkansas is ranked lower than most of the 50 states in healthcare access, healthcare quality, and public health. Approximately 44% of Arkansans live in rural counties and these communities experience poorer health outcomes. Thus, this research relates to the mission of improving the lives of Arkansans through medical research initiatives as issues such as

healthcare access, specific health diagnoses, and health disparities are relevant and related to both public health and medical research.

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Developing data-driven methods to identify and prioritize rural health needs is important for determining where to allocate resources and focus efforts on health initiatives. I previously taught research courses at the undergraduate level and currently research courses in a clinical doctorate program, and look forward to collaborating with an emerging and interested undergraduate researcher. We will work together to learn about quantitative, qualitative, and mixed-methods approaches to solving public health problems, while also collaborating on impactful, applied research that is relevant to the health of Arkansans.

Fabricio Medina-Bolivar - Phone Number 870-680-4319; Email fmedinabolivar@astate.edu

Department: Biological Sciences

Please provide a short paragraph describing the research/project/creative work that you do (in la...

Discovery and bioproduction of medicinal compounds from plants. The Medina-Bolivar research team is involved in the discovery and bioproduction of bioactive plant compounds with medicinal applications. Our studies utilize “immortalized” root cultures (known as “hairy roots”) as factories for a large diversity of plant natural products. Using a combination of molecular, cellular and biochemical approaches, our research team has developed strategies to increase the levels of selected natural products in hairy roots by more than 1,000 times when compared to the parental plant. Students that participate in the ABI Internship Program will work specifically with hairy root cultures to produce a class of biologically active natural products known as stilbenoids. These compounds have potential applications as preventive and therapeutics agents for cancer and cardiovascular diseases. The interns will be involved in different aspects of the research including production, analysis and purification of stilbenoids in hairy root cultures, and assessing their activity in chemical and cellular assays. Additional information can be found in the Medina-Bolivar Lab website:

<https://proxy.qualtrics.com/proxy/?url=https%3A%2F%2Fwww.fabriciomedinabolivarlab.com&token=bjrypxWf2J1NoZI96hde%2FDAmhfGs6nG%2FdzJBMJUTmas%3D>

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The research focus of this internship is on production and bioactivity of novel plant compounds that have potential applications as preventive and therapeutic agents for cancer and cardiovascular diseases. These are major health concerns in Arkansas. To this end, this research adheres to the ABI mission to improve the health of Arkansans through new and expanded agricultural and medical research initiatives.

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Interns will learn the technical skills associated with a plant tissue culture/analytical/molecular and cellular laboratory. These include aseptic techniques, plant tissue culture, analysis of natural products by high performance liquid chromatography (HPLC) and mammalian cell culture. In addition, the interns will learn how to maintain a research laboratory notebook, how to do research as part of a team and how to present the results of their research in laboratory and scientific meetings. The interns will also learn how to communicate their research to the general public.

Philip Tew - Phone Number 8709723742; Email ptew@astate.edu

Department: Economics and Finance

Please provide a short paragraph describing the research/project/creative work that you do (in la...

Research has repeatedly shown a direct relationship between socioeconomic factors and the health / health literacy of the individuals. However, with the ability to research any topic from a smart phone or computer, the potential health literacy inequity should be minimized. This project will look at college students' economic status while growing up to see if it has an impact on their health literacy as well as their actual general health.

Specifically, we will look at students' knowledge and practice related to self-care strategies, alternative therapies, and nutrition / fitness information, to determine if the economic status of the student has an impact.

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The focus of ABI is to improve the health of Arkansans. Health literacy is an important starting point in improving the health of our citizens - individuals can't / won't seek medical attention or make decisions to improve their health, if they don't have the literacy needed to know they need help or to make the change. This research will focus on the impact, if any, socioeconomic factors have on individuals having (a) basic health literacy, and (b) individuals making adjustments to improve their health.

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Currently the only research in this area focuses entirely on students attending a 2 year college in New York City where the overwhelming number of individuals analyzed were students of color. Research in this area has not looked at rural individuals who likely have more limited access to medical facilities and high speed internet than those living in a major metropolitan area. The residents of Arkansas are typically from areas more like those students who attend A-State than those that attend a 2 year school in NYC.

Jennifer Xie - Phone Number 8706808877; Email jennifer.xie@nyit.edu

Department: Basic Sciences, NYITCOM @ A-State

Please provide a short paragraph describing the research/project/creative work that you do (in la...

In light of the national crisis of opioid pandemic, seeking new, non-opioid analgesics as well as non-pharmacological therapies for chronic pain has never been more important. Our long-term goal is to understand the potential mechanisms that lead to pain chronicity and develop new chronic pain treatments. We are striving to work toward this goal to facilitate the discovery of new drug targets that are non-addictive and complementary with minimal side effects to help alleviate patients' sufferings and improve the quality of healthcare.

The students joining my lab may choose to take part in one of the three main schemes:

- 1) Explore the efficacy and mechanism of action of a novel, highly selective antagonist for $\alpha 9\alpha 10$ nicotinic acetylcholine receptors (nAChR) in treating migraine.
- 2) Utilize fetal stem cells and their exosomes to treat nerve injury or spinal cord injury-induced neuropathic pain and functional deficits.
- 3) Develop a mouse model of colitis to facilitate the discovery of novel therapeutics for visceral pain J.

[Note: All projects will be performed in live rats or mice.]

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Chronic pain has high prevalence in Arkansans and is the number one reason for patients to see the doctors. The research focus of this internship is on assessing the novel compounds or stem cell-related reagents to tackle neuropathic pain, visceral pain or migraines. This research adheres to the ABI mission to improve the health of Arkansans through new medical research initiatives.

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Our research is highly desirable to curbing the opioid pandemic that our society is currently facing. One of the main reasons causing this crisis is the staggering high number of prescriptions of opioids to treat chronic pain patients in the US due to the paucity of efficacious alternatives. The addictive and tolerance features of opioids exacerbated the issues. Novel, non-addictive therapeutics will help ease the demand of opioids and reduce the rudimental contributing factors.

In addition, our research will offer undergraduate students excellent and unique exposure to in vivo biomedical research. Our lab is using comprehensive methods to study the behavior, biochemical, immunohistochemical, and electrophysiological aspects of chronic pain to dissect the mechanisms of migraine, visceral pain and neuropathic pain as well as optimize novel, non-opioid treatment strategies. The students joining our lab will take part in one of these projects and learn any aspects of the relevant techniques. The

students are expected to attend weekly lab meetings to discuss the experimental design, review the results, troubleshoot any issues, as well as critique relevant journal articles. Students take active roles intellectually and are offered opportunities to attend national and international meetings and present their results (authorship for abstracts guaranteed). If sufficient contribution, authorship for manuscripts will be awarded as well.

Viswanathan Rajagopalan - Phone Number 870-680-8822; Email vrajagop@nyit.edu

Department: Basic Sciences, NYITCOM @ A-State

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The leading cause of death in the United States, in Arkansas, and worldwide are all Cardiovascular disorders. In the persisting COVID-19 pandemic, these disorders are both a major risk factor and a complication. Dr. V. Raj's laboratory investigates both mechanisms of cardiovascular diseases and strategies to improve cardiovascular health. The research studies are conducted at multiple levels, e.g., cellular, animal, human and computational.

Various conditions studied include, but not limit to, heart attack, heart muscle disease, heart failure, associated disorders such as hormonal disorders, obesity, diabetes, high blood pressure, etc. New projects are also emerging. Publications and other information are available at

<https://proxy.qualtrics.com/proxy/?url=https%3A%2F%2Fwww.nyit.edu%2Fbio%2Fvrajagop&token=i1KI9t8idK%2BzFUQChK65ZmTp8IL%2B8NctF8P7MEsw9A8%3D>

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With combined expertise in both biological and clinical aspects of the leading killer of Arkansas, the laboratory's goals directly aim to improve the health of Arkansans through new and expanded medical and plant-based initiatives. The diagnostic and therapeutic agents being studied and developed are expected to benefit our state and beyond.

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The research exposure and experience gained by the scholar will be highly valuable to pursue graduate studies or medical education or career in industry or paramedical/allied health programs. Students in the laboratory have successfully presented, won multiple awards and have published in leading journals. The students can get opportunities to learn and work with cutting-edge biological/medical technologies in molecular biology, physiology, genetics, biochemistry, pharmacology, biostatistics, stem cells, histology, bioinformatics and more. Students participate in laboratory meetings, learn to maintain laboratory notebook, work in team, and communicate scientific findings. Productive student contributions can yield opportunities to present in local, national/international conferences and co-author in publications that also positively impact the scholarly biological and medical community.