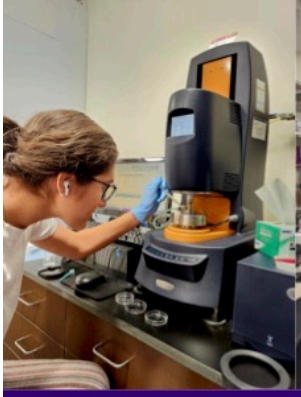
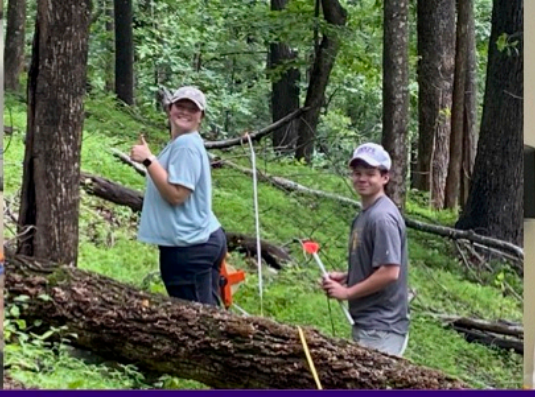
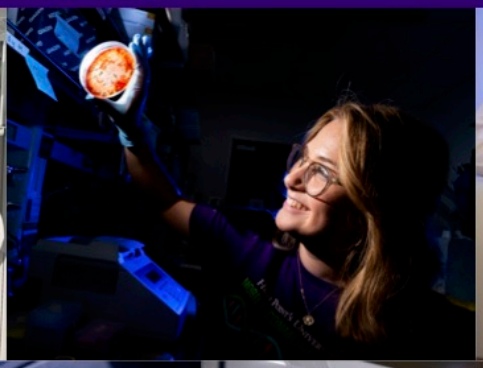
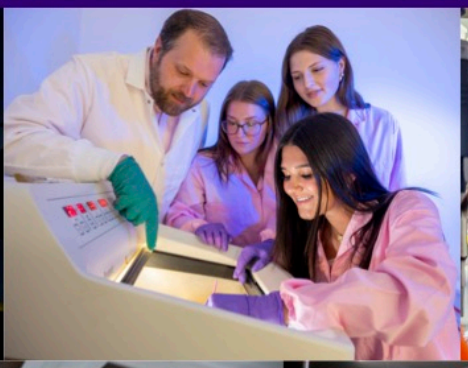





HIGH POINT UNIVERSITY

Wanek School of Natural Sciences

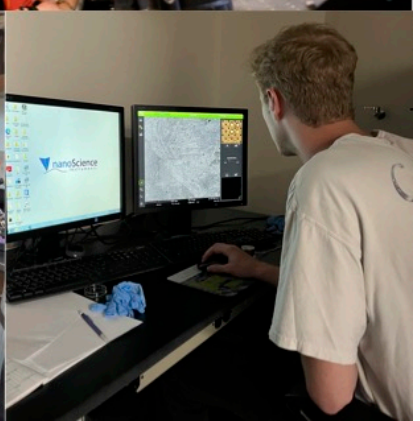
Summer Research Program in the Sciences
Final Research Symposium
July 24 - 25, 2025

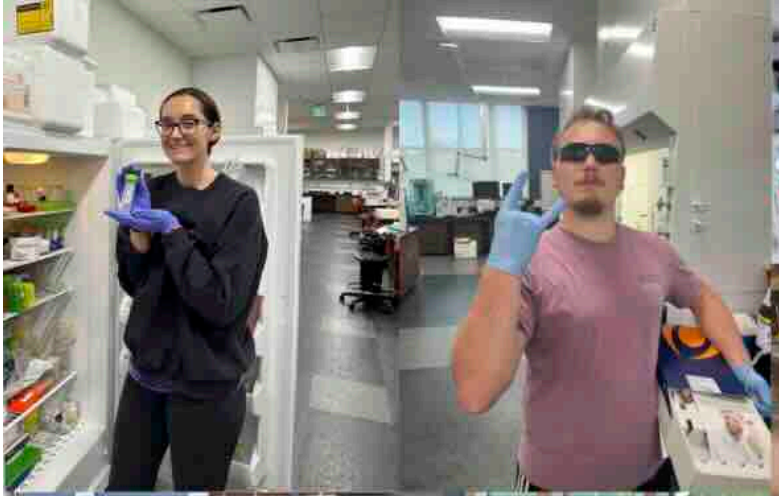




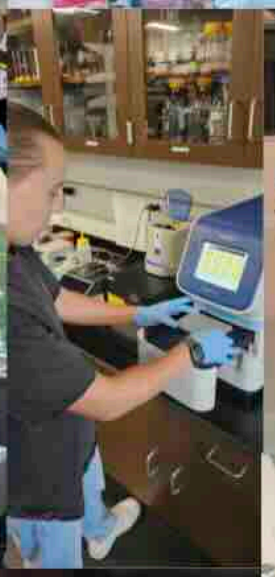






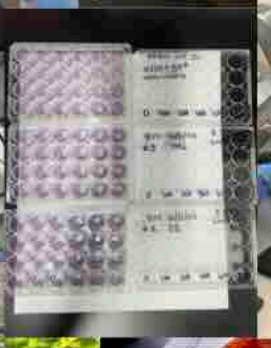




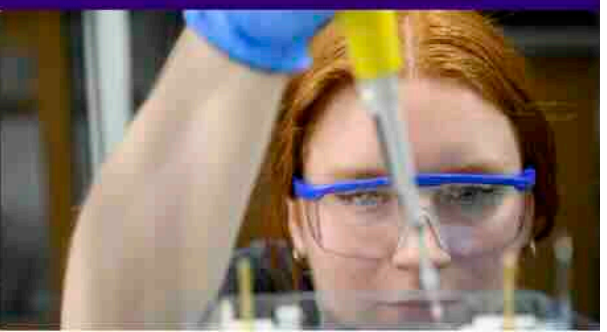












Scenes from SuRPS

2025 SuRPS Keynote Speaker

Adaptive light-sensing and color-changing materials inspired by nature

Olivia Armendarez
Department of Chemistry, Class of 2022
PhD Candidate, Northeastern University

ABSTRACT
Across the animal and plant kingdoms, systems in biology utilize their color as an adaptive feature to respond to external stimuli within their environment. While mechanistic pathways that trigger color and color change in most systems remain unknown, these processes serve as inspiration for new classes of bio-inspired sensors and displays. My research discusses chemical and biological approaches inspired by and based on biology to create adaptive subsystems that respond to an external stimulus. In both cases, the sensor is embedded within an adaptive hydrogel matrix which facilitates an optical readout, highlighting future applications in reusable, wearable technologies. In the first approach, we aim to overcome challenges associated with solar radiation dosimeters by leveraging photoacids as functional additives for chemical-based light sensors. In the second approach, we demonstrate an engineered living material (ELM) that functions as a sensor that can simultaneously power display components. By leveraging both optogenetic regulation and natural metabolism of microbes, we achieve spatiotemporal control of pH-responsive hydrogels to adaptive changes in color.

BIOGRAPHY
Olivia received a B.S. degree in biochemistry from High Point University in 2022. While there, Olivia was an inaugural member of the Natural Sciences Fellows Program and gained leadership experience in organizations such as NSF, biology club, and as a first-generation peer mentor. She developed her passion for interdisciplinary research after joining Dr. Pamela Lundin's lab where she investigated the role of self-assembled monolayer (SAM) structure on polymer morphology for applications in photovoltaic materials. She subsequently began her PhD in chemistry and chemical biology at Northeastern University where she creates bioinspired solutions for industrial challenges. While at Northeastern, Olivia has received a service award for her role as the Graduate Student Association (GSA) President and was selected as a Biotechnology Scholar in the Scientist Mentoring & Diversity Program (SMDP) through the International Center for Professional Development (ICPD).

SuRPS Final Symposium

Thursday, July 24, 2025, Culp Planetarium, Wanek School of Natural Sciences

Posters will be set up in the hall and lobby of the Wanek School of Natural Sciences.
All posters should be set up by 9 am on Thursday for both poster sessions and will be taken down after the symposium completes on Friday.

Session I: Oral Presentations: Dr. Bill Kochen, Department of Neuroscience, Presiding

	8:30 – 9:00		*COFFEE, TEA RECEPTION (WSNS Lobby)*
	9:00 – 9:05	Dr. Kelsey Kean	Opening Remarks and Announcements
	9:05 – 9:15		Afternoon Poster Session Elevator Pitch Videos
Th.1	9:15 – 9:35	Josh Elbertson	Design and Setup of a Focused Ultrasound Apparatus to Generate Cavitation Bubbles
Th.2	9:35 – 9:55	Aubrey Fessler	Exploring Rheological Properties of PDMS Blends
Th.3	9:55 – 10:15	Alexandra Shutters, Harlie Culbreth, & Isabella Frankovic	Brains, Bumps, and Buff Stuff: The Role of Creatine Prior to Receiving a mild TBI on Long-Evans Rats
Th.4	10:15 – 10:35	Holley Lowe	Observing the Extracellular Vesicle Output of *E. coli* Under Different Mechanisms of Stress
Th.5	10:35 – 10:55	Burton Brewer	Novel Antibiotic Adjuvants in ESKAPE Pathogens
Th.6	10:55 – 11:15	Lillian Gray & Chase Dillon	Evaluation of Novel Anti-virulence Compound Pretreatment on MRSA Virulence
	11:15 – 11:30		*BREAK*

Keynote Address: Introduction by Dr. Pamela Lundin, Department of Chemistry

11:30 am – 12:30 pm

Olivia Armendarez, HPU Class of 2022
Graduate Research Assistant, Northeastern University

Adaptive light-sensing and color-changing materials inspired by nature

12:30 *Assemble for group picture in WSNS Lobby*

12:30 – 1:45 *LUNCH BREAK*

Session II: Poster Presentations Part A: Wanek School of Natural Sciences Lobby, 2:00 – 3:00 pm

P1. Kal Hyun N. Burgess-Hicks: “Back to the Basics, the Quantum Regulation of the Circadian Clock”
P2. Sarah Czuba: “Optimization of Synthetic Rhodamine B Analogue Purification”
P3. Bryce Grier: “Efflux Inhibition in MRSA Using Loratadine”
P4. Jordan Havert: “Hidden Potential in Aquatic Fungi: Freshwater Fungi as Sources of Novel Neurodegenerative Treatments”
P5. Tyler Janick: “Marine Mycelia: Coral Fungi as Novel Acetylcholinesterase Inhibitors”
P6. Kaley LeFevre: “Synthesis and Evaluation of Antibiotic Adjuvants from Carbazole Scaffolds”
P7. Megan Mueller: “Exploring Greyscale Lithography Functionally”
P8. Gabriella Orecchio: “Metal Matters: Metallic Preference and Function in HeCA for CO_2 Conversion”
P9. Lauren Rumble: “Micropatterned Surfaces as a Passive Strategy Against MRSA”
P10. Zachary Ready: “Investigating Phantom Partials in Stringed Instruments”
P11. Gabriel Valenzano: “Assessing the Activity and Molecular Targets of Novel Antibiotic Adjuvants in MRSA”

3:00 – 3:15 *BREAK*

Session III: Oral Presentations: Dr. Eric Rokni, Department of Physics, Presiding

Th.7	3:15 – 3:35	Lexi Topping	Electrochemical Methods for Investigating Molecular Aggregation in Solution
Th.8	3:35 – 3:55	Garland Greene	Analysis of Degradation by FAST PETase on PET
Th.9	3:55 – 4:15	Shauna Skow	Septin-Septin Interactions in Fungi
Th.10	4:15 – 4:35	Sierra Werner	Circadian Protein Interactions and Phosphorylation of mTOR in *Neurospora crassa*
Th.11	4:35 – 4:55	Rebekah Olls & Jack Schoultz	The Effect of Microclimate, Land Cover, and Trap Height on the Oviposition Activity of Container-Breeding Mosquitoes
Th. 12	4:55 – 5:15	Sara Hamidpour & Vovi Lagutin	Deposition and Characterization of SiO_2 Thin Films for Buried Graphene Nanofabrication

SuRPS Final Symposium

Friday, July 25, 2025, Culp Planetarium, Wanek School of Natural Sciences

Session IV: Oral Presentations: Dr. Heather Miller, Department of Chemistry, Presiding

	8:30 – 9:00		*COFFEE, TEA RECEPTION (WSNS Lobby)*
	9:00 – 9:05	Dr. Kelsey Kean	Opening Remarks and Announcements
	9:05 – 9:15		Morning Poster Session Elevator Pitch Videos
Fr.1	9:15 – 9:35	Jordan Havert & Tyler Janick	Aquatic Allies: Fungi from Freshwater and Marine Sources in AChE Inhibition
Fr.2	9:35 – 9:55	Claire Klein	Investigating Musical Modes through HRV and Designing a Hemi-Anechoic Chamber for Controlled Replication
Fr.3	9:55 – 10:15	Caitlyn Wingeart	Textured PDMS Surfaces: A Promising Approach to Biofilm Prevention
Fr.4	10:15 – 10:35	Catherine Summerow	D-9-THC and Oxidative Stress, a Preliminary Study
Fr.5	10:35 – 10:55	David Simin & Hannah Stewart	Genetic Architecture of Wing Shape in *Drosophila melanogaster*
Fr.6	10:55 – 11:15	Lauren Marra	Recording History: Developing Fire Records of Flat Shoals, Hanging Rock State Park, NC
	11:15 – 11:30		*BREAK*

Session V: Poster Presentations Part B: Wanek School of Natural Sciences Lobby, 11:30 am – 12:30 pm

P12. Julia Crenshaw: “Potential Neuroprotective Effects of D-9-THC Against Oxidative Stress in Neuronal Cells”
P13. Aubrey Fessler: “Exploring Rheological Properties of PDMS Blends to Obtain Insight on Biofilm Adhesion”
P14. Sara Hamidpour: “Radio Frequency (RF) Sputtering of SiO_2 Thin Films for Buried Graphene Nanofabrication Applications”
P15. Vovi Lagutin: “Use of Atomic Force Microscopy and Ellipsometry to Confirm Thickness Measurements of Sputter-Deposited SiO_2 Thin Films”
P16. Alexandra Shutters, Harlie Culbreth, and Isabella Frankovic: “Before the Bump: Exploring the Role of Dehydration Prior to Receiving a mild TBI on Long-Evan Rats”
P17. Shauna Skow: “Septin-Septin Interactions in Fungi”
P18. Gianni M. Travaglini: “How Fire Severity Effects Species Change”
P19. Sierra Werner: “Circadian Protein Interactions and Phosphorylation of mTOR in *Neurospora crassa*”

Lunch at Café / Lab Clean Up

STUDENT ABSTRACTS ORAL PRESENTATIONS:

Note: presenting author(s) is underlined, * denotes faculty advisor(s)

(Th.5) Novel Antibiotic Adjuvants in ESKAPE Pathogens

Burton Brewer, Chloe F. Cox, Gabriel Valenzano, Kiara Busby, Heather Miller, and Meghan Blackledge*
Department of Chemistry, High Point University

Infections caused by ESKAPE pathogens are highly infectious and highlight a significant global health threat. The ESKAPE pathogens are *Enterococcus faecium*, *Staphylococcus aureus* (MRSA), *Klebsiella* and *E. coli*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacteriacea*. These bacteria are either Gram-positive or Gram-negative and have developed a resistance to beta-lactams as well as other antibiotic classes. One approach to combat these infections is the development of novel antibiotics. However, bacteria can quickly evolve resistance to new antibiotics, diminishing their effectiveness. Bypassing these resistance mechanisms is crucial for treating these infections and reducing the high mortality rate. An alternative strategy is to use antibiotic adjuvants alongside existing antibiotics. Adjuvants are small molecules that inactivate bacterial resistance mechanisms, thereby enhancing the efficacy of antibiotics without being lethal to the bacteria themselves. Previous research in the Blackledge lab has demonstrated that loratadine can function as an adjuvant against MRSA. While loratadine's tail is not necessary for its antihistamine activity, it is essential for its role as an adjuvant. Unfortunately, this tail can be easily cleaved in the human body, preventing loratadine from deactivating bacterial resistance mechanisms. Our hypothesis is that loratadine analogs with non-cleavable tails may exhibit improved adjuvant activity against select ESKAPE pathogens. A library of loratadine analogs with non-cleavable tails has been synthesized and evaluated for their ability to potentiate antibiotics in clinically relevant ESKAPE pathogens. Synthetic methodologies, biological data, and preliminary structure-activity relationships will be presented. The similarities and differences found in the SAR for these Gram-positive and Gram-negative bacteria will be discussed.

(Th.1) Design and Setup of a Focused Ultrasound Apparatus to Generate Cavitation Bubbles

Josh Elbertson and Eric Rokni*
Department of Physics, High Point University

Ultrasound is a high-frequency pressure wave that can be used both diagnostically and therapeutically. Low-intensity, unfocused ultrasound can be used as a diagnostic tool by processing contrasting signals from reflected sound waves to create images. High-intensity, focused ultrasound, specifically histotripsy, can be used as a non-invasive therapy that liquifies and breaks down diseased tissue through acoustic cavitation. Acoustic cavitation is the physical process of microbubbles violently expanding and collapsing as a result of high-pressure ultrasound waves, thus damaging cells. Histotripsy requires a high-frequency, and high-voltage setup to generate the power necessary to cause cavitation; however, these setups can be costly, necessitating an inexpensive alternative. In this study, we present our cost-effective apparatus used to create and study cavitation. This setup includes a piezoelectric transducer which operates at 750 kHz and a high-voltage amplifier capable of amplifying signals up to 600 V. We detail the design, construction, and function of each component, explaining why each device is necessary to generate cavitation. With our completed apparatus, future studies could investigate the physics of cavitation in different environments as well as applying it to different scenarios such as disrupting biofilms or treating neurodegenerative diseases like Alzheimer's.

(Th.2) Exploring Rheological Properties of PDMS Blends

Aubrey Fessler, Megan Mueller, Caitlyn Wingeart, and Jacob Brooks*
Department of Physics, High Point University

Rheometry is a technique used to study how materials deform and flow under different levels of stress and strain. The goal of this study is to use rheometry to investigate the viscoelastic properties of various polydimethylsiloxane (PDMS) blends. We focused on characterizing the flow behavior of common thickening agents (guar gum and xanthan gum), as well as examining how everyday materials respond to applied forces. Additionally, we examined a variety of different substances to gain insight into the proper experimental setup for various materials. These experiments provided a foundation for understanding material behavior, particularly the material's response to applied stress, in addition to other material and mechanical properties. Future work will involve further testing of PDMS blends, including hybrid formulations having variable stiffness, to understand how their stiffness affects surface interactions with biofilms.

(Th.6) Evaluation of Novel Anti-virulence Compound Pretreatment on MRSA Virulence

Lillian Gray, Chase Dillon, Meghan Blackledge, and Heather Miller*
Department of Chemistry, High Point University

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a dangerous human pathogen due to its resistance to many commonly used antibiotics, including methicillin. Its rapid spread in both hospital and community settings presents a significant public health challenge, increasing morbidity and mortality rates worldwide. In past research, we have investigated loratadine's anti-virulence effects in vitro. This drug helps combat MRSA through its ability to influence the expression of multiple key virulent factors called hemolysins. Both hemolysin genes and resulting hemolytic activity were downregulated after bacterial cultures were treated with loratadine. These results were also extended to an ex vivo human cell infection model. The primary aim of this experiment was to evaluate whether loratadine was effective at lowering the cytotoxicity of the MRSA-infected cells through pretreatment before infection. Our methods started by treating the Ea.hy926 endothelial cells with loratadine for 24 hours. Next, the cells were infected with MRSA USA 300. RNA was then extracted and purified from both the treated and untreated cells. The RNA levels of hemolysin genes were analyzed using reverse transcription quantitative polymerase chain reaction (RT-qPCR). Meanwhile, a lactate dehydrogenase (LDH) assay is also being used to measure the cytotoxicity levels of the host cells. Our optimized infection assay protocol will be presented along with preliminary hemolysin gene expression data.

(Th.8) Analysis of Degradation by FAST PETase on PET

Garland Greene, Gabriella Orecchio, and Kelsey M. Kean*
Department of Chemistry, High Point University

Polyethylene terephthalate (PET) is a polymer used to manufacture many types of plastic packaging and textiles that are used daily including water bottles, food containers, and other household products. Due to its versatility, PET accounts for approximately 10% of the 370 million metric tons of plastic produced annually worldwide. Although PET is recycled in large numbers, a large abundance of the plastic still is accumulated in landfills worldwide without a time effective, environmentally safe way to break it down. To combat this, efforts to find methods to break down, or depolymerize, PET into its basic monomers have increased with an enzyme known as *Is*PETase, that has the ability to degrade PET into its basic monomers: terephthalic acid (TPA), mono(2-hydroxyethyl) terephthalate (MHET), and bis(2-hydroxyethyl) terephthalate (BHET). The aim of this study is to be able to characterize the effectiveness of FAST PETase as a depolymerizing agent of PET in varying conditions, such as different concentrations and different buffers, to help discern what might cause this protein to have the most effective activity. Presence and activity of the protein was measured using techniques such as UV-Vis spectroscopy, scanning electron microscopy (SEM), gel electrophoresis, and other analytical techniques. It was discovered that this protein functions better at lower concentrations basic buffer solution. Other future work should include further analysis of this protein in lower concentrations and other non-neutral solvents.

(Fr.1) Aquatic Allies: Fungi from Freshwater and Marine Sources in AChE Inhibition

Jordan Havert, Tyler Janick, and Grace Hamilton*
Department of Chemistry, High Point University

Alzheimer's disease is a neurodegenerative disorder that affects memory and cognitive thinking. Currently, medications like Donepezil help by inhibiting an enzyme called acetylcholinesterase (AChE), which breaks down acetylcholine, a chemical that's already reduced in Alzheimer's patients. However, these drugs can be expensive and have side effects. Therefore, alternative AChE inhibitors could be valuable drugs for the treatment of neurodegenerative disease. We therefore screened a collection of forty-three different freshwater fungi from saltwater and freshwater. In order to identify the fungi, we extracted DNA amplified of the Internally Transcribed Spacer region using various primer pairs. Successful amplicons were sequenced for species identification. In order to screen for acetylcholinesterase activity, we prepared fungal extracts and tested them for their ability to inhibit human AChE using colorimetric assay. In the assay, the positive results reduced the enzymatic activity more than solvent alone. So far, thirteen freshwater and six saltwater fungi have shown early signs of inhibition. Additionally in total, twelve fungi from the library have been identified. This could potentially lead to a new source of AChE inhibitors for treatment of neurodegenerative diseases.

(Th.12) Deposition and Characterization of SiO_2 Thin Films for Buried Graphene Nanofabrication

Sara Hamidpour, Vovi Lagutin, and Sean Johnson*
Department of Electrical Engineering, High Point University

Nanowire fabrication on monolayer graphene is a potentially powerful semiconductor application for flexible electronics, photodetectors, and other nanoelectronics applications. Selective area growth of nanowires on graphene is yet to be accomplished. In this study, thin film deposition methods were surveyed for effectiveness of thickness, precision, surface uniformity, and adhesion to graphene substrates for the purpose of burying graphene in an SiO_2 dielectric layer. RF sputtering resulted in a successful burial of graphene under a ~21nm SiO_2 thin film. The thickness measurements of the SiO_2 thin film were confirmed via ellipsometry and atomic force microscopy (AFM). Photolithography and reactive ion etching (RIE) were used to fabricate the first patterns on buried graphene substrates.

(Fr.2) Investigating Musical Modes through HRV and Designing a Hemi-Anechoic Chamber for Controlled Replication

Claire Klein and Eric Rokni*
Department of Physics, High Point University

Musical modes are known to evoke unique emotional responses in listeners, with major modes typically associated with positive affect and minor modes with negative affect. In the past, studies have used heart rate variability (HRV) as a physiological marker to infer certain stress responses to stimuli. In this pilot study, participants (n=12) listened to five audio tracks: baseline pink noise, two major mode, and two minor mode. The major and minor tracks alternated, with the order counterbalanced between participants. For each track, HRV data was collected using PolarH10 sensors through the EliteHRV app. The HRV metrics collected for analysis included the root mean square of successive difference (RMSSD), high frequency (HF) power, and low frequency to high frequency ratio (LF/HF). In addition to the HRV data, after each track, listeners also completed a survey on their perceived stress levels. Each metric was compared across conditions (control, major, minor) using separate one-way ANOVA tests in SPSS. Preliminary results from the HRV data seem to suggest that listeners were the least stressed when listening to the pink noise track and most stressed when listening to the minor mode tracks. To improve future testing conditions, we began constructing a hemi-anechoic chamber, which simulates a free-field environment, to provide an acoustically controlled space. As the chamber was built, we measured sound transmission loss, reverberation time, and impulse response to evaluate the impact of adding different materials. This chamber will allow for perceptual and acoustical studies to be better controlled in the future.

(Th.4) Observing the Extracellular Vesicle Output of *E. coli* Under Different Mechanisms of Stress

Holley A. Lowe, Elyse Zeffiro, and Elijah Sage
Grekin Labs

Extracellular Vesicles (EVs) are lipid bilayer-bound particles that contain DNA, RNA, and proteins derived from their parent cells. These components allow EVs to serve as a primary intracellular communication system, encouraging growth, promoting health, and laying the foundation for the production of the parent cells. While EVs have earned significant research attention, bacterial EVs and their therapeutic benefits are still relatively unexplored, particularly in production efficiency. This project aims to optimize EV production from *E. coli* for potential applications in gut microbiome restoration. We investigated the effects of various stress conditions on *E. coli*, including pH stress, hypoxic conditions, oxidative stress, and nutrient-limited media, and observed the impact on EV output. Quantification and characterization of EVs were performed with Nanoparticle Tracking Analysis (NTA), utilizing laser-based particle tracking to determine overall concentration and size distribution. Results suggest that controlled stress conditions can significantly enhance bacterial EV production, offering a viable approach to large-scale industrial implementation. Stress-based optimization protocols will be applied to other essential gut bacteria to improve the availability of EV-based, cell-free therapies for gut microbiome restoration. Further exploration into the stress response mechanisms and their impact on EV composition with essential gut bacteria will be crucial for developing targeted therapeutic applications.

(Fr.6) Recording History: Developing Fire Records of Flat Shoals, Hanging Rock State Park, NC

Lauren Marra, Gianni M. Travaglini, and Dane Kuppinger*
Department of Biology, High Point University

This study investigates the fire history of Flat Shoals, North Carolina, and whether drought conditions contribute to an increased fire probability. With no historical record of forest fires in the nearby Hanging Rock area, documenting fire history and identifying patterns is essential for understanding and predicting future fire events. We hypothesized that fewer fires occurred from 1920-1969 than 1970-2022 due to government-enforced fire suppression from the twenties through the sixties. We also predicted that fire events were more likely to occur during drought years. Samples were collected from pine trees with visible fire scars. Cross sections were sanded to reveal tree rings, dated using standard dendrochronological methods. Fire-scarred years were compiled in a database to create a composite fire record. The record was split into two time periods (1920–1969 and 1970–2022) to compare Mean Fire Interval (MFI) and Weibull Median Interval (WMI). To assess correlations between drought and fire occurrence, an Epoch Analysis compared annual PDSI measurements to fire dates. Analysis showed MFI and WMI were higher during the suppression era (MFI = 7.67, WMI = 5.61 years) than the post-suppression era (MFI = 4.86, WMI = 3.99 years). No significant correlation was found between drought years and fire probability. The fire history of Flat Shoals reflects shifts in land management over time. The absence of a strong drought–fire link suggests that local, site-specific factors—such as management practices and fuel availability—may play a more critical role in fire occurrence than broader climatic drivers like drought.

(Th.11) The Effect of Microclimate, Land Cover, and Trap Height on the Oviposition Activity of Container-breeding Mosquitoes

Rebekah Olls, Jack Schoultz, and Daniel Greene*
Department of Biology, High Point University

Mosquitoes are the most medically significant arthropod disease vectors, and urbanization has been positively associated with the mosquito species that commonly transmit pathogens to humans. In particular, container-breeding mosquitoes, along with their habitats, have been shown to increase in abandoned areas and/or areas where waste is mismanaged. Therefore, we chose to measure the oviposition activity of container-breeding mosquitoes through ovitrap (473 ml black plastic cups filled with water and lined with brown cardstock) sampling at 2 heights (0 m [ground height] and 1 m in height) across 20 sites in 2 grids (Grid A, 6.71km²; Grid B, 5.62km²) within Guilford County, NC, that differed in the amount of surrounding developed land cover. During each sampling event, ovistrips were removed and replaced and the cups were refilled with water. Weekly sampling events occurred across 4 weeks in 2024 (12 June – 10 July) and 4 weeks in 2025 (5 June – 3 July). Once collected, the number of mosquito eggs were counted on ovistrips under a dissection microscope once ovistrips reached a slightly damp stage. Ovistrips were flooded one week after collection and maintained in small plastic boxes (fed with desiccated liver powder and brewer's yeast) in an incubator/environmental chamber at 27°C, ~70% humidity, 14:10 (D:L) until adult mosquitoes emerged (~7 days). Adults were then identified to species. Generalized linear mixed modeling was used to identify significant environmental (i.e., temperature and humidity) and land cover predictors of the number of oviposited eggs. As human expansion continues, the ability to identify variables tied to mosquito abundance is paramount to reducing the transmission of mosquito-borne diseases.

(Th.9) Septin-Septin Interactions in Fungi

Shauna Skow and Grace Hamilton*
Department of Chemistry, High Point University

Septins are cytoskeletal GTP-binding proteins that play an important role in processes like cell division and polarity, especially in fungi. In *Knufia petricola*, AspE is a non-essential septin that interacts with the core septin Cdc11. Previous work has shown that AspE binds GTP and slowly hydrolyzes it to GDP. However, we don't fully understand how AspE's ability to bind and hydrolyze GTP influences those interactions. This project focuses on figuring out whether AspE needs to bind a nucleotide in order to interact with Cdc11. For this experiment, I used site-directed mutagenesis to make specific mutations in AspE's predicted GTP-binding pocket. These mutations were designed to interfere with its ability to bind or hydrolyze GTP. Then, I used colorimetric nucleotide hydrolysis to see if the mutant versions of AspE could still bind and hydrolyze GTP. In parallel, I ran yeast two-hybrid (Y2H) assays to test whether these mutations also affected AspE's ability to bind Cdc11. By combining results from both the GTP hydrolysis and Y2H assays, I was able to look more closely at how nucleotide binding might regulate AspE's interactions with other septins, allowing for a deeper understanding of septin function and regulation. Overall, this will give us a clearer picture of AspE's role in fungal cell biology.

(Fr.5) Genetic Architecture of Wing Shape in *Drosophila melanogaster*

David Simin, Hannah Stewart. and Kenneth McKenna*
Department of Biology, High Point University

The development of shape, and the plasticity of such mechanisms, represents a fundamental challenge in modern biology. Specifically, ascribing genetic change to change in organ shape has been one of the most difficult problems to address. While intraspecific variation (within a species) in trait shape is typically minimal, interspecific differences (between species) contribute significantly to morphological diversity. This study investigates the genetic architecture underlying shape change using the holometabolous insect *Drosophila melanogaster* as a model. Using 200 isogenic lines from the Drosophila Genetics Reference Panel (DGRP), we set out to identify genetic variants that contribute to wing shape as well as those that contribute to plasticity in shape. By manipulating dietary availability at different larval stages following a previously described protocol, we can induce phenotypic plasticity, producing a wide range of wing sizes for each line so that we may attempt to identify those lines that have unique wing shapes. At our current state in our project, we have collected wing measurements from 30 of these lines. Wing shape is quantified using geometric morphometrics and the principal components (PC), centroid size, and the slope between centroid size and PC's 1 & 2 were collected. To uncover genetic determinants underlying variation in wing shape plasticity, we performed a genome-wide association study (GWAS) on these values for males and females from each line. We obtained several hundred unique quantitative trait loci (QL) for both sexes and have chosen to present the top 20 QTLs for both sexes. Our analysis demonstrates there is genetic variation underlying the mechanisms of shape and shape plasticity, and that those mechanisms are unique to both sexes. We highlight one promising allele from each sex that is known to show a wing phenotype.

(Th.3) Brains, Bumps, and Buff Stuff: The Role of Creatine Prior to Receiving a mild TBI on Long-Evans Rats

Alexandra Shutters, Harlie Culbreth, Isabella Frankovic, and Bill Kochen*
Department of Neuroscience, High Point University

Creatine supplementation is commonly used to strengthen athletic performance by encouraging energy production and enhancing muscle growth. Though its benefits for the brain have been investigated, no study has examined if creatine reduces the neuropathology of traumatic brain injuries. This study investigates whether pre-treatment of creatine in Long-Evans rats, via their drinking water, provides preventative neural effects that aid healing, memory, and behavior after a mild traumatic brain injury (mTBI).Half of the rats in the study were placed on a structured creatine dosing regimen: a one-week loading dose, equivalent to an adult taking 20-grams of creatine, followed by continual maintenance doses equivalent to an adult male taking 5-grams of creatine. After three weeks of creatine supplementation, rats received either a mTBI via a 200-gram weight dropped from 18-inches, or a sham injury. Of the rats that received mTBIs, some were immediately euthanized to evaluate any potential acute impacts. The remaining rats went through a series of behavioral and memory tests: novel object recognition, elevated zero maze, and the cookie test, before being later euthanized. Preliminary findings indicate that gender, mTBI, and creatine interact to significantly alter behavior ($p < 0.05$). Post-hoc multiple comparisons reveal a complex effect of gender, treatment, and injury. Data collection will continue into the fall semester. If additional findings continue to show significance, creatine may emerge as a neuroprotective compound, helping to lessen the severity of an mTBI.

(Fr.4) D-9-THC and Oxidative Stress, a Preliminary Study

Catherine Summerow, Julia Crenshaw, and Michael Grider*
Department of Neuroscience, High Point University

Since 2018's Farm Bill, and the removal of hemp from the legal definition of marijuana, use of cannabinoids has become much more widespread in the USA. Cannabidiol (CBD) and tetrahydrocannabinol (THC) are the most commonly used cannabinoids amongst the general population, and their effects on neuron health are widely under-studied. Both THC and CBD are antioxidants, and the Grider Lab is focused on the cell-specific neurotoxicity and/or the antioxidant ability of these compounds to protect against oxidative stress. The lab has also investigated effective injury doses of hydrogen peroxide in cell culture. We find that Delta 9 THC(D-9-THC) does not change cell viability in the absence of an injury, suggesting that D-9-THC is not toxic at physiologically relevant levels. In our hydrogen-peroxide injury model, preliminary data suggests that D-9-THC may have mild neuroprotective effects at concentrations below typical bioavailability after ingestion (inhalation or oral ingestion) in cell lines RN46A, and RN46A-B14. We plan to use additional cell lines to investigate an effective treatment window of D-9-THC, as well as CBD, and other types of THC.

(Th.7) Electrochemical Methods for Investigating Molecular Aggregation in Solution

Lexi Topping, Sarah Czuba, Pamela Lundin, and Keir Fogarty*
Department of Chemistry, High Point University

Electrochemistry offers powerful techniques for exploring molecular behavior in liquid solutions. In this study, Rhodamine B (RhB) is investigated using cyclic voltammetry and chronoamperometry to examine diffusion rates and determine if RhB has a higher tendency to aggregate as concentrations increase. The original goal was to manipulate RhB's color electrochemically by applying specific voltages. Early challenges in system stability led to important insights and refinements, including piranha cleaning procedures and conditioning the reference electrode with saturated KCl. After calibration, we determined diffusion coefficients across varying RhB concentrations. Preliminary data indicates that higher concentrations of RhB promote aggregation, which slows diffusion and affects electrochemical response. These findings contribute to an increased understanding of molecular dynamics in solution and lay the groundwork for future studies involving RhB analogs.

(Th.10) Circadian Protein Interactions and Phosphorylation of mTOR in *Neurospora crassa*

Sierra Werner and Alexander Mosier*
Department of Biology, High Point University

Circadian biology is a long-endured study focusing on the day long feedback loop that serves in "telling time" for cells within an organism. The core clock architecture is conserved in *Neurospora crassa*, making this organism to be the model organism for these series of experiments regarding the circadian cycle. An essential protein of this feedback loop is Frequency (FRQ), this protein has been found to interact with numerous different proteins at different time intervals of the cycle. For this experiment, the protein mTOR, which serves in regulating development and growth of cells, has an indirect connection with FRQ through different kinases and other proteins. Many of these connecting proteins serve to phosphorylate the circadian cycle, which is a major component to keeping the cycle functional and act to regulate further downstream processes. Through the use of western blots, similar timings were found to be between these proteins in attempts to better piece together the web of interactions involved in the circadian cycle. A smaller continuance of this project is looking at the quantum biology of the circadian cycle through Python.

(Fr.3) Textured PDMS Surfaces: A Promising Approach to Biofilm Prevention

Caitlyn Wingeart,[1] Aubrey Fessler,[1] Megan Mueller,[1] Lauren Rumble,[1] Meghan Blackledge,[2] Briana Fiser,[1] and Jacob Brooks*[,1]
[1]Department of Physics, High Point University
[2]Department of Chemistry, High Point University

Bacterial and fungal biofilm formation poses a significant threat in medical environments, leading to increased patient morbidity and higher healthcare costs. One promising approach to mitigate biofilm-related infections involves engineering textured surfaces that resist microbial attachment. Previous studies have demonstrated some success using laser-textured surfaces to reduce biofilm growth. In earlier work, polydimethylsiloxane (PDMS) was created using silicon molds patterned with "sharklet" and "flower" designs. These stamps were incubated with methicillin-resistant *Staphylococcus aureus* (MRSA), then fixed with paraformaldehyde, critically point dried, and imaged using scanning electron microscopy (SEM) to assess biofilm development. We focused on investigating how variations in microscopic circles feature size and spacing influence the effectiveness of these surfaces in preventing biofilm formation. Specifically, we varied the diameter size across 4 different spacings within a triangular lattice. Using photolithographic processes, new micro-pattern arrays were designed and written into a positive photoresist layer on large silicon wafers using the μMLA Heidelberg maskless aligner. Which when developed, these substrates created depressions to be used as molds. Then PDMS was poured over to create raised features, which will be used for future biological testing. By systematically exploring geometric parameters, this work aims to identify design principles that improve surface resistance to microbial colonization and offer new pathways for reducing device-related infections.

STUDENT ABSTRACTS POSTER PRESENTATIONS:

Note: presenting author is underlined, * denotes faculty advisor(s)

THURSDAY, JULY 24 POSTER PRESENTATIONS PART A (2:00 – 3:00 pm):

(P.1) Back to the Basics, the Quantum Regulation of the Circadian Clock

Kal Hyun N. Burgess-Hicks, and Alexander Mosier*
Department of Biology, High Point University

Circadian rhythms are a key defining aspect of life that is present in mammals, plants, archaea, some bacteria, and even certain types of fungi. As with any aspect of biological life, circadian rhythms are controlled by proteins that are central to the growth, development, and survival of the model organism. Just as how quantum physics is used in order to explain fairly complex concepts in modern physics, quantum biology employs quantum mechanics to explain complex ideas in modern biology. Quantum biology may play a major role in keeping the core clock in time by observing the overall system and searching for key regulatory proteins. Computational modeling is the process of digitizing and modeling a biological organism, system, or reaction chain in order to manipulate the environment, thereby observing the subsequent results. This work involved taking available modeling pieces and filling in the gaps to create a functional computational model for quantum mechanics on the circadian clock. By employing the use of western blotting in a separate project, we can identify how certain key proteins possess certain sequences and functions via observation.

(P.2) Optimization of Synthetic Rhodamine B Analogue Purification

Sarah Czuba, Pamela Lundin, and Keir Fogarty*
Department of Chemistry, High Point University

Rhodamine based derivatives are widely used for producing reliable fluorescent compounds used in advanced chemical applications. However, the effectiveness of their synthesis depends heavily on the purification process used to isolate the desired product from excess reagents, unreacted starting materials, and side products. Historically, Lundin lab efforts to synthesize various rhodamine B and fluorescein analogs have suffered challenges that arose from impurities that hindered both reaction efficiency and final product characterization. To address this, several purification strategies were investigated using an aniline monomer derivative of Rhodamine B to improve the quality of target compounds involved in a variety of rhodamine based synthetic reactions. Acid–base extraction protocols using hydrochloric acid, acetic acid, sodium carbonate, sodium bicarbonate, and selected mixtures were tested to remove residual starting materials and side products from crude reaction mixtures. These workup conditions were compared for their effectiveness in producing a cleaner monomer better suited for subsequent synthetic reactions of various rhodamine derivatives. Improving the reliability of this purification step is expected to enhance the consistency and performance of rhodamine derivatives in future synthetic and electrochemical studies.

(P.3) Efflux Inhibition in MRSA Using Loratadine

Bryce Grier, Meghan Blackledge, and Heather Miller*
Department of Chemistry, High Point University

Efflux pumps contribute significantly to antibiotic resistance in pathogens like *Staphylococcus aureus* and *Acinetobacter baumannii*, making infections harder to treat with conventional antibiotics. Loratadine, a widely used antihistamine, potentiates antibiotics that both these pathogens show resistance to. We hypothesized that loratadine may reduce efflux activity in strains of *S. aureus* and *A. baumannii*. Ethidium bromide (EtBr) efflux assays were used to monitor intracellular fluorescence as a benchmark for antibiotic efflux efflux function. High fluorescence levels indicates reduced efflux, as EtBr becomes trapped inside the cell when pumps are inhibited. Experimental conditions were optimized by adjusting glucose concentrations, incubation times, EtBr concentrations, bacterial concentrations, and reading intervals to enhance the sensitivity and consistency of the assays. In MRSA, treatment with loratadine led to increased EtBr retention, suggesting a decrease in efflux efficiency. A Δstk1 mutant was included to examine whether Stk1 (a possible loratadine target) may contribute to loratadine's efflux inhibition. Results did not confirm that to be the case, as there was minimal difference in efflux in comparison to the wild type. Similar fluorescence-based experiments were conducted on *A. baumannii* to determine whether loratadine's impact on efflux extends beyond *S. aureus*. In addition to efflux testing, accumulation assays were performed with and without loratadine to test if the disparity in rate of fluorescence gained was due to loratadine enhancing accumulation. These novel findings add to growing evidence that loratadine may help resensitize resistant bacterial strains by interfering with efflux-related mechanisms.

(P.4) Hidden Potential in Aquatic Fungi: Freshwater Fungi as Sources of Novel Neurodegenerative Treatments

Jordan Havert, Tyler Janick, and Grace Hamilton*
Department of Chemistry, High Point University

Alzheimer's disease is a neurodegenerative disorder that affects memory and cognitive thinking. Currently, medications like Donepezil help by inhibiting an enzyme called acetylcholinesterase (AChE), which breaks down acetylcholine, a chemical that's already reduced in Alzheimer's patients. However, these drugs can be expensive and have side effects. Therefore, alternative AChE inhibitors could be valuable drugs for the treatment of neurodegenerative disease. We therefore screened a collection of forty-three different freshwater fungi from Jordan Lake. In order to identify the fungi, we extracted DNA amplified of the Internally Transcribed Spacer region using various primer pairs. Successful amplicons were sequenced for species identification. In order to screen for acetylcholinesterase activity, we prepared fungal extracts and tested them for their ability to inhibit human AChE using colorimetric assay. In the assay, the positive results reduced the enzymatic activity more than solvent alone. So far, nine freshwater fungi have shown early signs of inhibition. Additionally in total, nine fungi from the library have been identified. This could potentially lead to a new source of AChE inhibitors for treatment of neurodegenerative diseases.

(P.5) Marine Mycelia: Coral Fungi as Novel Acetylcholinesterase Inhibitors

Tyler Janick, Jordan Harvert, and Grace Hamilton*
Department of Chemistry, High Point University

Coral reefs teem with life, yet their fungal inhabitants remain cloaked in obscurity. These marine fungi endure relentless assaults of salt, oxidative strain, and a ceaseless chemical arms race with neighboring microbes. Under such pressure, they forge unusual and potent compounds—molecules largely unknown to science. While terrestrial fungi have long gifted humanity with life-saving medicines, the ocean's fungal reservoirs remain a barely tapped wellspring. Acetylcholinesterase (AChE) catalyzes the breakdown of chemical signals essential for brain communication and memory. Inhibiting this enzyme is a treatment strategy for several neurodegenerative diseases, including Alzheimer's Disease. Although some fungi produce inhibitors of AChE, the potential of coral-associated fungi in this role remains almost entirely unexplored. In this study, we identified fungal isolates derived from coral ecosystems through DNA sequencing and assayed their chemical extracts for inhibitory effects on AChE using a colorimetric method. Several isolates, including *Rhodotorula diobovata*, *Aureobasidium melanogenum*, and *Penicillium antarcticum* displayed marked inhibition, surpassing control samples, revealing coral fungi as promising reservoirs of neuroactive compounds. This work opens a window into the vast chemical diversity hidden beneath the waves, heralding new possibilities for natural product discovery.

(P.6) Synthesis and Evaluation of Antibiotic Adjuvants from Carbazole Scaffolds

Kaley LeFevre, Sophie Gregory, Chloe Cox, Owee Kirpekar, and Meghan Blackledge*
Department of Chemistry, High Point University

Antibiotic resistance is a growing global threat, with over 2.8 million drug-resistant infections and 35,000 deaths reported annually in the U.S. alone. In 2019, antibiotic resistant infections caused an estimated 4.95 million deaths worldwide. Current approaches include developing new antibiotics, avoiding misuse, and spreading antibiotic stewardship awareness. However, they have had limited long-term success. Novel antibiotics that act on existing bacterial targets often face limited utility because the bacteria can rapidly evolve resistance as they have previously. Even if a new bacterial target is found, antibiotic treatment causes selective pressure that drives resistance to develop through natural selection. One emerging strategy to overcome these problems involves the development of antibiotic adjuvants. Antibiotic adjuvants are non-antibiotic compounds used in conjunction with existing antibiotics. Adjuvants overcome the bacteria's resistance mechanisms and allow antibiotics to work as intended. This research explores the synthetic expansion of carbazole scaffolds identified as active adjuvants in MRSA by the Blackledge and Miller labs. Our expanded carbazole derivatives are synthesized via nucleophilic addition of an epoxide linker to the nitrogen on the carbazole. One attractive feature of the epoxide linkers are their ability to be opened at the epoxide ring with a variety of nucleophiles. Once opened, the resulting product contains an alcohol group that acts as a hydrogen bond donor and acceptor, improving the compound's solubility in aqueous media. Although these reactions work well in theory, elevated humidity during the summer has introduced complications in synthesis, prompting the development of potential variations in the reaction. Reaction modifications, comparative yields and purities, and discussions of next steps will be presented.

(P.7) Exploring Greyscale Lithography Functionally

Megan Mueller, Caitlyn Wingeart, Aubrey Fessler, and Jacob Brooks*
Department of Physics, High Point University

Greyscale photolithography is a microfabrication technique that can be used for patterning photoresist on a silicon wafer substrate. These patterned surfaces can be used as molds for soft medical surfaces/implants, for microfluidic devices, and for super hydrophobic surfaces. In contrast to standard binary photolithography, the greyscale mode allows the user to moderate the local UV exposure dose for the photoresist. The benefit to using greyscale photolithography over the standard binary operational mode is the ability to control the vertical behavior of the three-dimensional microstructures. Rather than vertical sidewalls seen with binary operation, greyscale lithography allows for a continuous variation in photoresist thickness, leading to the creation of complex surface topographies and varying functional surface layouts. We focused on designing surfaces with the Heidelberg (μMLA) for use in biofilm prevention and hydrophobic surface applications. In practice, 3D surface designs must be able to be described using mathematical formulas in a $z(x,y)$ format. We used a Python script to convert from mathematical formulas to bitmap outputs. The script also allowed us to organize bitmap design units into regular arrays. In parallel to bitmap design, we characterized the processing parameters for the ma-P 1275G greyscale photoresist. Characterization efforts focused on development, spincoat, exposure, and development parameters first in binary mode. Later efforts explored feature size limitations. Characterization efforts resulted in successful exposure of the ma-P 1275G resist in greyscale mode as well, with results verified via SEM cross-section imaging. We observed unexpected curvature in some greyscale features, most noticeably with our "trench" function. We plan to account for this effect by adjusting the input function for the bitmap. So far, this has proved to be a tedious but cost-efficient solution to the overexposure issue. Future work will focus on refining exposure strategies and exploring complex surface geometries for functional applications in greyscale.

(P.8) Metal Matters: Metallic Preference and Function in HeCA for CO_2 Conversion

Gabriella Orecchio, Garland Greene, and Kelsey Kean*
Department of Chemistry, High Point University

Tardigrades, a type of extremophile, can survive under extreme conditions like high temperatures, extreme pH, and the vacuum of space. The Kean lab focuses on studying tardigrade proteins which allow them to survive and thrive under extreme conditions. We studied specifically an α-carbonic anhydrase (HeCA) from *Hypsibius exemplaris.* We successfully recombinantly expressed and purified HeCA. We examined metal preference with the use of a colorimetric assay and studied the physiological function of our protein with a CO_2 hydration assay. Understanding metal preference and the physiological function of proteins with stability under extreme conditions can help lead to applications of HeCA in carbon capture and the degradation of CO_2 emissions. We plan to further classify HeCA based on metal preference and maximize CO_2 hydration efficiency.

(P.9) Micropatterned Surfaces as a Passive Strategy Against MRSA

Lauren Rumble, Caitlyn Wingeart, Meghan Blackledge[2], Jacob Brooks[1], and Briana Fiser*,[1]
[1]Department of Physics, High Point University
[2]Department of Chemistry, High Point University

The increasing prevalence of bacterial infections and the rapid rise of antimicrobial resistance (AMR) pose significant global health challenges. According to the World Health Organization, in 2019, AMR was directly responsible for approximately 1.27 million deaths and associated with nearly 4.9 million deaths worldwide. As bacteria continue to adapt to antibiotics, there is a growing urgency to develop alternative strategies to prevent infections. One promising approach is the use of microscale surface patterning to reduce bacterial adhesion and biofilm formation—critical early steps in infection. In this study, we utilized photolithography to fabricate micrometer-scale hole patterns in a photoresist-coated silicon wafer, forming a master mold. This mold was then used to cast polydimethylsiloxane (PDMS) replicas of the patterned surface. Once cured and punched, these PDMS punches were placed into 48-well plates for testing with *Staphylococcus aureus* (MRSA). By physically disrupting bacterial attachment, these microtopographies may offer a passive, chemical-free method for preventing infections. If effective, such surface modifications could be integrated into surgical tools, catheters, or implants to reduce the risk of bacterial infection during medical procedures. Ultimately, this strategy could decrease the reliance on antibiotics and help slow the spread of antibiotic resistance.

(P.10) Investigating Phantom Partials in Stringed Instruments

Zachary Ready, and Eric Rokni*
Department of Physics, High Point University

The sound of a piano consists of multiple frequencies that contribute to its unique tone. The fundamental frequency is the lowest frequency and determines the perceived pitch while harmonics occur at integer multiples of the fundamental frequency and enrich the tone. In addition to these, irregular frequencies known as phantom partials occur at sum and difference frequencies of the harmonics and contribute to the unique timbre of a piano. While phantom partials were previously attributed solely to forced longitudinal movement in the piano's string, recent work suggests that nonlinearities in the instrument's wooden structure play a more significant role. In this study, we explore whether phantom partials are unique to the piano or appear across other wooden stringed instruments. To investigate this, each string on a guitar, banjo, violin, and cello were plucked while three accelerometers and a microphone measured the resulting frequencies. Phantom partials appeared in each instrument with the cello producing the most and the guitar producing the least. Future work will focus on finding where exactly the phantom partials are generated within an instrument. This will allow for more accurate mathematical modeling, which may improve music synthesis and support applications such as fault detection in wooden parts.

(P.11) Assessing the Activity and Molecular Targets of Novel Antibiotic Adjuvants in MRSA

Gabriel Valenzano, Meghan Blackledge*, and Heather Miller*
Department of Chemistry, High Point University

Methicillin-resistant *Staphylococcus aureus* (MRSA) has been a growing problem to treat due to its general resistance to beta-lactam antibiotics such as oxacillin. Previous research has investigated adjuvant compounds that assist in combating MRSA by inhibiting the cells' resistance mechanisms. Serine threonine kinase 1 (STK1) is a master regulatory protein that has evidence to suggest that it is a molecular target of these adjuvants. Molecules we study might be effectively inhibiting this key component to various regulatory processes in the cell such as antibiotic resistance and biofilm formation. We hypothesize that derivatives of these adjuvant compounds could be more effective antibiotic adjuvants in vitro. To test this, various synthesized derivatives will be tested for activity through repotentiation assays, combining adjuvant compounds with oxacillin. To further confirm that the adjuvant binding site is present in STK1, a target blind gravity column method with ATP resin will be used to capture any ATP-binding proteins. Additionally, a streptavidin agarose resin method for assisting with compound-protein binding complexes will be used if needed. Different adjuvant concentrations will be used to elute any proteins before being imaged through SDS-PAGE and identified by mass spectrometry. The results gathered from these assays will indicate which compounds are best at inhibiting the resistance of MRSA in the presence of an antibiotic and what proteins are being bound by the adjuvants. These results should give insight into how the adjuvant compounds interact with MRSA targets at the molecular level.

FRIDAY, JULY 25 POSTER PRESENTATIONS PART B (11:30 am – 12:30 pm):

(P.12) Potential Neuroprotective Effects of D-9-THC Against Oxidative Stress in Neuronal Cells

Julia Crenshaw, Catherine Summerow, and Michael Grider*
Department of Neuroscience, High Point University

After passage of the US Farm Bill in 2018, which excluded hemp from the legal definition of marijuana, the use of cannabinoids amongst Americans has increased. Tetrahydrocannabinol (THC) as well as cannabidiol (CBD) are two of the most used cannabinoids. Early in-vivo studies indicate that these compounds are neuroprotective. However, research has yet to determine the potential antioxidant effects that THC and CBD may have directly on neuronal health. We used two neuronal cell lines, RN46A and RN46A-B14, to test the neuroprotective qualities of D-9-THC against hydrogen peroxide induced oxidative stress. Many trials were conducted to determine the most effective injury concentration before investigating the effects of D-9-THC. Preliminary results suggest that lower levels of D-9-THC could have neuroprotective properties against injury from hypoxia. These concentrations are lower than the physiological levels of Delta 9 THC typically found in plasma of a person who has consumed marijuana. In the future, the Grider lab sets out to investigate the neuroprotective qualities of CBD as well as the role BDNF plays in assisting in neuronal cell survival.

(P.13) Exploring Rheological Properties of PDMS Blends to Obtain Insight on Biofilm Adhesion

Aubrey Fessler,[1] Megan Mueller,[1] Caitlyn Wingeart,[1] Meghan Blackledge,[2] Briana Fiser,[1] and Jacob Brooks*[,1]
[1]Department of Physics, High Point University
[2]Department of Chemistry, High Point University

Rheometry is a technique used to study how materials deform and flow under different levels of stress and strain. The goal of this study is to use rheometry to investigate the viscoelastic properties of biological materials, specifically bacterial biofilms. We examined the rheological properties of USA100, a hospital-acquired biofilm-forming strain of methicillin-resistant *Staphylococcus aureus* (MRSA), to inform future studies on biofilm formation on PDMS and other materials. This experiment provided preliminary data for understanding biofilm behavior, particularly its response to applied stress, in addition to other material and mechanical properties. We tested biofilms grown under both static and shear conditions, as previous literature indicates that biofilms grown under shear are more resistant to removal. Future work will involve refinement of the experimental protocol and development of a disposable testing chamber to contain biohazard materials effectively on the rheometer. We also plan to investigate the mechanisms by which the biofilm adheres to the substrate.

(P.14) Radio Frequency (RF) Sputtering of SiO_2 Thin Films for Buried Graphene Nanofabrication Applications

Sara Hamidpour and Sean Johnson*
Department of Electrical Engineering, High Point University

Physical vapor deposition (PVD) techniques such as radio frequency (RF) magnetron sputtering and electron beam (e-beam) evaporation are generally used to fabricate uniform thin films used in electronic and optical devices. Building on these techniques, RF sputtering offers precise control over deposition conditions, making it especially useful for producing dielectric layers. In this context, RF sputtering was used to deposit silicon dioxide (SiO_2) onto graphene/SiO_2/Si chips with 300±10 nm thermal oxide layers, and chemical vapor deposition (CVD) graphene characterized by Raman spectroscopy. Deposition parameters included 150 W RF power, 3.6×10^{-6} Torr base pressure, 5 mTorr working pressure, and 8-minute deposition run time. Ellipsometry measured the resulting SiO_2 thickness at ~21 nm, which was confirmed by atomic force microscopy (AFM), along with verification of surface uniformity. The results show RF sputtering as a precise and consistent method for dielectric layer deposition for future buried graphene nanofabrication processes.

(P.15) Use of Atomic Force Microscopy and Ellipsometry to Confirm Thickness Measurements of Sputter-Deposited SiO_2 Thin Films

Vovi Lagutin and Sean Johnson*
Department of Electrical Engineering, High Point University

Atomic Force Microscopy (AFM) and Ellipsometry are excellent tools for characterizing thin films and precisely measuring nano-scale thickness of materials. In this study, the characterization methods of AFM and Ellipsometry were used to confirm thickness measurements of an SiO_2 deposition. Sputtering was used to deposit a thin film of SiO_2 onto an Si/SiO_2 wafer. Ellipsometry was used to measure the thickness of the pre-deposited SiO_2 of the wafer, while the thickness of the deposited SiO_2 onto the wafer was validated using both Ellipsometry and AFM. The results of Ellipsometry rendered the pre-deposition thermally grown SiO_2 thickness to be ~275 nm while the post-sputter deposition SiO_2 thickness was ~367 nm. This equated to a fine estimate of ~92 nm thickness. The results of AFM further validated the findings of Ellipsometry by confirming an approximate 92 nm thickness. Both characterization methods rendered agreement with each other, showing similar measurements in deposition thickness.

(P.16) Before the Bump: Exploring the Role of Dehydration Prior to Receiving a mild TBI on Long-Evan Rats

Alexandra Shutters, Harlie Culbreth, Isabella Frankovic, and Bill Kochen*
Department of Neuroscience, High Point University

Combat athletes face a heightened risk of mild traumatic brain injuries (mTBI) due to the inherent physical contact with their sport. These athletes also frequently undergo extreme weight-cutting practices, often involving significant dehydration, to meet competition weight classes. When hydration is diminished, the protective fluid surrounding the brain is left vulnerable due to fluid reduction. This study investigates whether there is an effect between dehydration and mTBI severity. The mass of each individual rat was recorded, from there some of the rats were set to undergo a pre-determined dehydration regimen over the course of 48-hours, in which water access was restricted and then free access was returned for another 24 hours. Rat body mass did not significantly change between dehydration and rehydration. Rats received either a mTBI by a 200-gram weight dropped from 18-inches or a sham injury. Following the mTBI or sham treatment, some rats were immediately euthanized to evaluate any potential acute impacts. The remaining rats went through a series of behavioral tests: novel object recognition, elevated zero maze, and the cookie test, and were later euthanized. Preliminary findings indicate that gender, mTBI, and dehydration interact to significantly alter behavior ($p < 0.05$). Post-hoc multiple comparisons reveal a complex effect of gender, treatment, and injury. Data collection will continue into the fall semester. If future research continues to demonstrate significant findings, this could indicate that the dehydration practice utilized to cut weight is unhealthy and alternative weigh-in procedures should be implemented.

(P.17) Septin-Septin Interactions in Fungi

Shauna Skow, and Grace Hamilton*
Department of Chemistry, High Point University

Septins are cytoskeletal GTP-binding proteins that play an important role in processes like cell division and polarity, especially in fungi. In *Knufia petricola*, AspE is a non-essential septin that interacts with the core septin Cdc11. Previous work has shown that AspE binds GTP and slowly hydrolyzes it to GDP. However, we don't fully understand how AspE's ability to bind and hydrolyze GTP influences those interactions. This project focuses on figuring out whether AspE needs to bind a nucleotide in order to interact with Cdc11. For this experiment, I used site-directed mutagenesis to make specific mutations in AspE's predicted GTP-binding pocket. These mutations were designed to interfere with its ability to bind or hydrolyze GTP. Then, I used colorimetric nucleotide hydrolysis to see if the mutant versions of AspE could still bind and hydrolyze GTP. In parallel, I ran yeast two-hybrid (Y2H) assays to test whether these mutations also affected AspE's ability to bind Cdc11. By combining results from both the GTP hydrolysis and Y2H assays, I was able to look more closely at how nucleotide binding might regulate AspE's interactions with other septins, allowing for a deeper understanding of septin function and regulation. Overall, this will give us a clearer picture of AspE's role in fungal cell biology.

(P.18*)* How Fire Severity Effects Species Change

Gianni M. Travaglini, Lauren Marra, and Dane Kuppinger*
Department of Biology, High Point University

Fire is an essential part of ecosystems, allowing for nutrient cycling and new species of plants to appear. This research investigated the variable effects of fire on the regrowth of vegetation at Pilot Mountain State Park to increase understanding of vegetation regrowth patterns after fire in this region. We hypothesized that fire severity should be negatively correlated with canopy cover and positively correlated with understory growth. We resampled standard Carolina Vegetation Survey (CVS) vegetation plots (20m X 50m) originally sampled in 2002 and recorded the DBH of each stem reaching breast height. This was then used to calculate the basal area for understory and canopy trees. Each plot was in a different area of Pilot Mountain allowing for an assessment of the interactions between fire and other variables. Basal area calculations from 2002 were compared to those from 2025 to assess the effects of fire between sampling dates. Fire was more severe on steeper sloped plots and those on southwestern aspects compared to eastern or northern slopes. It was also important to note that the understory of Plot 806 had a near total dominance of *Robinea pseduoacacia* in the understory, likely due to wind damage to the canopy. The hypothesis that fire severity should negatively correlated with canopy growth and positively correlated with understory growth was supported by the basal area coverage in the understory being higher than the basal area in the canopy trees. More data will be necessary to get a better representation of Pilot Mountain's vegetation. Additional plots on different aspects and slopes and in different topographic positions would give a better understanding to see how fire severity interacts with these variables to cause changes in species dominance.

(P.19*)* Circadian Protein Interactions and Phosphorylation of mTOR in *Neurospora crassa*

Sierra Werner and Alexander Mosier*
Department of Biology, High Point University

Circadian biology is a long-endured study focusing on the day long feedback loop that serves in “telling time” for cells within an organism. The core clock architecture is conserved in *Neurospora crassa*, making this organism to be the model organism for these series of experiments regarding the circadian cycle. An essential protein of this feedback loop is Frequency (FRQ), this protein has been found to interact with numerous different proteins at different time intervals of the cycle. For this experiment, the protein mTOR, which serves in regulating development and growth of cells, has an indirect connection with FRQ through different kinases and other proteins. Many of these connecting proteins serve to phosphorylate the circadian cycle, which is a major component to keeping the cycle functional and act to regulate further downstream processes. Through the use of western blots, similar timings were found to be between these proteins in attempts to better piece together the web of interactions involved in the circadian cycle. A smaller continuance of this project is looking at the quantum biology of the circadian cycle through Python.

2025 SuRPS Faculty Participation and Projects

Department of Biology

Dr. Daniel Greene (Community Ecology, Entomology, and Landscape Ecology)

Characterization of arthropod diversity and abundance across various habitats and disturbance gradients in the southeastern U.S.

In the Greene lab, we are interested in measuring how arthropod community patterns change across managed and natural landscapes in response to/alongside environmental gradients (e.g., climatic and landscape data). Specifically, we are researching how the abundance of various arthropod taxa/functional groups (e.g., ants overall, decomposers, predators, etc.) differs across ecotones and disturbance (e.g., urbanization and/or fragmentation) gradients. Additionally, we are interested in assessing if biodiversity and/or abundance trends are consistent across arthropod and taxa/functional groups and sampling methods. We assess arthropod communities occupying macro- and micro-habitats (e.g., the arthropod community living within bryophytes) with commonly used sampling techniques (e.g., pitfall traps and leaf litter collection) and innovative capture methods to answer our questions. We also collect local environmental data via deployable sensors and utilize geospatial land cover data layers (e.g., USDA Copland Data Layer) to understand how arthropod communities are spatiotemporally structured. We spend our time identifying a wide variety of arthropods, learning different ecological modeling and mapping techniques, understanding our findings within the context of climate change, and enjoying our fieldwork! We love to collaborate and learn from others' experiences, so please reach out if you are interested!

Dr. Dane Kuppinger (Plant Community Ecology)

Fire history and fire effects in the Sauratown Mountains of North Carolina

The southeastern United States contains isolated forest communities that are dependent upon fire to maintain their structure and species composition. Fire effects are dependent upon fire frequency, seasonality, and intensity, so the local fire history significantly influences community composition. Luckily this history is preserved by scars present within annual growth rings of some of the surviving trees. Pilot Mountain and Hanging Rock State Parks just north of HPU both contain fire dependent plant species, yet the abundance of fire adapted species differs between them.

Dr. Ken McKenna (Developmental Biology)

Developmental genetic basis of larval color plasticity in the painted lady butterfly

Caterpillars display an amazing diversity of color patterns on their dorsal integument, ranging from brilliant greens and reds, to complex groupings of black and white. In the painted lady butterfly, *Vanessa cardui*, larvae display black bodies with simple white stripes along the dorsal midline. Recently, our lab discovered that this color pattern is sensitive to environmental temperature. When grown at temperatures as warm as 45°C (113°F), the caterpillar becomes almost entirely white. We are interested in determining the mechanism by which the color changes in response to temperature. In insects, integument color is produced via the melanin synthesis pathway. Tyrosine is converted to melanin via two intermediate enzymes, tyrosine hydroxlyase and dopadecarboxylase. We are using a diverse array of experimental approaches to uncover the developmental mechanism of integument patterning and plasticity.

Dr. Alexander Mosier (Circadian Biology)

Unveiling the Regulation of and by the Molecular Clock

The Mosier lab studies the circadian clock, a molecular mechanism keeps time so that the organism can be proactive rather than reactive to changes due to the Earth's day/ night cycle. This core clock is conserved across all branches of the tree of life. The first area of focus of the research is investigating how the core clock relays this temporal information through protein-protein interactions. Through the use of Western Blot analysis and Mass Spectrometry we look at protein function and regulation as influenced by the core clock mechanism. The second part of the lab is looking into the novel field of quantum biology and studying how quantum mechanics impact and regulate the clock's functionality. By developing computational models to simulate changes in basic quantum process we can begin developing an understanding of the impact these have on the core clock.

Department of Chemistry

Dr. Meghan Blackledge (Medicinal Chemistry)

Synthesis & Evaluation of Novel Compounds to Treat Bacterial and Parasitic Infections

The Blackledge Lab is interested in the development and study of small molecules that can be used to combat infections. For several years, our focus has been on studying compounds that reverse antibiotic resistance and restore the efficacy of common antibiotics against medically relevant bacteria. More recently, we have identified compounds that arrest the growth of neurological parasites and are working with collaborators to understand the mechanisms by which they act. Our lab is equal parts synthetic chemistry and microbiology and we have projects in each area for interested students. See below for more details!

Synthetic Chemistry Projects: Students who have an interest in synthetic organic chemistry will work to make libraries of molecules for further study. You will learn how to set up and monitor reactions, extract and purify your products, and characterize the structures to ensure compound identity and purity. Compounds may be tested in any number of medically relevant bacteria (MRSA, A. baumannii, E. coli, etc.) or against parasites of interest, depending on their structures. Students who have finished organic chemistry I and II are particularly encouraged to apply, but successful completion of general chemistry I and II is sufficient for working on these projects.

Microbiology Projects: In the microbiology lab, we have two main projects: (1) evaluation of small molecules as antibiotic adjuvants and (2) evaluation of compounds and surfaces to combat bacterial biofilms. Project 1 (adjuvants): Several of our small molecules have been able to modulate transcription of antibiotic resistance genes, effectively silencing resistance to common antibiotic classes. We are actively testing new compounds for activity as well as testing our library of compounds against different species of bacteria to discover further biological activities. Students will gain basic microbiological skills and clinical assays including broth microdilution MICs, checkerboard assays, and colony counts. Project 2 (biofilms): We commonly think of bacteria as lone, unicellular organisms. However, most bacteria in the environment exist in 3-dimensional communities referred to as biofilms. Biofilms can grow nearly anywhere but are particularly good at growing on human tissues (skin, teeth, eyes) and on indwelling medical devices like catheters and dental or orthopedic implants. It is estimated that ~80% of chronic infections are caused by a bacterial biofilm. In collaboration with labs in Chemistry and Physics, we are actively investigating ways to combat these biofilms through potentially therapeutic small molecules or by modifying the substances that make up medical devices to prevent biofilm formation and breakup existing biofilms. Students will gain experience evaluating bacterial biofilms under both static and flow conditions and will learn how to quantify biofilm formation quantitatively and qualitatively through staining and various microscopic visualization methods.

Dr. Keir Fogarty (Analytical & Fluorescence Chemistry)

Exploring Fluorescence Sensing Technology Using Rhodamine B Derivatives

The Fogarty lab's research focus lies in the field of analytical and materials fluorescence science. We have built a laser-based, single molecule fluorescence (SMF) instrument, developed fluorometry methodologies, and have developed 3D-printed fluidics for fluorescence assays. Our main project collaborates with the Lundin lab at HPU to develop novel, color-changing fluorescent molecules that can be used as fluorescent pH, UV, humidity, and electrochemical sensors with applications in environmental, biological, and optoelectronic areas of technology.

Dr. Grace Hamilton (Biochemistry)

Identifying genetic bases of fungal extremotolerance and cell shape plasticity

How do some fungi survive conditions that would be lethal to most other eukaryotes? Does their ability to change cell shape contribute to this extremotolerance? We will explore these questions in the model black fungus *Knufia petricola*, using RNA-seq to identify genes involved in cell shape change, CRISPR to knock out genes of interest, and recombinant protein biochemistry to study the cytoskeletal proteins that control cell shape and cell division. This project would be suitable for biochemistry, biology, or chemistry majors interested in learning the tools of molecular biology and protein biochemistry— and in exploring the limits of eukaryotic life.

Dr. Kelsey Kean (Biochemistry)

Studying extreme proteins from extreme organisms

Proteins are among the most abundant and functionally diverse biomolecules with the ability to carry out unique and specific functions and chemistries. In the Kean Lab, we are interested in understanding how proteins evolve and are able to carry out their unique and specific chemistries. A key piece to understanding how proteins work – when working correctly, when behaving aberrantly, or when being engineered for a new function – comes from exploring and understanding protein structure and function on a molecular level. One area of interest in our group is understanding proteins from extremophiles, organisms that can survive extreme conditions such as pH, temperature, and even the vacuum of space. In order to survive, these organisms must have very stable proteins. We are curious to know how these proteins work and what makes them so stable. Student researchers in the Kean Lab will have the opportunity to learn techniques in molecular biology, biochemistry, and structural biology.

Dr. Heather Miller (Molecular Biology & Biochemistry)

Disruption of virulence and antibiotic gene expression in MRSA

The Miller Lab is engaged in a range of collaborative research projects designed to explore critical molecular aspects of human pathogens. One of our main goals is to understand mechanisms through which novel antibiotic adjuvants we are studying exert their effects. We have data that supports multiple antibiotic adjuvants working against methicillin-resistant *Staphylococcus aureus* (MRSA), as well as other human pathogens. These antibiotic adjuvants likely bind and inhibit a major regulatory protein in *S. aureus* called serine-threonine kinase 1 (Stk1). In doing so, many downstream gene expression changes occur, dismantling *S. aureus* virulence.

Summer projects will focus on at least two areas: 1) examining the consequences of Stk1 inhibition using a human cell culture infection model. These experiments aim to understand the role of Stk1 in the regulation of cellular processes during infection. Students will employ advanced techniques in human cell culture and reverse transcription-quantitative PCR. 2) examining high-throughput RNA-seq data from multiple strains of MRSA to identify consequences of antibiotic adjuvants on gene expression. These experiments aim to shed light on which MRSA genes are always disrupted by adjuvant molecules and determine if these changes correlate with the bacteria's genetic background or environment in which it is acquired by humans. These analyses will offer predictive ability to other medically relevant MRSA strains. Students will gain experience in bioinformatic tools, as well as reverse transcription-quantitative PCR.

Department of Neuroscience

Dr. Mike Grider (Neuroscience)

Plant-Derived Molecules for Neuroprotection Against Hypoxic Injury

Members of the Grider lab will be exploring the role of hypoxia during development and following injury to the central nervous system. This summer, we will focus our research on identifying novel small molecules, derived from natural sources, that confer neuroprotection against an in vitro model of an ischemic stroke.

Using sterile cell culture techniques on neuronal cell lines and human stem cells, students will be performing biochemical and survival assays to uncover and define mechanisms of protection. The project will also involve collecting RNA for conducting transcriptomic analysis for the generation of additional hypotheses.

By the end of the project, students will have developed essential laboratory skills, including sterile culture techniques and data analysis. They will also enhance their ability to communicate scientific findings effectively through poster presentations.

Dr. William Kochen (Behavioral Neuroscience)

Dehydration and Traumatic Brain Injury

The Kochen lab studies environmental influences on neurodegenerative disorders including Traumatic Brain Injury (TBI) and Alzheimer's Disease utilizing rodent models. This summer, the Kochen lab will be conducting a study investigating the effect of dehydration on TBI. Boxers, martial artists, and other combat athletes dehydrate themselves immediately prior to a fight to bring down their weight. Some of these athletes are so dehydrated they cannot produce saliva. These athletes receive concussions during the fight which occurs soon after weigh-in. No study has adequately investigated if pre-injury dehydration changes the outcome of TBI.

Students involved in this study will be trained in all aspects of animal research including handling of animals, running and analyzing behavioral tasks, TBI induction, perfusion, and tissue collection. Students will be trained to full independence in most of these tasks. Following tissue collection, students will be trained in brain/organ dissection using a cryostat followed by tissue analysis utilizing immunohistochemistry, ELISAs, and Western Blots. Following tissue analysis, students will prepare and analyze all collected data for presentation and publication.

Department of Physics

Dr. Jacob Brooks (Physics, Biophysics, and Materials Science)

Interfacial Physics: Microscopic Surface Innovation & Biofilm Dynamics

These interdisciplinary research projects aim to use photolithography techniques to fabricate and study microfluidic channels with passive and active fluid flow control capabilities and to tackle biofilm formation and adhesion through cutting-edge surface design and rheological exploration. Utilizing advanced photolithography techniques, we develop micro-scale patterned surfaces with passive and active functionalities.

Our research on active surfaces primarily targets precise fluid manipulation in microfluidic channels. Active surfaces leverage magnetically actuated flexible micropillars to enable local control of fluid transport and mixing. This approach offers a promising pathway for applications requiring dynamic control over microscale fluid environments, including lab-on-a-chip devices and microreactors.

Simultaneously, our work on devices with passive surfaces is focused on creating innovative manufacturing methods to prevent biofilm formation on medical devices, such as catheters and implants. We tailor surface micro-patterns to disrupt biofilm adhesion at its inception, offering a scalable and practical approach for safer, long-lasting medical applications.

To deepen our understanding of biofilm behavior, an additional project will employ advanced rheological methods to quantify mechanical properties of biofilms, including surface adhesion. These data will inform the design of both passive and active surfaces by quantifying biofilm response to mechanical shear forces from external fluid flow or from active microstructures.

Furthermore, there may be other research opportunities with computational modeling for the projects described above or for exciting new projects. By integrating microfabrication, fluid dynamics, and rheology, these projects aim to develop transformative technologies for biomedical and industrial applications, advancing both our understanding and control of biofilm-surface interactions.

Dr. Briana Fiser (Physics)

Surface Patterning Analysis for Biofilm Prevention

The Fiser Lab applies nanoscale techniques to investigate the physics of biological systems, with projects in the fields of polymer physics, fluid dynamics, and biomimetic micro and nanotechnology. Biomimetic technologies allow scientists to both harness the power and creativity of nature and isolate and explore the contribution of individual components within complex processes, such as the resistance to bacterial adhesion exhibited by some surfaces. As an example, the surfaces of both the lotus leaf and cicada wing have micron-sized structures that effectively prevent bacterial colonization through surface hydrophobicity or rupture. Such patterned surfaces show promise as a blueprint for developing new technologies to fight bacterial growth on surfaces. Of particular impact and interest are surfaces used frequently in the field of human health, such as catheters, IVs, or cardiac stents. Bacterial biofilms cause up to 80% of chronic bacterial infections, and their growth on these indwelling medical devices is particularly difficult to treat due to their presence inside the human body and the rise in antibiotic resistance, which is expected to outpace cancer and diabetes combined by 2050. Projects this summer will explore the design and fabrication of patterned nano- and microscale surfaces with applications toward combating the growth of bacteria on silicone indwelling medical devices.

Dr. Eric Rokni (Physics)

Investigating Acoustic Phenomena in Medicine and Music: Twinkling Artifacts and Phantom Partials

Research in this lab explores the interdisciplinary field of acoustics. Students joining the lab may choose to focus on either Biomedical or Musical Acoustics. Both research tracks emphasize hands-on experimental work supported by computational analysis. Students will gain valuable skills in acoustics, measurement techniques, and experimental design, making this ideal for students interested in the intersection of physics, engineering, and applied science.

Biomedical Acoustics: This research track focuses on the fundamental physics of medical ultrasound with projects aimed at understanding phenomena such as the Doppler ultrasound twinkling artifact. The twinkling artifact is observed on mineralizations (e.g. kidney stones) and is thought to result from ultrasound scattering off microbubbles. Current research aims to understand how different bubble distributions affect the twinkling artifact. Students will gain practical experience using diagnostic and therapeutic ultrasound equipment, conducting underwater acoustic measurements, and fabricating biological-mimicking samples.

Musical Acoustics: This research track delves into the physics of musical instruments, focusing on phenomena such as phantom partials. These inharmonic tones, originally attributed to forced longitudinal motion in piano strings, have been shown to arise from nonlinearities in the instrument's wooden structure. Ongoing research aims to expand this understanding to other instruments, such as the cello. Students will learn to make precise sound measurements using speakers and microphones, analyze frequency data with FFT techniques, and design experimental fixtures using 3D printing and related tools.

Department of Electrical Engineering

Dr. Sean Johnson (Semiconductor Materials and Device Characterization) *Optoelectronic characterization of 1D and 2D nanostructures on Silicon and Graphene*	1D and 2D nanostructures have shown considerable advantages in optoelectronic characterization metrics such as responsivity, detectivity, and low dark current, in comparison with bulk structures. Surface interactions with these structures and the growth substrate can affect the quality of the desired metrics. Though silicon is the substrate of choice, the gapless material graphene has demonstrated valuable attributes suitable to the advancement of photonics and optoelectronics. 1D and 2D semiconductor photodetectors on various substrates are to be studied, modeled via Matlab and COMSOL, and characterized. III-V nanowire-based photodetectors, which were fabricated in conjunction with the Joint School of Nanoscience and Nanoengineering (JSNN) in Greensboro, NC, and the Shared Materials Instrumentation Facility at Duke University in Durham, NC are also analyzed.

SuRPS 2025 Seminar Series

Wednesdays at 11 am, Wanek School of Natural Sciences

Date	Name	Affiliation	Seminar Title
Friday, June 6	**Dr. Christina Hugenschmidt** Associate Professor	Division of Gerontology & Geriatric Medicine Wake Forest University School of Medicine Winston-Salem, NC	*Exploring the Neuroscience of Creative Movement and Its Effects on Health and Well-Being*
Wednesday, June 11	**Dr. Shabnam Hematian** Associate Professor	Department of Chemistry University of North Carolina at Greensboro Greensboro, NC	*Curious Molecules and Unexpected Paths: A Scientific Journey Through Redox Chemistry*
Wednesday, June 18	**Dr. Virginie Papadopoulou** Associate Professor	Department of Radiology and Lampe Joint Department of Biomedical Engineering University of North Carolina at Chapel Hill Chapel Hill, NC	*Engineering Ultrasound Tools for Human Health and Extreme Environments: From Biomedical Applications to Sea and Space*
Wednesday, July 2	**Dr. Andreas Gahlmann** Associate Professor	Departments of Chemistry, Molecular Physiology & Biological Physics, and Biomedical Engineering University of Virginia Charlottesville, VA	*Single-Molecule Imaging to Determine the Stoichiometries and Lifetimes of Transient Protein Complexes in Living Cells*
Wednesday, July 9	**Dr. Danesha Seth Carley** Associate Professor	Department of Horticulture North Carolina State University Raleigh, NC	*Beyond the Bench: Tackling Tomorrow's Ag Challenges with PSI & CIPM at NC State*
Wednesday, July 16	**Dr. Kathryn Reissner** Professor	Department of Psychology and Neuroscience University of North Carolina at Chapel Hill Chapel Hill, NC	*Single Cell Imaging of Glia Reveals Mechanisms of Drug Craving*

Past SuRPS Keynote Speakers

Year	Speaker	Title
2015	**Rachael Parker, Ph.D.** HPU Chemistry 2011 *Virginia Tech*	*Statistical and combinatorial approaches to designing repeat proteins as recognition elements in microbial sensors*
2016	**Sarah Craven Seaton, Ph.D.** HPU Chemistry/Biology 2004 *UNC Asheville Biology*	*Soirées in the Soil: Bacterial Communication, Cooperation, and Competition in the Rhizosphere*
2017	**Laura Lee, Ph.D.** HPU Biochemistry/Physics 2012 *North Carolina State University*	*Boiling Bugs Break Biomass: An Investigation Into High Temperature, Cellulolytic Microorganisms*
2018	**Gavid Coombs, Ph.D.** HPU Biochemistry 2014 *Yale University*	*A Journey Through Research: Peptide-Catalyzed Atroposelective Coupling of Arenes and Quinones*
2021	**Hailey Parry, Ph.D.** HPU Exercise Science/Chemistry 2017 *National Institutes of Health*	*Key to Success – A Note to Future Graduates*
2022	**Elizabeth Reardon** HPU Biology 2017 *Emmes Company, LLC*	*Planting Seeds: A Perspective on Alternative Paths*
2023	**Calla Telzrow, Ph.D.** HPU Biology 2016 *RFI at PPD*	*Underappreciated & Underestimated: Implications of Human Fungal Pathogens and Genetic Approaches to Understanding Them*
2024	**Alan Vasquez Soto, Ph.D.** HPU Physics 2018 *UNC Chapel Hill*	*Exploring the Fast Transient Optical Sky & Developing New Technologies for the Argus Array*

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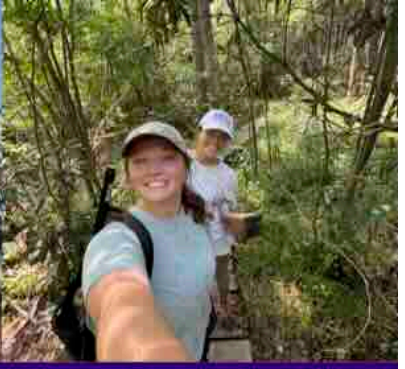
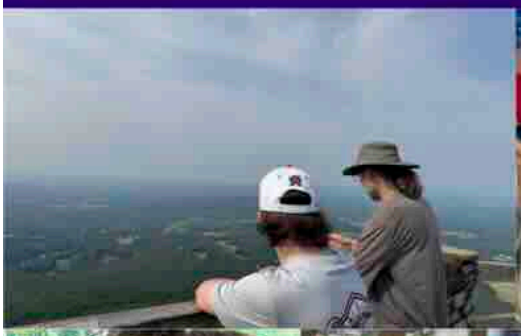


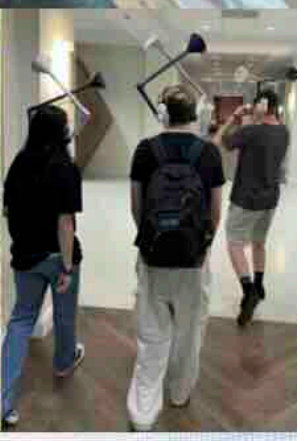
Scenes from SuRPS









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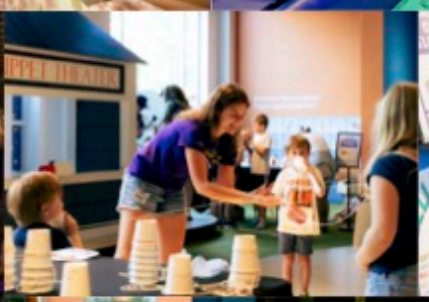

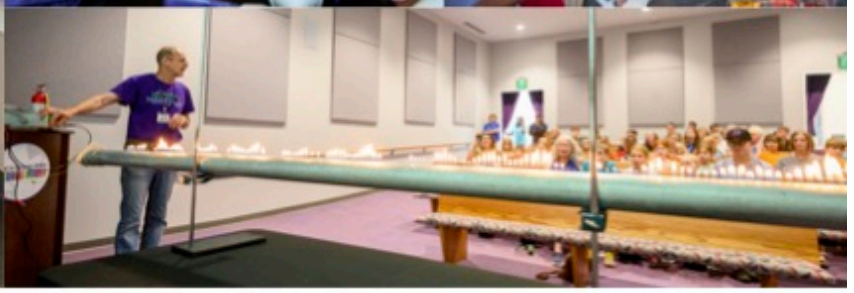

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