Office of Student Research

APPALACHIAN STATE UNIVERSITY

28th Annual Celebration of Student Research and Creative Endeavors

April 16, 2025

Full Program

Welcome to the ***28th Annual Celebration of Student Research and Creative Endeavors*** proudly sponsored by the Office of Student Research. Since 2005, the Office of Student Research (OSR) has supported opportunities for undergraduate and graduate students at Appalachian State to engage in mentored research and creative scholarship. We believe students who actively explore discovery in their fields are well-prepared to face the challenges of tomorrow.

We look forward to this event each year, and this year's celebration feels especially meaningful as our community continues to recover from the impacts of Hurricane Helene. The strong participation of students and faculty reflects the resilience we've witnessed time and again throughout this year. Applications for OSR Travel and Research Grants, as well as Undergraduate Research Assistantships, continue to grow—an encouraging sign of the campus-wide commitment to involving students in research and creative activities.

Today, we celebrate the culmination of these efforts with 152 student presentations — including 43 graduate students and 109 undergraduate students — showcasing Appalachian's unwavering dedication to student engagement. Faculty across campus have remained deeply committed to mentoring students and involving them in the research and creative process, and we are proud to support those efforts through the OSR.

Our students continually inspire us with their curiosity, hard work, and innovation. Yet, it's the exceptional dedication of our faculty mentors that truly makes this work possible. Their guidance and support allow us to highlight the incredible accomplishments of our students. To our student presenters: thank you for sharing your achievements with the campus community. Your projects have the potential to make a real difference, and we are proud of your dedication and contributions.

We are proud to support these student accomplishments, made possible by the support from the Office of Academic Affairs, Office of Research and Innovation, Office of Student Affairs, Cratis D. Williams Graduate School, and University College. Special thanks to Dr. Mark Ginn, Dr. Ted Zerucha, Dr. Christine Hendren, and the OSR staff—Kathy Weaver Stevens, Jack Scroggs, and Cole Shehan—for their continued efforts.

Thank you for joining us in celebrating the work of our students. We hope you leave today inspired by the creativity, curiosity, and collaborative spirit that defines our Appalachian community

Rebecca A. Battista, Ph.D., Director, Office of Student Research,
Professor - Department of Public Health and Exercise Science

Schedule of Events

Event Information

Doors Open at 8:30am.

All presentations occur on the 4th Floor Plemmons Student Union.

There is a **short break** between 12:00-1:00pm

Poster Competition Awards are announced at 12:45pm.

Poster Sessions include 2 sessions in the morning and 2 sessions in the afternoon.
Morning Session 1 - 9:00am -10:30am.
This session also includes the Poster Competition where Undergraduate and Graduate students were selected to participate based on reviews of their abstracts. They will present their poster to a panel of judges and the top 3 in each category will be selected.
Morning Session 2 - 10:40am -12:00pm
Afternoon Session 1 - 1:00pm - 2:30pm
Afternoon Session 2 - 2:40pm - 4:00pm

Poster boards are 4 feet by 4 feet. Numbers are assigned to posters - please look for your poster number upon arrival. Please arrive at least 10 minutes before your presentation to place your poster on the assigned board.

Oral Sessions include 2 sessions in the morning and 3 sessions in the afternoon.
Oral Session 1 - 9:00am - 11:20am
Oral Session 2 - 10:40am - 12:00pm
Oral Session 3 - 1:00pm - 2:20pm

Oral presentations are 20 minutes in length allowing for at least 5 minutes for questions. Please arrive at least 10 minutes before your scheduled session in order to upload your presentation. Please stay for the entire session. Oral presentations will occur in either room 415 or 417 Plemmons Student Union.

Poster Competition – 9:00am-10:30am – Parkway Ballroom
Posters PC 1 – PC 20

Graduate Student Poster Competition
Poster Competition 1
Caroline Fehlman, Geography Graduate Student - Masters
Faculty Mentor: Maggie Sugg, Geography and Planning
Co-Author(s): Maggie Sugg; Dennis Guignet; Zhiyuan Yao
Title: Maternal Healthcare Access Disparities in North Carolina, 2016-2019: A Fine-Scale Geospatial Analysis
The US maternal health disparities are not evenly distributed, with differences across geography, race, and socioeconomic factors. One key factor potentially driving maternal health disparities is maternal health care access, as research has shown access to providers such as obstetricians reduces adverse birth and maternal outcomes like preterm birth. This study examined the accessibility of maternal health care by providing the first fine-scale geospatial analysis of maternal health care access at the census block group level in North Carolina for 2016-2019. We used the Centers for Medicare and Medicaid Services National Plan and Provider Enumeration System dissemination database to geocode coordinates of maternal healthcare providers. Maternal health and infant individual-level data and the Area Deprivation Index community-level covariates were extracted to identify disparities in access. Accessibility was measured using the generalized enhanced two-step floating catchment area technique to compute spatial accessibility scores for healthcare providers. Measures of access were analyzed using multivariate multilevel analysis that accounts for individual—and community-level drivers and their association with maternal health and infant outcomes. Results show low-access regions have a higher incidence of severe maternal health and infant outcomes compared to middle and high-access regions, even after adjusting for key covariates (e.g., mother's race, etc.), such as preterm birth (PTB) (aOR 1.07, CI: 1.04 – 1.10) and pregnancy induced-hypertension (aOR 1.16, CI: 1.13 – 1.20). Effect modification results demonstrated that low access-regions had higher odds of PTB (OR 1.35, CI: 1.23 – 1.48) and low birth-weight (OR 1.43, CI: 1.30 – 1.57) for Non-Hispanic Black mothers compared to Non-Hispanic White mothers. Our work provides quantitative evidence of how limited access to clinicians influences maternal and infant outcomes in North Carolina.

Poster Competition 2
Jenna Hall, Biology Graduate Student - Masters
Faculty Mentor: Mary Kinkel, Biology
Co-Author(s): N/A
Title: THE ROLE OF GUT MOTILITY GENES IN ZEBRAFISH

Gut motility disorders are common, yet the causes are not well understood. Gut motility disorders impart a physical burden on those who suffer and also a healthcare burden due to lengthy treatments. Zebrafish are a model organism that share genetic similarities with humans but have simpler intestinal tracts, allowing gut motility to be more easily studied. The zebrafish intestinal tract has three clearly defined regions: the intestinal bulb, small intestine, and colon. My study aimed to 1) map expression patterns of genes of interest across the zebrafish intestine and 2) determine the role of the motilin receptor, which is known to be involved in gut motility in humans. To accomplish aim one, tissue samples were collected by dissection across the regions of the zebrafish gut. RNA was isolated from each tissue and reverse transcribed to cDNA. The cDNA was then amplified using PCR. Control genes were tested, including ada and ctsh. These genes were predicted to be region specific along the intestine, with ada expressed only in the bulb and ctsh expressed only in the small intestine. Unexpectedly, ada expression was observed in both the bulb and small intestine. Similarly, ctsh, was observed in both the intestinal bulb and small intestine. Next, I mapped the expression of ano1, a chloride channel known to be required for normal gut motility. The results showed that ano1 was observed in all three regions of the gut. This is significant, as ano1 is required for setting the pace of contractions along the gut. To accomplish aim 2, ANQ-11125 was used to antagonize the motilin receptor. Live fish were treated with the antagonist and then imaged across several hours to detect changes in gut motility. The assay showed that inhibiting the receptor caused delayed intestinal clearing compared to mock-treated controls. Understanding the genes required for normal gut motility will help to identify potential treatments for gut motility disorders.

Poster Competition 3
Kaylee Noble, Nutrition Graduate Student - Masters
Faculty Mentor: Alisha Farris, Nutrition and Health Care Management
Co-Author(s): Emily Bowles, Dr. Brook Harmon, Dr. Heather Schier
Title: Evaluating the Effectiveness of a Cultural Foods Course on Cultural Competence Through a Survey"
Cultural competence is a skill with increasing importance in the healthcare field due to changing cultural demographics in the U.S. Less than 20% of accredited nutrition and dietetics programs offer a course in cultural competence, and those that do focus more on basic cultural knowledge without offering experiences to enhance intercultural communication skills. The purpose of this study was to evaluate the impact of a Cultural Foods course on cultural competence in students from nutrition majors or minors. An anonymous survey was developed from 4 validated questionnaires. Questions were associated with a cultural competence construct of knowledge, skill, desire, awareness, or encounters. Students enrolled in a Cultural Foods course during the fall semester of 2023 were recruited to answer questions prior to and after the course. Descriptive statistics were used to analyze the data. Of the 24 respondents, all were 18-24 years old;

the majority were female (95%); and white (85%). Most students reported taking the class for a nutrition major requirement (70%), and all were upperclassmen. Students remained largely unchanged on all cultural competence constructs prior to and after taking the course. However, students reported more awareness in cultural competence after taking the course and were more knowledgeable about biases and felt more capable of assessing their own strengths and weaknesses in the area of diversity. Current nutrition students are future nutrition professionals. Courses which include these topics are warranted in order to provide quality healthcare for all individuals.

Poster Competition 4
Jose Picado, Exercise Science Graduate Student - Masters
Faculty Mentor: Alan Needle, Public Health and Exercise Science
Co-Author(s): Dr. Herman van Werkhoven, Dr. Kristen Nicholson, Dr. Rene Salinas
Title: PULSE VS KINATRAX: CAN CONCURRENT VALIDITY BE ESTABLISHED WHEN COMPARING IMU TO MARKERLESS MOTION CAPTURE ELBOW VARUS TORQUE IN COLLEGIATE PITCHERS?"
The rise in elbow injuries among youth athletes has sparked increased research on baseball pitching biomechanics, with a focus on tracking joint loads using advanced technologies. While marker-based motion capture is considered the standard for measuring kinematics and kinetics, new tools, like markerless motion capture and inertial measurement units (IMUs), are also being explored. We aimed to establish concurrent validity by assessing whether PULSE bands (IMUs) provide similar data to markerless motion capture in tracking elbow varus torque. Nineteen collegiate pitchers (age: 20.7 ± 1.5 yrs) volunteered for this cross-sectional study in a pitching biomechanics laboratory. Participants threw 15 fastballs while elbow varus torque was measured with a markerless motion capture system (Kinatrax Inc., Boca Raton, FL) and PULSE IMUs (Driveline., Kent, WA) simultaneously. Elbow varus torque (in newton-meters [NM]) was assessed at the maximum value experienced on the medial elbow throughout the pitching motion. Participants reported once at the beginning of pre-season and once after pre-season. Eleven individuals completed both pitching sessions. Across 165 pitches, the PULSE registered lower torque than Kinatrax. Kinatrax registered higher elbow varus torques (99.22 ± 10.42 Nm) while PULSE registered lower elbow varus torques (63.07 ± 1.07 Nm). The PULSE system underestimates varus torque compared to the markerless motion capture system (36.15 ± 10.47 Nm). Upon running a correlation, PULSE does not consistently underestimate varus torque (Adj. $R2 = 0.26$). The PULSE IMU is not able to produce accurate elbow varus torque values. The findings reveal the use of IMU alone would not be suitable enough to track elbow varus torque in pitching or identify predictive injury patterns.

Poster Competition 5
Kyle Vetter, Business Administration Graduate Student - Masters

Faculty Mentor: Dennis Guignet, Economics
Co-Author(s): N/A
Title: THE IMPACTS OF MITIGATING HAZARDOUS CHEMICAL RELEASES ON INFANT HEALTH"
The Resource Conservation and Recovery Act requires industries to investigate and clean up releases of hazardous chemicals. Little is known about the quantified benefits to residents living near these facilities. Using individual data on all births in NC from 1990-2019, we implement difference-in-differences regression models and estimate the effects of cleanup on the health of newborns in the surrounding communities. Conditional on numerous covariates, pre- and post-cleanup health-distance gradients are estimated to determine the spatial extent of any impacts on infant health. We find post-cleanup improvements in health to newborns living within 250 meters. We assess and statistically determine that children born near these sites but living 250-1,000 meters away serve as an appropriate control group. Our results reveal noticeable health improvements after cleanup, suggesting a 133 to 170 gram increase in birthweight, and an average increase in gestational age of 0.8 to 1.0 week. These results are robust to various techniques to control for confounding factors, including the use of facility and block group fixed effects; facility-specific, nonlinear time trends; and the employment of exact covariate matching procedures. A series of linear probability models yield similar results, suggesting a 3.7 to 6.6 percentage point (pp) reduction in the risk of low birthweight, a 3.0 to 4.1 pp reduction in the risk of very low birth weight, and a 5.5 to 9.8 pp reduction in the risk of preterm births. These results, however, are not always statistically significant at conventional levels, with p-values in the range of p=0.06 to 0.16. Our quantified improvements in infant health illustrate an important benefit from cleaning up hazardous chemical pollution and can inform future environmental regulations and community outreach programs. As such, our results should be of interest to local communities, state and federal regulators, and industry stakeholders."

Poster Competition 6
Sean Doherty, Exercise Science Graduate Student - Masters
Faculty Mentor: Herman van Werkhoven, Public Health and Exercise Science
Co-Author(s): Alan R. Needle, Robert J. Kowalsky
Title: CAN THE OPENCAP MARKERLESS MOTION CAPTURE FRAMEWORK DETECT LOWER EXTREMITY KINEMATIC CHANGES DURING A FATIGUING RUN?"
PURPOSE: During endurance running, changes in running form can impair performance and increase injury risk. A “gold standard” to study these changes, 3D passive reflective marker-based motion capture, has several barriers to use such as cost, space, and accessibility. The OpenCap markerless motion capture framework is more accessible, using two or more smartphones and an open-source algorithm to process human movement kinematics [1]. This study investigated OpenCap’s ability to detect

kinematic changes at the hip, knee, and ankle due to fatigue when compared to a marker-based system (Vicon). We hypothesized that the kinematics measured by OpenCap would significantly differ from those measured by Vicon, and that OpenCap would not be able to detect joint angle changes caused by fatigue. METHODS: Thirteen participants completed a fatiguing treadmill run. At two-minute intervals OpenCap recorded data from two smartphones, while Vicon recorded data from nine cameras tracking markers on the participant. The range of joint motion for each stride (ROM) was averaged across 5 strides from participants' first and final intervals. RESULTS: At the hip, a system-by-time interaction indicated a difference between the systems' ROM pre-fatigue. However, OpenCap was able to detect differences due to fatigue. At the knee, there was a main effect of time, indicating significant changes in ROM due to fatigue, but no significant differences between systems. At the ankle, there was a significant time-by-system interaction, but there were still significant changes in ROM due to fatigue and no significant differences between the systems at the pre- and post-fatigue time points. CONCLUSIONS: Our findings show OpenCap's potential as an alternative to marker-based motion capture when studying running gait. At the knee and ankle, OpenCap was able to detect joint range of motion changes due to fatigue without any differences between the two systems.

Poster Competition 7

Joe Rebilas, Sustainable Technology Graduate Student - Masters
Faculty Mentor: Chris Tolbert, Sustainable Technology and the Built Environment
Co-Author(s): None

Title: CASE STUDY OF A COST-EFFECTIVE SUSTAINABLE TRANSPORTATION SOLUTION: A STEP-BY-STEP MANUAL FOR THE ELECTRIC CONVERSION OF A 1988 FORD RANGER"

The global transportation sector is transitioning to electrification, leaving individuals with limited and often financially inaccessible options for new electric vehicles (EVs). This study addresses the need for cost-effective alternatives by exploring the conversion of internal combustion engine (ICE) vehicles to electric vehicles. ICE vehicles frequently face mechanical issues leading to costly repairs and eventual disposal, despite having functional components remaining. This research focuses on repurposing a 1988 Ford Ranger by converting it to an electric vehicle, providing a comprehensive, step-by-step manual for the process. Older vehicles, particularly those produced between 1980 and 2000, are ideal candidates for conversion due to their more simple electronic systems. By retrofitting vintage pickup trucks with electric drive systems, this research aims to offer a viable solution to cost concerns while reducing waste by reusing an existing vehicle. Throughout the conversion process, each step, component, tool, and special consideration was documented. The most time-consuming steps involved fabricating parts and wiring the motor controller. The total cost for the conversion, excluding machinist costs, tool costs, and the vehicle itself, totaled $12,539.96, resulting in a cost

savings of $14,255 compared to the cheapest new EV on the market as of 2024 data. The largest cost was the electric motor at $8,100, chosen for its high torque and simple design. The conversion used a 144-volt, 7.92 kWh lead-acid absorbent glass mat (AGM) battery pack. Lead-acid was chosen for its low cost and simple installation but, because of its low energy density, contributed to the vehicle's limitations in range and speed. The study concluded that while the conversion process was time-consuming and resource-intensive, it is feasible for mechanically experienced individuals. The converted vehicle, however, had limitations in range, speed, and comfort features, making it less viable as an alternative to new EVs for most individuals. Nonetheless, the electric conversion process holds potential for those interested in driving older or classic cars, offering a unique and reliable alternative to traditional restoration methods.

Poster Competition 8
Caleb Blackburn, Geography Graduate Student - Masters
Faculty Mentor: Maggie Sugg, Geography and Planning
Co-Author(s): Sophie Ryan
Title: Spatial Disparities in Disaster Recovery: Assessing Flood Risk, Resilience, and Federal Aid Distribution in Western North Carolina After Hurricane Helene"
Helene, the most destructive storm to strike the U.S. mainland since Katrina, caused unprecedented devastation in Western North Carolina, a region historically less affected by extreme weather events. The storm resulted in 106 confirmed fatalities and left thousands of residents without essential services (e.g., washed-out roads, collapsed water systems) for weeks, compounding immediate and long-term challenges. Despite the severity of the disaster, little is known about the region’s situational needs and disaster relief efforts in the months following Helene. This study leverages real-time data to assess community resilience, flood risk, and federal disaster aid distribution, identifying areas most in need of assistance and unmet recovery needs. Resilience is quantified using over 20 variables from the American Community Survey, while flood risk is evaluated through First Street Foundation data and high-resolution precipitation records from PRISM. FEMA Individual and Households Program funding and Department of Transportation road closure data are analyzed to assess aid distribution and accessibility. All datasets are examined at a high spatial resolution to identify disparities in disaster response. Methods include geospatial analysis and multilevel regression to produce spatial outputs highlighting the most at-risk populations, unmet assistance needs, and the hardest-hit locations. Our results indicate that rural communities with high exposure and lower resilience receive less aid than urban centers, and only 56% of reported damages are covered by FEMA. This is the first study to analyze Helene’s impacts, directly informing the association between exposure, resilience, and disaster aid distribution. Our findings illustrate significant disparities in federal assistance even after controlling for exposure and underlying population characteristics, demonstrating the need for more equitable disaster relief strategies.

Poster Competition 9
François Desautels, Biology Graduate Student - Masters
Faculty Mentor: Andrew Bellemer, Biology
Co-Author(s): Dr. Megen Culpepper
Title: ANTICONVULSANT PROPERTIES OF LONG POLYUNSATURATED FATTY ACIDS IN DROSOPHILA MELANOGASTER SEIZURE MODEL"
Almost 50 million worldwide suffer from epilepsy. Epilepsy is characterized by recurrent seizures which are defined by abnormal electrical firing in the nervous system that can cause muscle spasms, paralysis, and convulsions. Currently, many anti-epileptic medications do not provide full symptom relief and have adverse side effects. Recent literature suggests that long polyunsaturated fatty acids (PUFAs) such as arachidonic acid (AA) are anticonvulsant (reduce seizure behavior) across species, including Drosophila melanogaster. We aim to uncover the mechanisms by which these anticonvulsant long PUFAs exert their effects in a seizure-prone mutant fly line known as parabss1. Parabss1 flies contain a gain of function mutation in their voltage-gated sodium channels and mimic intractable epileptic patients. Seizures can be induced in parabss1 flies with mechanical stimulation and seizure recovery times can be recorded for statistical analysis. We confirmed that AA is anticonvulsant. We also found that fish oil and its long PUFA components are anticonvulsant. Our preliminary data suggest that PXT (a hypothesized cyclooxygenase-like enzyme that metabolizes AA) knockdown in the nervous system of parabss1 flies is proconvulsant (experiments ongoing). Due to PXT's potential connection to epilepsy, we also aim to characterize the in vitro enzymatic activity of PXT. We have expressed and purified PXT from BL21(DE3) E. coli cells. We performed enzymatic activity assays using a 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay and a dissolved oxygen detector. Interestingly, we found that PXT not only has peroxidase activity, but also has catalase functionality unlike mammalian cyclooxygenase. Future experiments will focus on determining PXT's reactivity with long PUFAs and resolving PXT's role in seizure behavior and treatment. The in vitro data will be used in concert with the fly model data to understand the role and mechanism of action PXT plays in seizures.

Poster Competition 10
Chris Lucero, Geography Graduate Student - Masters
Faculty Mentor: Derek Martin, Geography and Planning
Co-Author(s): Forest Pearson
Title: INVESTIGATING THE TEMPORAL NATURE OF OROGRAPHIC INFLUENCES ON PRECIPITATION INTENSIFICATION DURING HURRICANE HELENE IN THE SOUTHERN APPALACHIAN MOUNTAINS.
On September 26th 2024, Hurricane Helene made landfall in Florida's Big Bend region before slowly traveling northward for nearly three days through the Southeastern

United States. This storm caused record-breaking precipitation across much of the Southeast with notable intensity in Southern Appalachia, where severe flash flooding and landslides caused hundreds of deaths and billions of dollars in economic and property damages. These precipitation-related impacts were likely intensified due to pre-saturated soils and multiple orographic factors such as steep slopes, high elevations, and the direction of aspects relative to dominant wind direction. Previous studies have primarily used simulated hurricane data to analyze these relationships due to the limitations of ground-based precipitation observations in temporal and spatial resolution. However, the use of these precipitation observations remains crucial for accurately understanding storm-terrain interactions over finer temporal resolutions. The objective of this research is to use precipitation observations to investigate the temporal nature of the relationships between orographic factors in Georgia and intensification of precipitation during Hurricane Helene. Precipitation observations from September 26th, 27th, and 28th were downloaded from 70 stations within the Local Climatological Database and Cooperative Observer Program. Precipitation intensification was calculated as average hourly precipitation at 3 hour, 6 hour, and 24 hour increments and interpolated in ArcGIS Pro with the Empirical Bayesian Kriging method. Preliminary results indicate the 3-hour increment best captures the temporal development of orographic effects on precipitation. These results provide valuable insight on the importance of short-term variations in observed precipitation for understanding the nature of storm interactions with orographic factors in Southern Appalachia.

Undergraduate Poster Competition
Poster Competition 11
Withdrawn

Poster Competition 12
Lauren Fleeman, Environmental Science Undergraduate Student
Faculty Mentor: William Anderson, Geological and Environmental Sciences
Co-Author(s): N/A
Title: BASEFLOW SOURCES IN A MOUNTAIN HEADWATER STREAM BASED ON PASTA MODELING OF AIR AND STREAM TEMPERATURES"
Stream temperature is a key factor in determining stream health and habitability for aquatic life, and elevated stream temperatures typical of urban environments can cause significant shifts in the species composition. Boone Creek, a heavily urbanized headwater tributary of the South Fork New River, is particularly vulnerable to thermal stress because of lack of riparian shade and heated run-off during convective storms. Stream temperature surges during storm events, which may cause increases of up to 5 degrees C within 15 minutes, store heat within the streambed and influence subsequent stream temperatures. In this study, we use the model PASTA (Paired Air and Stream

Temperature Analysis) to determine the source of groundwater in Boone Creek, which may influence the stream's thermal sensitivity. PASTA uses annual temperature signal metrics and linear regression parameters of daily mean air and stream temperatures to interpret measures of groundwater dominance and thermal sensitivity. PASTA calculates amplitude ratio, phase lag, mean ratio, linear regression slope, and linear regression intercept based on local air and stream temperature data collected at 19 monitoring sites between 2013 to 2019. Model output indicates that Boone Creek experiences pronounced shallow groundwater influence and is significantly impacted by anthropogenic sources and complex temperature dynamics. Our findings suggest that shallow groundwater provides baseflow to Boone Creek, where stream temperatures are largely influenced by seasonally dynamic surface conditions. Downstream sites within our study reach have greater anthropogenic influence and are more sensitive to temperature surges than upstream sites nearer to the headwaters. Our findings not only provide insight on groundwater-surface interactions in an urbanized headwater mountain stream but also suggest potential thermal stressors on aquatic life.

Poster Competition 13
Addison Pollock, Biology Undergraduate Student
Faculty Mentor: Darren Seals, Biology
Co-Author(s): Hannah Wolf, Maryam Ahmed
Title: THE EFFECT OF VSV INFECTION ON PODOSOME ACTIVITY IN M1 AND M2 THP-1 MACROPHAGES
As oncolytic viruses are investigated in clinical trials for their ability to target and kill cancer cells, their impact on other cell types like the tumor-associated macrophage are less clear. Macrophages exist among a range of subtypes. M1 macrophages have a primary role in host immunity and are associated with improved cancer patient prognosis. M2 macrophages, in contrast, have a wound-healing role that can facilitate tumor growth, angiogenesis, and metastasis. All macrophages are professionally invasive and utilize actin-rich, extracellular matrix-remodeling podosomes to migrate through tissues. Here we have tested model THP-1 macrophage podosome activity over extended time courses and in response to infection with oncolytic vesicular stomatitis virus (VSV). Two VSV strains have been analyzed: rwt (wild-type) and rM51R-M viruses. rM51R-M virus has an M protein mutation that disables its ability to shut down host antiviral responses and represents a safer therapeutic option. We also have prior evidence that rM51R-M virus may be able to repolarize M2 macrophages to an M1 phenotype. To assess podosome function, VSV-infected macrophages were plated onto fluorescently-labeled gelatin coverslips as a means of analyzing extracellular matrix degradation activity. Under mock conditions, M1 macrophages exhibited greater podosome activity than M2 macrophages and were unaffected by VSV infection. In contrast, rwt virus reduced M2 podosome activity at 72 hours post-infection while rM51R-M virus increased it to levels comparable to M1 macrophages. These data may

indicate reduced cell viability in M2 macrophages following rwt virus infection and a repolarization of M2 macrophages to an M1 phenotype by the mutant virus strain. Both effects would present potential benefits for the cancer patient.

Poster Competition 14
Leiana Santoro, Geology Undergraduate Student
Faculty Mentor: Andrew Heckert, Geological and Environmental Sciences
Co-Author(s): N/A
Title: Dissolving diagenetic selenite from microvertebrate concentrate:
An exploration of diverse techniques
Screenwashing fossiliferous sediments is one of the best ways to recover tiny fossils (e.g., microfossils, microvertebrates, vertebrate microremains). However, not all rocks are amenable to breakdown in water alone. We aim to minimize the volume of screenwash concentrate to facilitate picking, specifically, to dissolve diagenetic selenite, a common component within fossiliferous concentrate. If we can dissolve a majority of the selenite, it will cut down on the time it takes to pick through the concentrate.
We were working with concentrate collected in 1983 by the Field Museum from the Upper Triassic (Adamanian) Placenas/Downs' quarry in Arizona, arguably the most productive Triassic locality in North America. We have more than 50 kg (~110 lb) of concentrate obtained by traditional screenwashing that still has abundant selenite. Through diverse protocols, we tried to optimize the selenite dissolution, with minimal risk to the fossils. We identified the average percentage of selenite within the concentrate to be ~37%, so removing it would reduce the volume, and therefore the picking time, by approximately 35%. We developed three protocols for screen washing 100g batches concentrate in, DI H_2O (control), 5% NaCl, 10% NaCl, and 5% K_2CO_3 solution, each for 3-4 wash and dry cycles. We lost about 50% of the concentrate in the K_2CO_3 wash after 4 cycles. Compared to the DI wash that lost about 20% of concentrate, we suspect that 20% of the 50% lost was clay minerals and debris left over and the other 30% was selenite, which matches the original hypothesis, where the NaCl treatment was no different than the DI wash. So far as we know, no one has addressed this specific question of the breakdown of selenite in screenwash concentrate. We hope that the standardized protocols we describe here will facilitate the comparison of these and similar techniques with a variety of different sites of varied composition.

Poster Competition 15
Amanda Bruckstein, Nutrition Undergraduate Student
Faculty Mentor: Caroline Smith, Public Health and Exercise Science
Co-Author(s): N/A
Title: THE EFFECTS OF HYPERHYDRATION AND MENSTRUAL CYCLE PHASE ON EXERCISE PERFORMANCE IN AEROBICALLY TRAINED WOMEN"

Exercise in the heat often results in performance decrements due to dehydration, resulting in increased strain on the cardiovascular system and greater heat illness risk. Some evidence suggests that hyperhydrating (HH) prior to exercise in the heat may improve performance. HH can be achieved via excess fluid intake and/or hydrating agents such as sodium. HH may improve performance by increasing blood plasma volume, reducing cardiovascular strain and dehydration risks. Research is limited regarding HH and exercise performance in women. Hormonal changes throughout the menstrual cycle alter body temperature, thirst, and hydration needs. PURPOSE: Investigate the effects of HH versus euhydration (normal hydration) on cycling time trial performance in the follicular versus luteal phases of the menstrual cycle. METHODS: Each participant completed four experimental visits (two during follicular phase and two during luteal phase) of the menstrual cycle. For each phase, one visit was euhydrated (EU) and the other HH. During HH participants consumed 30/ml/kg fat free mass of a beverage containing 6.2g Crystal Light Pure/L with a total of 7.45g/L sodium chloride. During each time trial, participants cycled for 45 minutes in a 30°C, 20% relative humidity environmental chamber. Heart rate, core temperature, RPE, workload, and distance were recorded throughout each trial. RESULTS: Preliminary data from 3 participants (24.3 ± 1.7 years, 37.7 ± 4.6 mL/kg/min VO2max, 22.5 ± 4.6 body fat %) in the luteal phase indicate that average power output was similar during the HH versus EU condition (146.4 ± 23.4 watts vs. 146.5 ± 31.2 watts). Average heat rate throughout the time trial was similar during the HH versus EU condition (78.9 ± 9.9 bpm vs. 82.4 ± 7.0 bpm). CONCLUSIONS: Preliminary data indicates similar performance and heart rate responses between EU and HH, but data collection is ongoing. This may have implications for the optimization of hydration strategies for female athletes.

Poster Competition 16

Ian Daniel, Geography Undergraduate Student
Faculty Mentor: William (Hui) Wang, Geography and Planning
Co-Author(s): Joshua McLellan

Title: Observing Western North Carolina Well Water Quality Post Flood-Event"

In North Carolina, approximately 35% of residents rely on private wells as their primary water source, with well usage particularly common in rural regions such as Western North Carolina. Given that well water is essential for drinking, bathing, and other household needs, its quality is critical to public health. While some counties in this region face a "relatively low" risk of riverine flooding and expected annual loss, many exhibit "moderate" social vulnerability, according to FEMA's National Risk Index (NRI). This study examines the potential impact of riverine flooding on well water quality across Western North Carolina. Using FEMA's risk assessment formula, we integrate flood risk data with water contamination factors to generate an interpolated raster map identifying wells at risk of contamination due to flooding. We hypothesize that flood

events introduce contaminants into well water, posing health risks to residents. By visualizing these risks, our findings aim to support property owners and prospective buyers in making informed decisions regarding land use and water safety. Providing accessible, data-driven insights can help communities better understand and mitigate water contamination risks following flood events.

Poster Competition 17
Justin Gilbert, Public Health Undergraduate Student
Faculty Mentor: Martie Thompson, Public Health and Exercise Science
Co-Author(s): Sophie Ryan (potentially)
Title: COVID-19 SCHOOL CLOSURES IN NORTH CAROLINA AND THE EFFECT ON ADOLESCENT MENTAL HEALTH AND EMERGENCY DEPARTMENT VISITS."
"Suicide is a leading cause of death among youth and along with worsening mental health, poses a critical public health problem. The onset of the Covid-19 pandemic only made this problem worse, especially with school closures and the increase of social isolation during the lockdown. The purpose of our study is to investigate if and how school learning modalities (remote, in-person, hybrid) during the pandemic period were associated with risk for mental health crises among school-aged youth in the state of North Carolina. State-wide data sources that provide information on school closures (COVID-19 School Data Hub) and emergency department visits (North Carolina SHEPS data) will be merged to determine if a remote learning modality was associated with an increased risk for seeking emergency medical care for a mental health crisis. We will assess if the proportion of ED visits due to mental health reasons each month is correlated with the learning modality that the school district was operating under. Implications of our study findings and suggestions for interventions will be discussed.

Poster Competition 18
Quinn Keefer, Geography Undergraduate Student
Faculty Mentor: Maggie Sugg, Geography and Planning
Co-Author(s): Caleb Blackburn
Title: SPATIAL CLUSTERING OF GUN VIOLENCE DURING HEATWAVES IN THE UNITED STATES (2015–2023): A PURELY SPATIAL BERNOULLI ANALYSIS
As climate change accelerates, the frequency and intensity of heatwaves are increasing, raising concerns about their potential impact on public safety. This study investigates the spatial distribution of gun violence incidents during heatwaves in the United States from 2015 to 2023. Using data from the Gun Violence Archive (390,755 incidents), which provides a comprehensive database of gun violence deaths in the United States, and climatic data from NOAA's ClimGrid, we examine the association of 2-day and 3-day heatwave events and gun violence deaths using purely spatial Bernoulli model of a heatwave and non-heatwave gun violence deaths. Heatwaves are defined using local heat thresholds of the 95th threshold and a 30-day moving window for each county.

Findings consistently revealed elevated gun violence clusters in California's West Coast (Relative Risk: 1.32-1.62) and the southeastern United States (Relative Risk=1.13), while the Midwest (Relative Risk: 0.73-0.80) exhibited lower-than-expected incidents during heatwaves. These clusters remained stable across different model specifications (e.g., spatial window size, number of Monte Carlo simulations), reinforcing their statistical significance with p-values below 0.05. The persistence of these patterns suggests that heatwaves may play a role in exacerbating gun violence, possibly due to increased aggression, greater outdoor activity, or socio-environmental stressors associated with extreme heat in regions of the West Coast and the southeastern US."

Poster Competition 19

Raven Lester, Biology Undergraduate Student
Faculty Mentor: Ashley Adams, Biology
Co-Author(s): Rylee Strassner

Title: AN ASSESSMENT OF FUNGAL DIVERSITY IN SOUTHERN APPALACHIAN COARSE WOODY DEBRIS"

Forests are the largest terrestrial carbon (C) sinks globally. Previous research has focused on C stored in live trees, but some C is sequestered in deadwood or coarse woody debris (CWD). Lignin-digesting fungi drive CWD decomposition and exhibit great diversity across environments. Understanding CWD decomposition is necessary for contextualizing forest C cycling. Yet, the relationship between lignicolous fungal diversity and decomposition is poorly understood. I am assessing fungal community composition across woody decay classes (fresh to highly decomposed) and forest dominance (coniferous and deciduous). My goal is to use fungal community patterns to predict wood decomposition on a broad scale. I hypothesized that CWD would create hotspots of fungal diversity and that i) forest type, ii) decay class, and iii) elevation would affect community structure. I am testing my hypotheses by performing a fungal survey across six plots established at the Department of Biology's Robert Gilley Research Station, where the abundance and decay class of CWD was previously surveyed. In the Summer and Fall of 2024, I evaluated fungal presence by surveying fungal fruiting bodies across all CWD previously identified. Next, I collected wood plugs from each piece of CWD for DNA extraction and sequencing. This semester, I am extracting DNA from all CWD plugs collected and assessing abundance with qPCR. I am using amplicon sequencing of the fungi-specific ITS region to evaluate fungal diversity. Preliminary data shows differences in fungal abundance consistent with my hypotheses, with a greater abundance of fungal fruiting bodies in coniferous-dominant forests. This project will advance our understanding of decomposer ecology. Broadly, it will further our understanding of C cycling pathways through wood decomposition, which is crucial for climate mitigation.

Poster Competition 20

Tucker Terrell, Geology Undergraduate Student
Faculty Mentor: Ellen Cowan, Geological and Environmental Sciences
Co-Author(s): Keith Seramur
Title: RESTORING SOUTHERN HISTORY THROUGH GROUND-PENETRATING RADAR: REVEALING THE LOST BURIAL GROUND OF ENSLAVED ANCESTORS AT FORT DEFIANCE

The Lenoir family papers, archived in the Appalachian Collection record the names of the enslaved people at Fort Defiance Plantation between 1792 and 1865. These records mention a “negro cemetery”, but omit its size and location on the historic property. A descendant of the enslaved population suggested this cemetery is in the wooded area Southeast of General William Lenoir’s plantation house. A reconnaissance survey of the area revealed surficial depressions, field stones, and periwinkle and daffodils that commonly indicate unmarked burials of African Americans. The goal of this project is to use ground-penetrating radar (GPR) to identify unmarked burials by imaging reflections from the subsurface to locate and map the boundaries of the cemetery for future preservation. Unmarked burials are identified by anomalies or reflections in the GPR data produced by the contrast in electrical properties between undisturbed soils and homogenous backfill in the graves. The anomalies include shallow reflections off the walls of the grave shaft and deep reflections off the bottom of the grave. A workflow was established to evaluate the presence of each burial within thirteen grids of GPR profiles spaced 1-foot apart. Linear GPR profiles were processed into three-dimensional ‘slices’ of the subsurface to identify patterns in the reflection characteristics. Graves were of similar size, shape, and orientation, although they appeared in distinct groupings. One fieldstone was identified as a headstone, and several cairns of quartz river pebbles were found in the 1.08-acre survey area. 42 potential unmarked burials have already been identified with the GPR reflection data. This research will be used to create a map of the cemetery for use by the nonprofit Fort Defiance, Inc. Efforts are underway to gather the descendants to dedicate the burial ground and to ensure the preservation of this newly discovered African American cemetery at Fort Defiance.

Morning Poster Session 1 - Parkway Ballroom
Posters 21-39

Poster 21
Jessica Frazier, Biology Undergraduate Student
Faculty Mentor: Ashley Adams, Biology
Co-Author(s): Mia Dziwanowski, Hei-Young Kim, Jeremy Ferrell
Title: EXPRESSION DURING OPTIC NERVE REGENERATION IN ZEBRAFISH
Organic soil amendments play a crucial role in agriculture by enhancing soil health, improving nutrient availability, and supporting sustainable farming practices. Different types of soil amendments can significantly influence agricultural sustainability and crop growth. Synthetic mineral fertilizers are commonly used in agriculture, however, there are drawbacks associated with them. Synthetic fertilizers leach harmful chemicals such as nitrates into the soil and disrupt ecosystems. In turn, plants become deficient in micronutrients for photosynthesis and respiration. As more research continues to reveal the long-term effects of synthetic fertilizers, organic amendments are becoming a promising alternative. Organic amendments have shown to increase the organic matter content of soil and provide valuable micronutrients. Some of these amendments include compost and biochar, with multiple studies that show co-composting with biochar improve compost production and combine the effects of both amendments. Two questions remain; i) how do organic amendments impact overall crop growth? and ii) how do organic amendments influence crop nutrient properties? I hypothesize organic amendments will positively affect crop biomass compared to crops grown in unamended potting mix and adding organic amendments will result in higher plant tissue nutrient content than plants grown in unamended treatments. In a greenhouse experiment, spinach seedlings were planted in 32 pots and grown using 4 organic amendment treatments (potting mix, compost, compost + 5% biochar, and compost + 10% biochar) for 8 weeks. They were clipped at the base, dried, weighed, and will be tested for nutrients (e.g., N, P, K, Fe). Our preliminary data shows the total mass of the spinach was greater across all organic amendment treatments compared to the control. These findings not only enhance our knowledge of the effects of organic amendments on spinach growth but also its significance in plant health and function.

Poster 22
Zoe Horack, Biology Undergraduate Student
Faculty Mentor: Shea Tuberty, Biology
Co-Author(s): Spencer Bechtol, Zachary Abbott, Alek Brown, Joe Johnson, George Santucci
Title: REVIVING RIVERS: CAN LIFE BE RECOVERED THROUGH STREAM RESTORATION?

Stream restoration, central to ecosystem recovery, enhances ecosystem services, although its cost-effectiveness is debated. Hardin Creek has been continuously impacted by runoff from Watauga High School, Highway 421, construction sites, New Market shopping center, and other pollutants; specifically road salt. The New River Conservancy (NRC) was awarded $653,500 to restore 1,620 feet of the stream. This research project aims to collaborate with leaders of the NRC, the Town of Boone, and Watauga County to assess the ecological effects of this restoration, evaluating its ability to mitigate chemical contamination, physical disturbances, and predicting potential long-term impacts. We hypothesize that restoration may not be sufficient to improve the long-term water quality of the stream, while also compromising the short-term efficacy. To evaluate this, aquatic macroinvertebrate and fish collections will be conducted in Hardin Creek and feeder streams after restoration (2025) to use in comparison of the extensive pre-restoration data collections (2009 - 2024). In addition, the water quality and composition will be analyzed through the use of IBI, ICP, and IC assays. This research will assist in determining whether the stream's health has improved post-restoration and if the intervention remains sustainable in the following years. Ultimately, the results of this study will provide further necessary insight into the effectiveness of the growing trend of stream restoration projects and whether their ecological benefits, or lack thereof, justify the significant financial investment.

Poster 23
Maggie Pipkin, Biology Graduate Student - Masters
Faculty Mentor: Shea Tuberty, Biology
Co-Author(s): Aleisha Whipple, Liyah Moser, Duck Duckworth, Sherri White-Williamson, Carol Babyak
Title: THE CUMULATIVE IMPACT OF ENVIRONMENTAL POLLUTANTS ON SAMPSON COUNTY WELL WATER
Sampson County, NC, is second in the nation for industrial hog production with over 931 (375 poultry, 555 swine, 1 cattle) concentrated animal farm operations (CAFOs), and receives landfill waste from 73 of 100 NC counties, making GFL Sampson County Landfill the 2nd largest methane emitter nationally. Major leaching events from this landfill put residents at risk for contamination in their drinking water as over 50% of residents in Sampson County rely on private drinking wells. Contaminants from these leaching events include perfluoroalkyl substances (PFAS), inorganic elements, excessive nutrients, and other toxins and microbes. This study will use Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) to detect any exceedances in toxic metals (lead, arsenic, etc), Ion Chromatography (IC) to detect anions (nitrate, phosphate, etc) that are harmful to human health, and 3M PetrifilmTM E. coli testing to assess potential bacterial load. Since 2021, a total of 199 drinking water samples have been collected. Results showed a 13.6% exceedance rate for at least one primary toxin (e.g. Pb, As, NO3), and a 68.3% exceedance rate for secondary contaminants (e.g. Al, Fe,

Mn) in collected samples. Our objectives for this study are to, in partnership with Environmental Justice Community Action Network (EJCAN), (1) expand the water sample set through well water or stream sampling, (2) research impacts and potential mitigation strategies for residents of Sampson County, NC, and (3) determine if there is a correlation between the distance and/or density of environmental pollutants.

Poster 24
Anderson Payne, Biology Graduate Student - Masters
Faculty Mentor: Ashley Adams, Biology
Co-Author(s): Jeb Barrett
Title: EFFECTS OF BIOCHAR AMENDMENTS ON NEMATODE COMMUNITY STRUCTURE
Biochar is increasing as a sustainable soil amendment due to its ability to enhance soil carbon, water infiltration, decrease soil density, increase plant and microbial activity, and mitigate the adverse effects of fertilizers in farm runoff. However, the effects of biochar are highly variable, with feedstock and production temperature impacting the final biochar product and its influence on soil health. While current research has focused on the short-term impacts of biochar on soil biogeochemistry and, to some extent, microbial communities, little is known about biochar's lasting impacts on soil, and even less about its effects on soil biodiversity, especially microfauna such as nematodes. This is a promising area of future research as nematode communities are excellent indicators of soil health because they react quickly to changes in the soil ecosystem and occupy every consumer trophic level in the soil food web. Our research focuses on how biochar (hay, softwood, and hardwood feedstocks) applied in 2019 influences nematode abundance and community structure. Within the hardwood feedstock treatment only, we compare long term effects with a recent 2024 biochar addition. We hypothesize that biochar effects will show an overall increase in nematode abundance in both the short and long term (2024 vs 2019). Comparing feedstocks in the 2019 treatments only, hardwood biochar will have the most impact due to its higher surface area compared to hay and softwood. Our preliminary results showed that all biochar treatments had greater nematode abundance than the control plots, where the hay feedstock had the most nematodes on average, with 255 in 30g of wet soil. Regarding community structure, the relative abundance of different trophic groups differed by feedstock. Overall, there was greater nematode abundance in the 2024 plots compared to the 2019 plots. With continued research, biochar's impacts on nematode competition and abundance will become clearer.

Poster 25
Ava Clark, Biology Undergraduate Student
Faculty Mentor: Andrew Bellemer, Biology
Co-Author(s): N/A

Title: THE ROLE OF PHOSPHATIDYLCHOLINE LYSOPHOSPHOLIPASE, SWISS CHEESE, IN NOCICEPTION

Interactions between neurons and surrounding glial cells are crucial to nervous system development, cell differentiation, and migration, all of which contribute to regulating cell survival and overall survival of an organism. These neuron-glia interactions are present in the nervous systems of both humans and Drosophila melanogaster (fruit fly), making D. melanogaster an ideal model organism to study these phenomena. Swiss cheese (sws) is a phosphatidylcholine lysophospholipase present in nerve cells throughout the CNS, salivary glands, midgut, malpighian tubes, adipocytes, and male reproductive system of Drosophila melanogaster. Sws has a human ortholog, neuropathy target esterase (NTE), a membrane protein involved in neuronal-glial cell interactions and nervous system development. When functioning normally, sws is involved in cell signaling via phospholipase activity and is essential for neuronal ensheathment by glia. However, when lost or mutated, sws produces adverse phenotypic responses like abnormal wrapping of glia around neurons, neuronal apoptosis, and morphological changes such as smaller cell cortexes and more vacuoles (its namesake), leading to overall neuron degeneration. The role of sws in sensory neurons is not fully understood and this study aims to fill in this gap. We used genetically modified flies in which sws function was removed from nociceptive sensory neurons to determine the effect of sws loss of function in response to a 45°C probe in D. melanogaster larvae. We predict that animals lacking sws function will have less sensitive nociceptive responses, indicated by longer latencies of a 360° rolling behavior (common response to thermal noxious stimuli) compared to animals with normal sws function. Further directions for investigation include morphological analysis to determine the role of sws in regulating nociceptor morphology.

Poster 26

Addisyn Keen, Biology Undergraduate Student

Faculty Mentor: Andrew Bellemer, Biology

Co-Author(s): N/A

Title: Hormonal Modulation of Nociception: The Influence of Ecdysone in Drosophila

Nociception, the process of detecting noxious stimuli, exhibits sex-specific differences. Understanding these differences is crucial, as sex influences pain perception and susceptibility to chronic pain conditions in humans. Despite this, the hormonal mechanisms underlying nociceptive variation remain unclear. This study investigates the role of ecdysone, a key steroid hormone in Drosophila, in modulating nociceptive sensitivity. Given the established roles of steroid hormones like estrogen and testosterone in mammalian pain modulation, we hypothesize that ecdysone similarly influences nociceptive thresholds in a sex-dependent manner in fly larvae.

To test this hypothesis, we employ genetic manipulations of ecdysone signaling by knocking down the ecdysone receptor (EcR) in nociceptive neurons using ppk-Gal4

drivers. Behavioral thermal assays (heat probe at 42–46°C) will be conducted to assess nociceptive behavior in Drosophila, comparing nociceptive responses between males and females, as well as between ecdysone-manipulated flies and controls. We predict that disrupting ecdysone signaling will alter thermal sensitivity, with differences between sexes suggesting a hormonal contribution to nociceptive modulation. Additionally, we will use qPCR and RNA-seq to examine whether ecdysone signaling influences the expression of nociception-related genes, including ion channels and stress pathway genes. GFP-tagged nociceptors will be utilized to visualize the effects of ecdysone receptor knockdown on developing nociceptors. By leveraging Drosophila's genetic tractability, this research aims to identify hormonal mechanisms contributing to sex differences in nociception, potentially informing broader pain management strategies across species.

Poster 27
Hannah Orton, Biology Graduate Student - Masters
Faculty Mentor: Andrew Bellemer, Biology
Co-Author(s): N/A
Title: Neurological Dysfunction Genes related to Seizure Phenotypes in Parabss1
Epilepsy affects about 50 million people worldwide and is characterized by seizures and abnormal electrical activity in the nervous system. Seizures can be characterized by spasms, convulsions, and unconsciousness along with other symptoms. Treatments are available but do not work for everyone. Epilepsy is also a comorbidity with many different neurological disorders like autism spectrum disorder, attention deficit hyperactivity disorder, and Rett syndrome. The genetic mechanisms that underlie these conditions are not completely understood, but they can be studied using a Drosophila melanogaster model. Fruit flies have 60% of the same genes as humans and can be easily genetically engineered and used in experiments. Flies that carry the parabss1 mutation have seizures that respond to mechanical stimulation, providing a convenient model for studying the mechanisms of seizures. I hope to identify genes associated with these dysfunctions of the human nervous system and then increase and decrease their activity in parabss1 mutants to observe how they may modify seizure phenotypes. This would enable me to study how these genes related to neurological dysfunction interact with seizure phenotypes caused by parabss1. To do this, I will identify the genes associated with dysfunction of the human nervous system and test their interactions with the parabss1 phenotype via seizure assay with mechanical stimulation. Seizure assays are measured by how long after a seizure event flies recover and crawl on the side of the vial they are housed in. I would expect that the seizure assay used with flies with an increased activity of seizure-related genes would result in a longer recovery time, while flies with a decreased amount of activity of these genes would have a faster recovery time. This experiment will help us understand the relationship between these genes and their disorders, ultimately showing how seizures affect the nervous system.

Poster 28
Umamah Quadri, Biology Undergraduate Student
Faculty Mentor: Andrew Bellemer, Biology
Co-Author(s): N/A
Title: DIET MODIFICATIONS USED AS TREATMENT FOR EPILEPSY
Epilepsy is a prevalent neurological disorder affecting approximately 1 in 26 individuals worldwide. Characterized by recurrent seizures, epilepsy arises from a complex interplay of genetic and environmental factors, necessitating individualized treatment approaches. While anticonvulsant drugs remain the primary therapeutic strategy, their variable efficacy has driven research into alternative interventions, including dietary modifications and microbiome-based therapies. Drosophila melanogaster with the parabss1 mutation is a valuable model for studying seizure susceptibility and potential modulatory compounds. Previous research has shown that supplementing fly food with anandamide, a type of polyunsaturated fatty acid, reduces seizures in parabss1 mutants. Building on this, we investigated whether other polyunsaturated fatty acids (PUFAs), specifically Gamma-linolenic acid (GLA), would have a similar effect. Seizure assays revealed that GLA had no significant impact on seizure behavior. These findings suggest that different PUFAs exert distinct influences on neuronal excitability, potentially through unique metabolic pathways linked to seizure susceptibility. Expanding on this work, we explored the role of antibiotics and gut microbiome modulation in seizure management. Emerging evidence underscores the gut-brain axis as a crucial factor in neurological health, yet its implications for epilepsy remain largely unexplored. By elucidating the relationship between microbial composition and seizure susceptibility, this research aims to identify novel therapeutic strategies for epilepsy, particularly for individuals unresponsive to conventional drug treatments.

Poster 29
Maxwell Ramey, Biology Undergraduate Student
Faculty Mentor: Jon Davenport, Biology
Co-Author(s): Jon Davenport
Title: Diet of three co-occurring large Plethodons in western North Carolina
Three species of large Plethodon salamanders co-occur in northwestern NC; Plethodon yonahlossee, Plethodon montanus, and Plethodon cylindraceus. They occupy similar habitats so it has been hypothesized that dietary niches may differ to allow co-occurrence. We performed gastric lavages on >10 individuals of each species at three different sites. All regurgitated prey items were preserved for identification and enumeration. Out of the 170 samples collected thus far, we've processed 50. From those initial 50 samples, there is a high degree of overlap in diets of the three species. There is also high overlap among the most common prey items: ants, springtails, millipedes, mites, and beetle larvae.

Poster 30
Jacob Clontz, Biology Undergraduate Student
Faculty Mentor: Mark Venable, Biology
Co-Author(s): N/A
Title: PROTECTING MAMMALIAN CELLS FROM PIT VIPER VENOM USING A NATURAL LIPID INHIBITOR
Around 9,000 people are bitten by snakes each year in the United States with more than 30% being from venomous snakes. North American pit vipers are a subset of venomous snakes that have a broad range across the United States and make up a sizable portion of annual snakebites. Many of the venomous snake bites require expensive antivenom. One of the major antivenoms used in hospitals for North American pit viper bites is crotalidae polyvalent immune fab. This antivenom is produced by extracting venom from several species of North American pit vipers in US-based labs. This venom is then sent to Wales to be processed before being sent to Australia where sheep are inoculated with a strand of venom. The sheep produce antibodies that are extracted and sent back to Wales for more processing to produce pure Fab fragments. The fragments are checked for viral contaminants before being placed into a serum and sent to the United States for packaging and distribution. This process is logistically-intensive involving thousands of miles of transport. Phospholipase A2 (PLA2s) are a common component in pit viper venom that attack membrane phospholipids resulting in cell and tissue death. Dr. Venable's lab has identified a naturally-derived lipid that has displayed inhibition of Pit viper venom PLA2 in a test tube. Viability assays on mammalian cells developed a baseline of mammalian cell viability in the presence of venom from the genus crotalidae which contain rattlesnakes, cottonmouths, and copperheads. Further assays with the addition of the naturally derived lipid are expected to show improved mammalian cell viability. These results would support the hypothesis that the natural lipid has PLA2 inhibitory effects as well as promise in its development into a novel antivenom.

Poster 31
Kennedi Ratcliffe, Economics Undergraduate Student
Faculty Mentor: Dr. Dennis Guignet, Economics
Co-Author(s): Dr. Santosh Nandi, Department of Management, nandis1@appstate.edu
Title: ASSESSING THE EFFECT OF HURRICANES ON HOUSING MARKETS: A STUDY OF NORTH CAROLINA AND VIRGINIA COASTAL COUNTIES
As climate change increases the frequency and intensity of hurricanes, it is critical for both homeowners and policymakers to understand the effects of hurricanes on housing markets. Understanding these effects helps to inform strategic decisions about property investment and development in coastal areas. By examining the effects of Hurricanes Matthew, Florence, and Dorian on housing prices and the volume of transactions in 23 coastal counties in North Carolina and Virginia, this study aims to provide valuable

insights into how hurricanes affect housing markets in regions particularly vulnerable to climate change. The study addresses three key research questions: (i) What is the effect of hurricanes on housing prices and the quantity of transactions? (ii) How does the occurrence of multiple hurricanes affect the housing market? and (iii) Do any price or transaction effects from hurricanes attenuate over time? To answer these questions, a panel of monthly data covering a study period from 2016-2022 is compiled for the 23 coastal counties in North Carolina and Virginia. The degree to which counties are impacted by a hurricane is measured based on assistance eligibility designations by the U.S. Federal Emergency Management Agency (FEMA). The data are analyzed using multivariate statistical regression models. Preliminary analysis based on two North Carolina counties suggests a negative and statistically significant association between Hurricane Florence and housing prices. This negative association seems to intensify in the 12-month post-hurricane period, compared to a shorter 6-month period. While housing prices decreased by 13% in the first 6 months following the hurricanes, this depreciation increased in magnitude to 17% for the 12 months following the hurricane, suggesting that any negative capitalization effects may intensify, rather than attenuate, over time. Analysis of the much larger 23-county study area, and of multiple hurricanes, is currently underway.

Poster 32

Sofie Van Moorleghem, Nutrition Graduate Student - Masters
Faculty Mentor: Manan Roy, Nutrition and Health Care Management
Co-Author(s): Alisha Farris Ph.D., RDN, and Danielle Nunnery Ph.D., RDN.

Title: CLIMATE CHANGE AND NUTRITION OUTCOMES - A LITERATURE REVIEW

Introduction: The climate crisis is one of the most pressing issues today, with its effects on temperature, weather, and soil already influencing food production. There are various aspects of the relationship between climate change and nutrition status that remain unclear. Methods: A traditional literature review was conducted using nutritional, scientific, medical, and agricultural databases like PubMed, ScienceDirect, Arigcola, Elsevier, and Google Scholar. Keywords such as “climate change”, “nutrition impact”, and “nutrition outcomes” were used to identify relevant articles. A total of 26 studies were analyzed, focusing on regions including Africa (7), Asia (9), Eastern Mediterranean (2), and Global/Other (4). Results: The studies reviewed highlight the impact of climate change on nutrition and overall health. Climate change strains food systems, decreases nutrient quality and impacts all methods of agriculture practices. Disruptions in food production, reduced crop yields, and extreme weather events exacerbate food insecurity, malnutrition, and micronutrient deficiencies, particularly in vulnerable populations. Conclusions: This review emphasizes the vulnerability of populations and the need for climate-smart farming and sustainable dietary practices. Significant gaps remain in understanding the long-term impacts of climate change on nutrition outcomes, especially the cumulative effects over time. Research is needed in

high-income countries and on the socioeconomic factors that affect adaptation to climate-related nutrition changes. This review highlights the critical connection between climate change and nutrition as the issue gains prominence in research.

Poster 33
Samuel Svetik, Nutrition Graduate Student - Masters
Faculty Mentor: Ayron Walker, Nutrition and Health Care Management
Co-Author(s): Danielle Nunnery, Katie Wolsiefer
Title: EXPLORING FACULTIES' INPUT AND FEEDBACK ON AN EDUCATIONAL SIMULATION ON WEIGHT BIAS
Current medical education and training for health providers exhibits prominent weight stigma messaging that influences attitudes, prejudice, and standards of care towards overweight or obese patients. Fortunately, weight-inclusive education interventions have been found to reduce the development of weight stigma as well as raise awareness to the issue. The purpose of this study was to create a video simulation displaying an interaction of weight bias in the healthcare setting between a physician and an overweight patient to be presented to future healthcare professionals. Then, a faculty focus group of nutrition professors who have experience instructing weight science provided feedback on the quality of the video simulation and gave their perspective on how to best improve upon it. Development of this study focused on creating focus group questions and coding worksheets, a script and video production for the simulation, which were all based on previous research. The focus group members were recruited through email outreach based on knowledge and experience with weight sciences, of which, four doctorate holding faculty members of the Beaver College of Health Sciences were selected. There were seven major themes identified through the faculty-based focus group. Themes included: Lack of Listening (Occurrences: 6, Agreement Rate: 3/4), Physician Bias and its Effects on the Patient (Occurrences: 19, Agreement Rate: 4/4), Rapport (Occurrences: 27, Agreement Rate: 4/4), Faculty Experience with Weight Bias (Occurrences: 6, Agreement Rate: 4/4), Need for Training for Both the Physician in the Video and Future Healthcare Professionals (Occurrences: 9, Agreement Rate: 3/4), Positive Feedback (Occurrences: 21, Agreement Rate: 4/4) and Negative Feedback (Occurrences: 9, Agreement Rate: 4/4). Findings from this study suggest the video could be a useful tool in capturing and explaining the experiences on weight bias in healthcare. Participants provided feedback that will be addressed in future renditions of the video. Future research will ask students in larger bodies to provide feedback on video to encourage more alignment with experiences and create a better teaching tool for weight bias.

Poster 34
Carolyn Gura, Exercise Science Graduate Student - Masters
Faculty Mentor: Rebecca Battista, Public Health and Exercise Science

Co-Author(s): Brooke C. Towner, Stella Cybulski, J. Joy James
Title: SCIENCE IN MOTION: EXPLORING WAYS TO INCREASE CHILDRENS PHYSICAL ACTIVITY DURING THE SCHOOL DAY
BACKGROUND: Only 24% of children meet the recommended physical activity (PA) guidelines, with many spending more time in front of screens and less time outdoors. Integrating PA into classrooms can provide opportunities for increasing PA. The purpose of this study was to investigate children's PA levels across the school day and examine differences in settings during science lessons. METHODS: Participants were first-grade children (N=42, 44% boys, 56% girls, average age 6.36±0.28 years), from classrooms in a Title 1 Lab school. PA was integrated into science lessons using three settings: indoor non active, indoor active, and outdoor active. Children also received physical education (PE) once per week. Accelerometers were used to estimate PA using Evenson cut points for step counts and moderate to vigorous physical activity (MVPA). Data was collected during three two-week periods (December, February, May). Teachers placed and removed accelerometers on the children at the start (7:55am) and end (2:50pm) of the school day. Exploratory t-tests compared step counts and MVPA between PE and non-PE days, while repeated measures ANOVA analyzed PA differences between science lesson settings ($p<0.05$). RESULTS: Children took an average of 3,653 steps per day and spent 26.07 minutes in MVPA. PA was significantly higher on PE days compared to non-PE days on both step count ($p=0.001$) and MVPA ($p=0.001$). However, no significant differences were observed in step counts or MVPA between the science lesson settings. There was no interaction effect between lesson setting and classroom for step count or MVPA minutes. CONCLUSIONS: Integrating PA into science lessons provided additional opportunities for children to engage in PA. The impact did not differ significantly where the science lessons occurred. Since PE only occurs one per week, finding ways to integrate PA throughout the school day is essential. Collaboration between PE and classroom teachers may help design lessons to promote higher PA levels and improve student health and engagement.

Poster 35
Mabry Watson, Exercise Science Graduate Student - Masters
Faculty Mentor: Alan Needle, Public Health and Exercise Science
Co-Author(s): Jared Skinner, Jennifer Howard
Title: NON-INVASIVE BRAIN STIMULATION OF THE MOTOR CORTEX ON HOP PERFORMANCE IN INDIVIDUALS WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Anterior cruciate ligament (ACL) ruptures are known to be life-altering injuries with persistent, detrimental long-term impairments despite surgical reconstruction (ACL-R), raising risk of re-injury. Non-invasive brain stimulation paired with eccentric training has demonstrated improvements in neural excitability and function in patients with chronic ankle instability. The purpose of this study is to determine the preliminary

efficacy of eccentric training paired with brain stimulation over the primary motor cortex (M1) on performance and GRoC in patients with a history of ACL-R. 17 individuals with ACL-R participated in a double-masked randomized controlled trial. Participants reported to the lab for 11 visits consisting of 8 training and 3 testing sessions (baseline, post-training, and retention). Training sessions involved eccentric loading of the involved limb while receiving active or sham brain stimulation over M1. Outcome measures are patient-reported GRoC of knee function and single-leg (SH) and triple-crossover hop (TCH) for distance performance on the involved and uninvolved limb. For SH, Fisher's LSD showed significant differences across all time points for the involved limb ($p<.05$) and between post-training and retention for the uninvolved limb ($p=0.027$). Significant differences were also observed in performance of the uninvolved and involved limbs ($p=.006$) during baseline measures. For TCH, Fisher's LSD showed a significant difference between baseline and retention ($p=.002$) for the uninvolved limb and no significant differences between any time points for the involved limb ($p>.05$). Significant differences were observed in performance of uninvolved and involved limbs ($p=.020$) during retention. No differences were observed across groups, but changes were observed relative to strength training. These findings indicate potential improvements in ACL-R outcomes with similar interventions, however, further research is needed.

Poster 36

Liam Brady, Exercise Science Undergraduate Student
Faculty Mentor: Matthew Rogatzki, Public Health and Exercise Science
Co-Author(s): N/A

Title: SWEAT LACTATE AS A MARKER OF EXERCISE INTENSITY

The current model for analyzing lactate concentration and lactate threshold employs the collection of a blood sample using invasive measures. However, it is difficult to collect a blood sample during exercise without posing a risk to the individual exercising. Due to the associated risks of blood collection, this study investigates the analysis of sweat lactate as a noninvasive method for indicating exercise intensity. This study analyzed sweat lactate levels in 8 male and 2 female recreationally active subjects. Heart rate measurements occurred every minute during exercise, and sweat was collected by placing sandwich bags on the upper back and surgical gloves on the subjects' right hand while running on a treadmill at moderate and heavy intensities. Following exercise, sweat rate was determined utilizing values of sweat absorbed by Tegaderm-secured absorbent patches on the lower right back. Mean (SD) average heart rates at moderate and heavy intensity exercise were 139 bpm (12.35) and 167 bpm (8.72), respectively. Mean (SD) local sweat rate values for moderate and heavy intensities were 8.66 mgcm-2min-1 (1.49) and 2.23 mgcm-2min-1 (2.35), respectively. Sweat lactate concentrations from both intensities were analyzed using an enzymatic sweat lactate assay. Mean (SD) lactate concentrations for back sweat at moderate and heavy

intensities were 34.5 mM (17.85) and 23.87 mM (9.83), respectively. Mean (SD) lactate concentrations for hand sweat at moderate and heavy intensity exercise were 46.40 mM (0) and 26.89 mM (0), respectively. These results indicate that sweat lactate concentrations varied between collection sites and decreased from moderate to heavy-intensity exercise, illustrating a possible correlation to exercise intensity. Further research is needed to clarify the response of sweat lactate concentrations to exercise and relevance to exercise intensity.

Poster 37

Colby Bierwirth, Geology Undergraduate Student
Faculty Mentor: Cole Edwards, Geological and Environmental Sciences
Co-Author(s): N/A

Title: LOCATION MATTERS, OR DOES IT? TESTING STABLE CARBON AND OXYGEN ISOTOPIC VARIABILITY FROM ORDOVICIAN CARBONATE LITHOLOGIES: IMPLICATIONS FOR DIAGENETIC OVERPRINTS OF PALEOENVIRONMENTAL RECONSTRUCTIONS

Stable carbon (δ13C) and oxygen (δ18O) isotopes are measured from bulk carbonate rocks to reconstruct ocean isotopic compositions, conduct chemostratigraphic correlation, and to provide insights into potential paleoenvironmental conditions. Recent work on modern carbonate systems suggests that >1‰ inter-grain variability exists, however, challenging whether interpretations made of ancient environments reflect primary conditions. Few studies have been conducted on whether such variability exists in deep time, and those that do include some facies that are non-ideal for chemostratigraphy. In this study, we test theinter-grain variability by resampling a previously studied Lower Ordovician section to document isotopic variability of multiple sampled spots from a rock sample (n>4). Study samples are from the Ibex area, western Utah, where previous work shows a >2‰ positive δ13C excursion is preserved in lime mudstone facies. Resampling at a higher resolution (<1m, n = 81) collected facies that range from lime mudstone to packstone, many hand samples have multiple facies present. Isotopic data were measured using the PrecisION mass spectrometer coupled to an IsoFLOW device at Appalachian State University. Preliminary results indicate that lime mudstone facies of the same hand sample have average δ13C values between 0.075‰ (n=4), within analytical error (<0.08‰). However, samples with mixed lithologies can have δ13C values that can differ by up to 0.23‰. 18O variations are larger where lime mudstone facies vary by 0.10‰ (n=4), but still within analytical error. Samples of non-mudstone facies have δ18O values that up to 0.37‰. Comparison of these new and published data indicate that mean lime mudstone δ13C values differ by an average of 0.01‰ and non-mudstone facies by 0.02‰. Mean lime mudstone δ18O values have no statistical difference, but non-lime mudstone facies are statistically different by up to 0.12‰. Future work will consist of documenting further variability.

Poster 38

Jackson Leatherman, Geology Undergraduate Student

Faculty Mentor: Cole Edwards, Geological and Environmental Sciences

Co-Author(s): N/A

Title: STABLECARBONISOTOPE (δ13CCARB AND δ13CORG) EVIDENCE OF THE TOARCIAN OCEAN ANOXIC EVENT FROM CENTRAL ITALY: EVIDENCE FOR A GLOBALLY MIXED TETHYS SEA.

The Toarcian Ocean Anoxic Event (T-OAE) occurred 180 million years ago and is one of several globally recognized OAEs. Geochemical evidence of this event is measured from biostratigraphically-constrained carbonate rocks and organic-rich (black) shales worldwide. Previous studies record a positive stable carbon (δ13C) increase of ~5‰, but the sulfur cycle and perturbation is less well constrained. Previous work indicates that a positive sulfur isotopic (δ34S) excursion of ~6‰ is coincident with the δ13C excursion from several sections in Europe. The similar magnitude of these excursions to other OAEs suggests they had similar causes and that the carbon and sulfur reservoirs did not vary in size through time. Here we explore the global expression of T-OAE by studying another section in central Italy and test what environmental constraints possibly characterize the carbon and sulfur cycles during this time. We sampled 28 lime mudstone hand samples from central Italy to identify whether the T-OAE is preserved in these rocks. This 65-m-thick measured section comprises marly limestone and shale facies, with a thin (<30-cm-thick) black shale preserved in the lower part of the measured interval. Bulk carbonate (δ13Ccarb) and bulk organic matter (δ13Corg) were sampled for chemostratigraphic correlation to assist with age constraints. Fresh rock surfaces were drilled for isotopic analysis. We observe a clearly defined δ13Ccarb increase from 0‰ to ~3.5‰. However, the δ13Corg record is less clearly defined, but δ13Corg values increase from ~ -30‰ to -26‰ at the peak of the excursion. The magnitudes of these results are similar to published studies, suggesting that these sections deposited in well-connected basins able to freely exchange with the global reservoir. Future work will analyze the same samples to generate a sulfur isotopic record, from carbonate-associated sulfate and pyrite, to better characterize the global to regional expression of this geochemical perturbation.

Poster 39

Sophia Choiniere, Geology Undergraduate Student

Faculty Mentor: Andrew Heckert, Geological and Environmental Sciences

Co-Author(s): N/A

Title: LIFE RECONSTRUCTION OF THE EARLY CRETACEOUS DROMAEOSAUR MICRORAPTOR GUI, THE SMALL THIEF

Microraptor gui was a small dromaeosaur with feathered arms and asymmetrical feathers on its back legs that was approximately 77 centimeters long. This small theropod dinosaur lived in the Early Cretaceous, ~125-113 million years ago.

Microraptor was discovered in what is now the Liaoning Province in northeastern China. The holotype specimen of Microraptor gui, and most other Microraptor specimens, are compression fossils. Compression fossils are basically two dimensional, but known for their excellent preservation, as they are flattened organisms with chemically altered organic material. Microraptor gui had its feathers preserved on the slab, some of which include indications of color. Melanosomes are organelles that store and produce melanin, which gives color to skin, feathers, or fur. An analysis published in 2012 revealed that the feathers of Microraptor gui preserve mold impressions of tiny melanosome structures. The melanosomes' shape and arrangement is extremely similar to that seen in extant birds with iridescent feathers, suggesting that Microraptor would have an iridescent sheen like many modern corvids. The reconstruction of the Microraptor began by finding its measurements—I decided to construct a juvenile Microraptor perched on a small tree using published illustrations of the fossils, life reconstructions, and modern corvids as references. I made a sketch, transferred it to cardboard, and hot glued small pieces of foam to provide a more realistic form. Because the foam was compressible and clay wouldn't stick to it, I covered it with a thin layer of papier-mâché, and finally, glued on commercially available feathers before painting to match paleo reconstructions. While labor intensive, the process is inexpensive, with total material costs ~$40. I plan on creating more replicas, as I learned a lot about model creation. I brought the model on an outreach trip, and many people were shocked to learn about the preservation of color in the fossil record.

Morning Session 2 - Poster Presentations

Poster 41
Avery Hodgson, Biology Undergraduate Student
Faculty Mentor: Rachel Bleich, Biology
Co-Author(s): Dr. Kevin Zwetsloot, Dr. Chequita Brooks, Oluwatobi Azeez
Title: QUANTIFICATIONS OF CHANGES IN SHORT-CHAIN FATTY ACIDS DUE TO EXERCISE IN OLD AND YOUNG MICE
The gut microbiome plays an essential role in the promotion of gut health based on the abundance and function of certain microorganisms. One way microorganisms can promote gut health is through the production of short chain fatty acids (SCFAs), which have been linked to the reduction of gut inflammation (butyrate and propionate) and reduced resistance to insulin (acetate). While it has been found that exercise can alter the microbiome, how this occurs or its implication on gut health is not well-known. To better understand the relationship between exercise, microbiome composition and gut health, cohorts of young (3-4 months) and old (20-21 months) C57BL/6 mice were divided into exercise and sedentary groups. Food intake and running data were collected daily and fecal samples were collected weekly over the course of 9 weeks. Previous work that focused on identifying changes in mice gut microbiome taxonomy revealed significant changes to the microbial composition in exercising mice. Despite this, more research on how the taxonomic changes impact certain processes, such as SCFA production, is needed to better understand the effect of exercise on gut health. This project attempts to better understand the effects of exercise on gut health with a focus on identifying changes in SCFA abundance with exercise. This project will utilize fecal samples from young and old populations to quantify the abundance of short-chain fatty acids, specifically butyrate, acetate, and propionate, at two intervals during the 9-week study. These fecal samples will be extracted with diethyl ether, derivatized and quantified via GCMS and the comparison of the integrated curves to a standard curve of each SCFA. It is hypothesized that there will be a significant increase in SCFA abundance in the exercising mice between the beginning and end of the study, suggesting that the microbiome alterations observed in the taxonomic study are promoting gut health.

Poster 42
Kiara Neilsen, Biology Undergraduate Student
Faculty Mentor: Rachel Bleich, Biology
Co-Author(s): Ally Lawing
Title: BACTERIAL INTERACTIONS OF A CALORICALLY RESTRICTED MICROBIOME
Diet and nutrition are essential in regulating an individual's health and well-being. Recent developments have linked the human gut microbiome composition to multiple

bodily regulations, such as inflammation, nutrient absorption, and energy use. Together, alterations to the gut environment due to caloric restriction, such as eating disorders, famine, or intense dieting, may be linked to long-term health consequences. Rats may be used as model organisms to study the microbiome during an ad libitum or food-restricted diet. In this project, bacteria from the fecal sample of a severely calorically restricted rat (40% of normal diet) were isolated, characterized by colony morphology, and grown in co-culture together to examine potential interactions between seven aerobically isolated bacterial strains and between four anaerobically isolated strains. The diluted fecal sample was incubated under aerobic and anaerobic conditions to examine all bacteria present in the gut of the calorically restricted rat. Isolates were plated in close proximity and as 1:1 strain mixtures (measured via optical density). Potentially enlarging isolate pairs were further studied by plating at incrementally increasing distances from each other. Wrinkling was observed in two pairs of 1:1 mixed aerobic isolates and one pair of closely-plated aerobic isolates. Colony wrinkling in co-culture indicates potential biofilm (protective phenotype) formation between these isolates. In strains that were isolated anaerobically, no changes in phenotype were observed in co-culture. Using 16S sequencing, most isolated microorganisms were successfully identified: Staphylococcus aureus (two), Bacillus species (three), Enterococcus species (two), and Lactococcus species (one). Studying the interactions between isolated strains from this fecal sample in these nutrient-rich conditions may further our understanding of nutrient restriction and its influence on the human gut microbiome.

Poster 43

Marcus Planck, Biology Undergraduate Student
Faculty Mentor: Cara Fiore, Biology
Co-Author(s): N/A

Title: ECOLOGY OF FRESHWATER SPONGES IN WESTERN NORTH CAROLINA

Freshwater sponges (Porifera: Demospongiae: Haplosclerida: Suborder Spongillina) are pervasive worldwide but with patchy distributions and limited literature on their ecology and distribution. Freshwater sponges typically disperse by sexual reproduction with a planktonic larva and by production of resting bodies known as gemmules. The gemmules are both a dormant stage of the sponge during winter or drought and are considered a propagule that can be transported to other rivers by waterfowl. Here we present the species distribution for freshwater sponges at five sites in western North Carolina and preliminary information on factors that influence hatching gemmules from a subset of these species. Four sponge species were found consistently at the sites, but each site tended to have just one species, while multiple species at one site was occasional. Hatching of gemmules was inconsistent in the laboratory but generally required longer periods (7-10 days) to initiate hatching compared to the model sponge species used in many developmental biology studies, Ephydatia muelleri. While

freshwater sponges tend to be relatively small and cryptic, they are important filter feeders, habitat, and trophic connections in aquatic systems. This work provides preliminary insight into an understudied but ecologically relevant group of animals in aquatic systems and further work is needed to better understand the ecology, functional roles, and factors affecting the distribution of freshwater sponges.

Poster 44
Tanishka Dass, Chemistry Undergraduate Student
Faculty Mentor: Michael Reddish, Chemistry and Fermentation Sciences
Co-Author(s): Amy Brown
Title: The Stabilization of Membrane Scaffold Proteins for Lipid Nanodisc Formation
Cytochrome P450 27A1 (CYP27A1) is a protein involved in the metabolism of cholesterol and vitamin D3. CYP27A1 has also been implicated in a number of hormonal cancers and age-related neurodegenerative diseases, therefore representing a potential therapeutic target. However, as a membrane protein, studying CYP27A1 in solution is difficult because in water, the hydrophobic regions on the protein misfolding can alter the protein's structure and function. It is also challenging to isolate the proteins due to them being embedded within the phospholipid bilayer. An approach to combat this issue is the use of phospholipid bilayer Nanodiscs, which have the ability to provide a more native membrane-like environment. Nanodisc technology is a useful tool in the study of membrane proteins as they allow for long-term stability of the protein and control of the membrane composition. A key component in the construction of Nanodiscs are membrane scaffold proteins (MSP), which support self-assembly of phospholipids into the disc shape. Despite the advantages of Nanodisc technology, the process of assembly can be complicated using MSP. Though MSP can be purchased it is cost prohibitive and not sold in an amount for a large-scale production of Nanodiscs. We have previously attempted construction of Nanodiscs with CYP27A1 using MSP-1E3D1. Disc construction and CYP incorporation appear to be successful; however, there appears to be a CYP27A1-derived aggregate with approximately the same molecular weight as the CYP27A1 Nanodisc. This overlap makes it difficult to confirm and improve the purity of the complex. To separate the aggregate and CYP27A1 complexes, we are working to generate smaller Nanodiscs with MSP-1D1. The stability of the two MSPs is different. We will present evidence of CYP27A1 Nanodisc construction, comparison of MSP stabilities, and characterization of formed Nanodiscs.

Poster 45
Heiden Kristoffersen, Chemistry Undergraduate Student
Faculty Mentor: Jefferson Bates, Chemistry and Fermentation Sciences
Co-Author(s): Jack N. McKeon, Gary L. Guillet
Title: ELECTRONIC STRUCTURE STUDIES OF A REDUCED TRI-FERROUS EXTENDED METAL ATOM CHAIN COMPLEX

Extended metal atom chain (EMAC) complexes have been synthesized using an array of first-row transition metals to produce a wide array of compounds. Recently, a novel tri-ferrous complex has been synthesized that does not utilize the usual 2,2'-dipyridylamine (dpa) ligand framework, which essentially always results in a tetragonal coordination environment and general formula M3(dpa)4X2, where X is an anion. Instead, the tri-ferrous complex utilizes a pyridine-based ligand (L) system resulting in the formation of trigonal complexes with general formula Fe3L3. Reduction of this complex leads to a mixed-valent tri iron EMAC with formula [Fe3L3]-1 that is very reactive. Semi-local and random phase approximation (RPA) density functional theory calculations were utilized to explore this novel [Fe3L3]-1 complex in order to compare and contrast with the neutral molecule that was previously reported. The calculations indicate that the reducing electron is delocalized in a pi bonding orbital formed from the d orbitals, which increases the bonding interactions between the metals. Consequently the Fe–Fe distances are shortened in the anion compared to the neutral. Unlike the neutral, however, a distribution of Fe–Fe bond lengths have been obtained from the experimental crystal structures and indicates a preference for an asymmetric configuration. By calculating 2D potential energy surfaces (PES) utilizing different DFT methods, the calculations indicate a relatively flat PES near the minimum for all functionals but that the overall shape of the PES and preference for symmetry vs asymmetry is heavily influenced by the amount of exact exchange mixing used in hybrid functionals. Magnetic coupling constants were also calculated for select molecular configurations. Regardless, the closeness in energy for a range of symmetric and asymmetric Fe–Fe–Fe configurations supports the observed experimental data.

Poster 46

Emily Willman, Environmental Science Undergraduate Student
Faculty Mentor: Robert Swarthout, Chemistry and Fermentation Sciences
Co-Author(s): Harlie Hodge

Title: QUANTIFYING BIODEGRADATION RATES OF DILUTED BITUMEN FROM THE 2010 KALAMAZOO OIL SPILL

In 2010 the largest inland oil spill in U.S. history occurred in the Kalamazoo river releasing an estimated 843,000 tons of diluted bitumen oil (dilbit). This was the first U.S. spill of dilbit, which is more viscous and dense compared to other traditional petroleum products making the environmental response and cleanup more challenging. Quantifying the biodegradation rate of hydrocarbons from dilbit oil can inform how quickly and to what extent aquatic systems can degrade dilbit oil. Dilbit biodegradation rates were assessed using aerobic microcosm experiments. Microcosms contained sterilized sand spiked with 25 mg of dilbit collected during the response to the Kalamazoo River spill and were divided into three treatment groups: 1) live ocean water, 2) live ocean water spiked with nitrogen and phosphorus, and 3) a negative control using autoclaved ocean water. The experiments ran for 58 days with triplicate vials

collected at intermediate time points. Remaining oil at each time point was extracted and concentrated prior to analysis by gas chromatography with mass spectrometry (GC-MS). Concentrations of individual hydrocarbons were quantified and normalized to the concentration of C30-hopane. Loss rates of each hydrocarbon were determined and traditional biodegradation indices (n-C17/pristane and n-C18/phytane) were quantified. This work will provide insight into the biodegradation potential of dilbit relative to more well-studied, traditional petroleum products to better inform cleanup efforts in future spills.

Poster 47
Benjamin Goodridge, Environmental Science Undergraduate Student
Faculty Mentor: Sarah Carmichael, Geological and Environmental Sciences
Co-Author(s): Dr. Sarah Carmichael, Dr. William Anderson
Title: HOW DOES SUBMARINE GROUNDWATER DISCHARGE AFFECT PALEOTEMPERATURE CALCULATIONS? A CASE STUDY FROM DEVONIAN ISLAND ARCS IN THE CENTRAL ASIAN OROGENIC BELT.
The Frasnian-Famennian (F-F) mass extinction during the Late Devonian period (372 MA) is one of the most severe extinction events in Earth's history. Although rapid climate change has been suggested as a cause, uncertainty remains about the ocean paleotemperatures throughout this extinction event. Paleotemperatures in marine environments can be inferred from δ18O isotope values in fossils using calcite-water oxygen isotope fractionation, but there are relative few study sites in open-ocean paleoenvironments at the F-F boundary, except for the volcanic island arcs of the Central Asian Orogenic Belt. One of the challenges in determining paleotemperatures in near-shore, high-porosity island arc environments is the influx of submarine groundwater discharge, which can artificially inflate paleotemperatures if they are derived from δ18O calcite-water fractionation calculations. Paleozoic hydrogeologic conditions of the Central Asian Orogenic Belt study sites were simulated using the island of Montserrat as a modern-day analog of a volcanic island arc environment, and a 2D submarine groundwater discharge model was developed using SUTRA. Expected δ18Ocalcite was determined using δ18Owater value output from the SUTRA model and a range of nearshore temperatures from 278.15 K to 318.15 K, then compared with δ18Ocalcite found in marine fossils of late Devonian age for a best fit.

Poster 48
Zsigmond Majtenyi, Environmental Science Undergraduate Student
Faculty Mentor: William Anderson, Geological and Environmental Sciences
Co-Author(s): Nicholas Fiori
Title: Impacts of Storm Overwash and Sea Level Rise on Saltwater Intrustion of Barrier Island Freshwater Aquifers

Barrier islands serve as critical freshwater reservoirs for coastal ecosystems and communities, yet they face an increasing threat from saltwater intrusion due to rising sea levels and intensifying storm activity. Previous modeling efforts have examined sea-level rise (SLR) and tidal influences on barrier island aquifers, but they often overlook the episodic yet impactful role of storm overwash events. This study enhances the realism of existing simulations by incorporating a storm overwash signal into a numerical SUTRA (Saturated-Unsaturated Transport) model. The addition of this signal allows for a more comprehensive assessment of how transient, high-energy coastal flooding events influence groundwater flow and salinity distribution. By integrating overwash dynamics with SLR and tidal variability, this research provides a more accurate depiction of future aquifer conditions. The addition of storms has a topographically limited effect on freshwater aquifer width and water table, yet differences exceeding 50% are found around 2050 and 2075 depending on the SLR scenario. Simulations account for saltwater intrusion adding up to 30,000 kg of salt into the sound side by the end of the century and 5,000 kg into the ocean side. Storms accelerated saltwater intrusion into barrier islands adding over 100% more total salt into the aquifer around 2025 and 40% by 2100. Simulations are conducted across varying barrier island properties, including hydraulic conductivity, SLR intensity, recharge rates, dispersivity, sound salinity, and island width, to generalize findings beyond the North Carolina coast.

Poster 49
Jack Dickson, Geography Undergraduate Student
Faculty Mentor: Bhuwan Thapa, Geography and Planning
Co-Author(s): Bhuwan Thapa, Geumjin Han, Miyoun Kwon, Yoonjin Ro
Title: Spatiotemporal variations in surface temperature and built environment: Case of Seoul, South Korea
High-density buildings, complex transportation networks, and urban green infrastructure can alter the ambient temperature in megacities in complex ways. Using the case of Seoul, South Korea, this study highlights the relationship between ambient surface temperature and the built environment. The study uses a dense hydrometeorological network of 1,146 sensors scattered across the city collecting hourly temperature and precipitation data for 2023 and 2024. This data is aggregated to estimate daily minimum and maximum. For built environmental features, the study creates a 3-meter spatial resolution landcover map using a supervised classification method based on PlanetLab data. The landcover data is further analyzed to create landcover-related variables like percent impervious and percent tree cover. In addition, the study also derives other built environmental variables like building height data (100-meter raster imagery derived from GLAMOUR), road networks, and industrial sites from various sources. Linear regression is performed to explore the relationship between ambient temperature and built environmental features. The preliminary result

reveals a positive role of tree cover in reducing the ambient temperature, whereas a negative effect of the built environment is increasing the ambient temperature. This study brings light to the urban heat island effect in the dense cityscape of Seoul.

Poster 50
Eden Vigus, Geography Undergraduate Student
Faculty Mentor: Bhuwan Thapa, Geography and Planning
Co-Author(s): Jackson Kinney, Bhuwan Thapa, Erik Rabinowitz, Ram Poudel, Jennifer Schroeder Tyson, Brian Raichle
Title: ACTIVE COMMUTER EXPOSURE TO AIR POLLUTION IN RURAL APPALACHIAN COLLEGE COMMUNITY
Air pollution is a global environmental health risk, contributing to both mortality and morbidity globally. Using ambient air quality sensors and air quality & biometric sensors attached to pedestrians, bicyclists, and e-bikers, gaps in understanding the air pollution exposure of these groups in a rural Appalachian setting are being explored. Cycling and walking participants take a loop route from the Holmes Convocation Center that takes them through identified high, medium, and low-traffic areas. Meanwhile, air quality indicators, GPS coordinates, speed, and heart rate data generated by the participants are all collected in real-time at 1-2 second intervals. Additionally, ambient air quality sensors at selected points along the route collect a dataset against which to compare the participants' data. The ambient air sensors are integrated into a stand-alone, photovoltaic battery-powered system to collect air quality data 24/7. Reasoning and challenges with the ambient air sensor systems will also be discussed. As a result of our ambient and mobile sensing, this study has the potential to identify air pollution hot spots and areas that pose an increased risk of air pollution intake. By focusing on active commuter air pollution exposure and potential health implications, this study aims to support evidence-based policies for promoting cleaner transportation options and better health outcomes.

Poster 51
Bella Vanden Boom, Geography Graduate Student - Masters
Faculty Mentor: Maggie Sugg, Geography and Planning
Co-Author(s): Caroline Fehlman
Title: IDENTIFYING MATERNAL HEALTHCARE DESERTS: A CENSUS-TRACT LEVEL SPATIAL ANALYSIS
Access to maternal healthcare is critical to maternal and infant health outcomes. However, significant disparities in healthcare provider availability exist across the continental United States, with notable scarcity in rural and underserved regions. This study employs spatial analysis techniques to map the distribution of maternal healthcare providers at the census tract level throughout the US, utilizing point-level provider data. Geographic coordinates of maternal healthcare providers, including

obstetrics, family medicine, and midwifery, were geocoded using the CMS's National Plan and Provider Enumeration System (NPPES) public use file, covering the period from 2016 to 2022 (n=511,346). Geospatial methods, including spatial joins, bivariate clustering techniques, and multivariate regression, were employed to quantify the density of maternal healthcare providers at the 2020 census tract level and underlying risk factors (e.g., rurality, low-income community). The study identifies regions with low provider density, highlighting areas of maternal healthcare deserts, which are present in the Dakotas, parts of the southeastern US, and western US. Lack of providers was spatially associated with rurality, low-income communities, and locations with high numbers of Indigenous Americans. Findings inform the understanding of geographic disparities in provider accessibility and can guide targeted policy interventions to improve maternal health equity, particularly in underserved and rural regions throughout the United States.

Poster 51
Elvis Geissler, Geology Undergraduate Student
Faculty Mentor: Andrew Heckert, Geological and Environmental Sciences
Co-Author(s): Caeden Carter, Kathleen Plesh, Joshua Crouch
Title: PRODUCING PORTABLE PALEONTOLOGICAL EXHIBITS TO ENHANCE EDUCATIONAL ENGAGEMENT
Formal training across a swath of paleontological methods, or “preparation” is relatively uncommon, especially at the undergraduate level. We have striven to turn this challenge into an opportunity by combining GES 3264: Paleontological Laboratory and Analytical Techniques with our small (1200ft2) museum to generate “mini-exhibits.” The intention is thus to leverage student interest to develop small exhibits suitable for our limited museum space and/or travel to outreach events. As students in the course, and later as museum interns, we each developed two “mini” or “tabloid” exhibits, so named because they are limited in size to graphics that fit on an 11x17” (“tabloid” paper). While one of the exhibits may be on vertebrate body fossils, the other must be on either fossil traces, invertebrates, or plants to ensure a diversity of coverage. After approval of our chosen topic, we would design and develop all graphics and 3D components. This typically includes some combination of casts, 3D prints, and, as feasible, actual fossils. We produce these during “out of class” (“homework”) time in our PURL (Paleontological Undergraduate Research Lab). Vertebrate mini-exhibits benefit from 3D printing, making fossil models accessible. These include endocasts of Tyrannosaurus rex and Yuraramirim montealtensis, a Metoposaurus skull reconstruction, and a marine amniote jaw comparison. Invertebrate, plant, and trace fossil mini-exhibits highlight how 3D modeling enhances education. A 3D-printed Didymoceras donezianum showcases heteromorph ammonite morphology. A coprolite ichnology display features sculpted clay coprolites from an Upper Triassic site. The Mazon Creek diorama presents reconstructions in a handcrafted aquatic setting. The bitten ammonite reconstruction

illustrates predator-prey interactions. These exhibits allow us to contribute lasting educational resources, fostering engagement in paleontology beyond the classroom.

Poster 53
Madison Schwarte, Geology Undergraduate Student
Faculty Mentor: Marta Toran, Geological and Environmental Sciences
Co-Author(s): N/A
Title: MATERIALS FOR YOUTH EDUCATION OUTREACH
The Paleontology Undergraduate Research Lab (PURL) at Appalachian State University produces fossil molds, casts, and 3D prints for geology and paleontology outreach programs for informed science education. The lab aims to produce replicas for activities that are compatible with state science standards. At outreach events, lab members give away hundreds of fossil replicas as a fun exercise to encourage children to ask questions. We use tin-based silicone rubbers to build the molds and urethane resins to pour the cast. Using dyes and paints to make more realistic casts. Students learn the importance of lab safety, including safe handling of molding and casting materials. We produce hands-on materials that, with the guidance of the department's outreach coordinator, become the basis of outreach kits associated with specific educational standards. For research or outreach, when deciding to mold a fossil, there are lots of considerations beyond the suitability of the fossil for molding. These include the cost in terms of time and material, the need for storage, and the benefits of the resulting casts. By incorporating simple 1-part molds of popular outreach items into the curriculum of various GES classes, it is possible to acquire molding rubber and casting materials using educational (classroom) funds and to have students generate multiple simple molds for class projects. The resulting molds can then be poured by any trained person. In this way, we can augment specimens for labs and provide specimens for outreach. Our library of these molds means that there are always molds available to pour. These skills can be transferred to other undergraduates. With this program App students learn the constraints of paleontology programs, such as money, time, and other resources. Specifically, students learn materials and methods associated with fossil replication, which can then be used in other paleo labs and on other internship opportunities.

Poster 54
Jayne Hinson, Physics Undergraduate Student
Faculty Mentor: Jefferson Bates, Chemistry and Fermentation Sciences
Co-Author(s): N/A
Title: COMPLEX EXCITATION ENERGIES FROM A FIRST-ORDER TRUNCATION OF THE IRREDUCIBLE RESPONSE FUNCTION
Many-body perturbation theory (MBPT) and time dependent density functional theory (TDDFT) have served as cornerstones of computational chemistry and physics for nearly the last half century. The connections between these theories have driven advances in

each respective field as each utilizes some form of density-density response function as a central quantity for calculating excited state properties. In this study, we utilized two different reference determinants to calculate the non-interacting density-density response, one obtained from the mean-field (MF, aka Hartree-Fock) approximation and the other from DFT. The non-interacting response function is then utilized to determine the approximate interacting excited states within the random phase approximation (RPA), with and without an exchange correction. In addition, we utilize an approach from MBPT to renormalize the response function by calculating an approximate irreducible polarization, a typical ingredient in Green's functions calculations. The two-site, asymmetric Hubbard model with finite boundary conditions is utilized to generate numerical results comparing the reference dependence of the renormalization scheme. A fourth-order polynomial is derived for the eigenvalues of the response function within this renormalized scheme, leading to complex eigenvalues compared to the exact excitation energy which is real. This work demonstrates the difficulty of making low-order truncations of the irreducible response function, and indicates the importance of treating the density-density and irreducible response functions on equal footing.

Poster 55

Clara Lopez, Physics Undergraduate Student
Faculty Mentor: Brooke Hester, Physics and Astronomy
Co-Author(s): Brooke Hester

Title: STRATEGIES FOR OPTIMIZING RAMAN SPECTRA IN A LASER TWEEZER RAMAN SPECTROSCOPY (LTRS) SYSTEM

Raman spectroscopy is a valuable tool for studying the vibrational and rotational frequency modes of molecules. A Raman spectra occurs when incident light excites a molecule to a higher vibrational state and when the molecule relaxes emitting photons whose energies match the vibrational energy shifts at wavelengths specific to that molecule. Raman spectroscopy is extremely valuable because it is very specific and sensitive allowing us to identify particular materials. In the Laser Tweezer Raman spectroscopy (LTRS) system, we use a 785 nm diode laser for excitation and a liquid nitrogen cooled spectrometer/CCD camera for measuring spectra. The LTRS system has the ability to use three lasers -a 785 nm diode laser to obtain a Raman spectra, a 1064 nm diode laser to trap particles, and a 633 nm HeNe laser for position detection- to trap and get a Raman spectra from that sample . The system is currently being automated to allow LTRS to be used "anywhere" -similar to space probes- without the need of human operators. Various spectrometer settings and attributes, laser alignment quality and Raman spectrum alignment quality, sample preparation, and laser quality and power all potentially affect the quality of the measured spectrum. Here we explore these various effects on spectra measured with our LTRS system.

Poster 56
Alan Schneider, Physics Undergraduate Student
Faculty Mentor: Brooke Hester, Physics and Astronomy
Co-Author(s): Asher Rockriver, Clara Lopez
Title: Implementation approaches for automating and optimizing optical tweezers in a Laser Tweezer Raman Spectroscopy system
Laser Tweezer Raman Spectroscopy is a spectrographic technique that uses Raman spectroscopy with optical trapping via optical tweezers to hold and manipulate single particles, allowing precise acquisition of spectral data without the need for physical contact. The optical tweezer aspect of the LTRS system is important because it ensures a higher signal to noise ratio of the Raman spectra measurements; the Raman signal is usually very weak, and the optical tweezers allow for more light to be scattered off the sample, allowing for a higher signal. Our LTRS setup utilizes a 1064 nm diode laser for particle trapping, and a 532 nm solid state laser for sample position detecting. The LTRS system in the BiyOSeF laboratory is undergoing automation in order to ensure higher quality spectral data and to allow for autonomous operation. Automating the optical tweezers in the setup will improve our ability to manipulate and analyze samples, allow for precise position calculations, and increase efficiency in the obtaining of Raman spectra. Here, we explore the automation of the optical tweezers within the LTRS system, highlighting different approaches for optimization, and the impact on precision, efficiency, and reproducibility in microscopic particle analysis.

Poster 57
Chloe Thompson, Physics Undergraduate Student
Faculty Mentor: Brooke Hester, Physics and Astronomy
Co-Author(s): N/A
Title: IMPLEMENTATION OF A SPATIAL LIGHT MODULATOR FOR PRODUCING AN ARBITRARY INTENSITY DISTRIBUTION LASER BEAM
A spatial light modulator (SLM) is any kind of device used to manipulate light by changing its amplitude, phase, or polarization. We have a Thorlabs EXULUS-HD3HP, which contains an array of Liquid Crystals on Silicon. These crystals are arranged as pixels so that their rotation changes as different voltages are applied to them. This SLM allows for individual pixels to be manipulated, generating the highest precision modulation. Our lab uses optical tweezers to trap and manipulate microscopic particles, commonly used in an optical microscope to view the trapped object. The ultimate goal of this project is to implement the SLM and use it in our optical tweezers apparatus for generating any any shape of optical trap by generating any intensity distribution in the reflected laser beam from the SLM. To familiarize ourselves with the SLM, we will use it to change the amplitude, phase, or polarization of a helium-ion laser such that its beam profile resembles the Appalachian State mascot, Yosef. This process will allow us to better understand the capabilities of the SLM, and ultimately incorporate it into our

optical tweezers arrangement so that it is then capable of generating arbitrary optical traps

Poster 58
Cade Tischer, Physics Undergraduate Student
Faculty Mentor: James Sherman, Physics and Astronomy
Co-Author(s): Jonathan Linderich
Title: OPTIMIZING AEROSOL HUMIDIFICATION FOR IMPROVED CLIMATE MODELING AND FIELD MEASUREMENTS
Atmospheric aerosols influence climate by scattering sunlight and acting as cloud condensation nuclei (CCN), yet their effects remain highly uncertain. This project, supported by NC Space Grant, contributes to two NSF-funded field campaigns at Appalachian State University (APP) in Fall 2024 and Spring 2025, in collaboration with Georgia Tech and NOAA. The primary objective is to improve measurements of the aerosol light scattering humidity enhancement factor, f(RH), which is crucial for understanding aerosol-cloud interactions. A central focus of this research is the development and optimization of a membrane-based humidification system for precise aerosol sample conditioning in nephelometer measurements. This involves designing, manufacturing, and extensively testing a new humidifier assembly that utilizes an expanded polytetrafluoroethylene (ePTFE) membrane to control aerosol humidity. The system will be deployed in field campaigns to provide reliable and reproducible f(RH) measurements under varying atmospheric conditions. Collected data will be analyzed using custom-developed software, with a portion of the datasets supporting machine learning (ML) models, led by Georgia Tech collaborator Dr. Pengfei Liu, to predict aerosol liquid water content (ALWC). This project offers hands-on experience in hardware development, aerosol instrumentation, and environmental data processing. By advancing humidification technology for aerosol studies, this research improves measurement accuracy and contributes to refining climate models in the southeastern U.S.

Poster 59
Michaela Sutherland, Psychology Undergraduate Student
Faculty Mentor: Tim Huelsman, Psychology
Co-Author(s): Cassidy Zekas, Leah Uteg-Winkelman, Camila Yamaleyeva, Niasia Jones, Hunter Bass, Jess Doll, Kristl Davison
Title: SCALING DEI: EVALUATING CHANGE PREPAREDNESS IN ORGANIZATIONS
Many organizations implement Diversity, Equity, and Inclusion (DEI) programs to foster a diverse workforce and improve organizational culture. However, research shows that these programs often fail to produce significant change (Kalev & Dobbin, 2016), with varying success across organizations. Recent backlash against DEI efforts, such as over 80 anti-DEI bills in the U.S. and companies like Ford, Lowe's, and Meta scaling

back DEI initiatives (Lamparksi, 2024; Elias, 2023), suggests the need to assess if organizations and employees are truly prepared for DEI efforts. Although DEI programs are becoming more common, there is a gap in research on organizational readiness for DEI. Existing studies focus on program outcomes and best practices, but few explore readiness for DEI change itself. This gap is concerning, as without assessing preparedness for DEI success, organizations may struggle to create lasting impact. Developing a DEI readiness scale could offer insights into the factors that support or hinder DEI initiatives, and help organizations identify gaps and align resources to achieve meaningful change. This project will explore factors like leadership capabilities (Hundschell et al., 2024), employee behavioral intentions (Turner, 2023), and organizational support/resources (Wells-Cheeks, 2024; Billsten et al., 2018). This research will include a literature review, survey development, and pilot testing with Appalachian State University students, followed by administration to partnering organizations. The outcome will be a tool to assess organizational readiness for DEI, ultimately enhancing the success of DEI program implementation and fostering a more inclusive workplace."

Poster 60

Jaylin Van Noy, Psychology Undergraduate Student
Faculty Mentor: Yalcin Acikgoz, Psychology
Co-Author(s): Anastasia Dubinsky, Reagan Kaeding, Alex Hernandez
Title: PROFESSIONALISM

Professionalism in the workplace is essential for positive interactions between employees, colleagues, supervisors, and customers. However, most research on professionalism has focused on the medical field, with little attention in the management and organizational psychology literature. This study aims to address this gap by presenting a framework to understand professionalism in the workplace. Using the Merriam-Webster definition and insights from generative AI, we identify key aspects of professionalism, such as integrity, competence, respect, reliability, accountability, appearance, communication, collaboration, adaptability, and ethical behavior. This framework lays the groundwork for future research on the causes, effects, and measurement of professionalism at work. The manuscript also proposes a way to measure professionalism and suggests directions for future studies. This past fall, we first consulted the literature and AI to create our initial list. We also met in three focus groups with HR professionals to identify additional dimensions. Next, we developed a survey and collected data from white collar employees to get our expanded list of dimensions rated in whether they are considered a professionalism dimension. Currently, we have received our data and are in the process of analyzing it, and our most recent evaluation was looking at contingency tables of our data. Our next step is developing items measuring the dimensions that clear the current round and testing our measure's validity. This work has given us a strong foundation of understanding

professionalism in the workplace. Once we have our finalized data, we aim to elaborate on the dimensions of professionalism and describe each in greater detail. We hope that by the end of our study, the data we were given will help begin to give us a proper way to define professionalism, as well as provide and propose future avenues for research on professionalism.

Poster 61
Elizabeth Arnold, Psychology Undergraduate Student
Faculty Mentor: Shawn Bergman, Psychology
Co-Author(s): Dacey Ramroth
Title: SAFETY REPORTING BETWEEN EMPLOYEES AND CONTRACTORS
Despite competition from other organizations, companies can readily attract top performers by focusing on safety culture. A strong safety culture shows employees that their organization cares about their well-being, which fosters a positive work environment. By comparing employee and independent contractor observations, the current study aims to demonstrate the effectiveness of a strong employee-led behavioral observation reporting program. We used two years of safety observation data from a major oil refinery company. We then selected the five departments with the most behavioral observations and incidents. Rolling sum time-series logistic regression was used to investigate the compliance data classified by employment. The results of the data analysis showed that while independent contractors' observations raised their median Odds Ratio (OR) of 1.012, staff observations dramatically decreased incident odds with a median OR of 0.986. Implications from these findings are that organizations investing in safety programs should prioritize the participation of their current employees to improve their efficacy in reducing injury probabilities. Encouraging employee participation in safety reporting promotes a healthier safety culture, lowers incidents, improves corporate culture, saves lives, and increases value.

Poster 62
Mollie Bollinger, School Psychology Graduate Student - Masters
Faculty Mentor: Sandra Gagnon, Psychology
Co-Author(s): Mary Margaret Watson, India Horn, Emie Choquette, Kellie Honeycutt, Katherine Smith, Jack Settlemyer, Madeline Messitt, Gracie Leophard
Title: COLLEGE VICTIMS OF HIGH SCHOOL BULLYING: DOES SOCIAL SUPPORT MATTER?
The current research aimed to expand the understanding of the impact experiencing bullying in high school has on mental health in college. Existing research shows evidence that adolescent bullying victims experience problems with mental health, peer relationships, and self-esteem and are at risk for suicidal ideation. This extends past high school, as victims report higher rates of depressive and anxiety disorders and other mental illnesses during young adulthood. Cyberbullying is particularly concerning given

the pervasiveness of social media, which presents endless opportunities for bullying. However, research has also shown that social support may help protect bullying victims from some of these adverse outcomes. The goal of this study was to determine if different sources of social support may attenuate the mental health outcomes from traditional and cyberbullying. We examined overall social support and support from friends, family, and significant others as moderators of the relationships between high school victimization and college mental health. Our findings support the detrimental effects of traditional and cyberbullying victimization during high school on college mental health, showing higher levels of both types were associated with worse mental health. Overall social support and support from family and friends predicted better mental health. Surprisingly, no significant interactions emerged between either type of bullying and any source of social support when predicting mental health scores. Knowledge that harm can follow students into college provides a strong impetus not only to prevent bullying during high school but also to provide extra support to victims. School psychologists can educate parents and teachers about these future risks and help them support students as they transition into young adulthood, a time when anxiety and depression rates are high. Our ability to promote resilience is enhanced when we understand the future risks of bullying.

Poster 63

Mary Margaret Watson, School Psychology Graduate Student - Masters
Faculty Mentor: Sandra Gagnon, Psychology
Co-Author(s): Mary Margaret Watson, Sandra Gagnon, Mollie Bollinger, Emie Choquette, India Horn, Kellie Honeycutt, Jack Settlemyer, Katherine Smith, Madeline Messitt, Gracie Leophard

Title: College Victims of High School Bullying: Emotion Regulation May Help

Bullying in high school is a serious issue, with 22-25% of students reporting victimization. Bullying victimization is associated with numerous adverse outcomes, such as depression, anxiety, and suicidal ideation. These outcomes are associated with both traditional bullying and cyberbullying and have been shown to affect mental health and adjustment in college. Cognitive reappraisal and emotional suppression are emotion regulation strategies that have been linked to mental health outcomes but with mixed findings. This study examined the relationship between bullying (both traditional and cyberbullying) in high school and its effect on mental health outcomes in college. This study also examined the role of emotional regulation as a potential protective factor from these adverse outcomes. The sample consisted of 329 undergraduate students who reported high school bullying experiences and current emotion regulation and mental health symptoms. We ran eight linear regressions that revealed main effects, with two interactions found between cyberbullying and emotional suppression. No interactions were found for cognitive appraisal or traditional bullying. The results indicate that emotion suppression moderates the relationship between cyberbullying and both

anxiety and depression. The interaction exists with individuals who reported average or high levels of suppression. Those students were more likely to experience adverse mental health from cyberbullying than those with low suppression. The interactions suggest that emotional suppression is a key risk factor for exacerbating the mental health effects of cyberbullying. School psychologists can help prevent these effects by prioritizing interventions that address emotional suppression. They can support teachers by educating them to recognize the effects of bullying and emotional suppression so they can better support their students.

Poster 64

Sophia Chapdelaine, School Psychology Graduate Student - Masters
Faculty Mentor: Crystal Taylor, Psychology
Co-Author(s): Gracie Streeval and Jamie Yarbrough

Title: BOOSTING SOCIAL-EMOTIONAL SKILLS: SECOND STEP'S IMPACT ON ELEMENTARY CHILDREN

Social-emotional learning (SEL) is the process of applying and acquiring skills, attitudes, knowledge, and competencies, including self-awareness, self-management, responsible decision-making, social awareness, and relationship skills (Fundamentals of SEL - CASEL, 2023). Second Step is a research-based, universal SEL program designed to teach skills to enhance student social-emotional growth by teaching children coping skills to deal with common social and emotional challenges. In this presentation, we aim to discuss the implementation of Second Step within a rural charter school in the southeastern region of the United States. The presentation will outline the successes and barriers experienced in the process as well as data to show the improvements made in the children's social-emotional well-being following 11 weeks of intervention. The study sought to examine the efficacy of Second Step when implemented by graduate students at the class-wide level. Three main research questions were of interest:
(1.) Does Second Step decrease elementary children's social-emotional and behavioral risk levels? (2.) Does Second Step improve children's knowledge of social-emotional concepts? (3.) What are elementary teacher's perspectives on Second Step? A small, rural K-8 charter school requested support from a local school psychology program as part of an initiative to support the social-emotional needs of their children following universal screening data that indicated high rates of social-emotional and behavioral risk. All children from kindergarten to fifth grade received the intervention. Children received the intervention on Wednesday mornings for 30-40 minutes for 11 weeks. Pre- and post-universal screening scores were used to answer the first research question. The students at-risk decreased from 30% to 26%. The second research question examined whether the childrens' knowledge of social-emotional concepts improved following intervention, which improved by 8% after receiving the intervention. The third research question examined teachers' perceptions of the intervention, which they rated overall as 3.57 out of 6.

Poster 65
Sarah Louise Wood, Sociology Undergraduate Student
Faculty Mentor: Ellen Lamont, Sociology
Co-Author(s): N/A
Title: CLASSED DATING PRACTICES: HOW COLLEGE STUDENTS USE SOCIAL CLASS TO NAVIGATE THEIR ROMANTIC DECISIONS
Previous research has found that mate selection is heavily influenced by social class. Early data uncovered a gendered exchange, as men exchanged high social class for partners of high physical beauty. However, increased gender equality, the romantic love ideal, and evolving preferences in mate selection have shifted this process, potentially making it more substantive and egalitarian. This may be especially true on college campuses, as evolving roles and expectations for women are closing the gap that has perpetuated a gendered exchange of social class in relationships. However, social class remains a marker of success and social standing, and therefore indicators of class may be used in more subtle, less overt ways than in the past. Given these tensions, it remains unclear how individuals perceive class and how it impacts their dating practices. This research draws on 10 in-depth interviews with undergraduate students to understand how students make sense of social class in the context of intimate relationships. Preliminary findings show that students recognized class stratification among majors, clubs, and greek life organizations that grouped students together into classed dating patterns. Interviewees emphasized the romantic love ideal and denied the conscious use of social class to select partners, but identified how financial expectations of romance are heavily gendered and shape dating practices. Ambition was the main factor that students looked for in a partner, which acts as a symbol of class and upward mobility in the future. Ambition was understood differently for men and women, and was connected to less egalitarian attitudes. College is often seen as class equalizing, with educational attainment closing class gaps, but the permanence of traditional gender roles in students' expectations for their futures may prove that we need more nuance in how the institution of college is analyzed as a predictor of social class and homogamy.

Poster 66
Emma Getz, Public Health Undergraduate Student
Faculty Mentor: Richard Christiana, Public Health and Exercise Science
Co-Author(s): N/A
Title: TICK-BORNE DISEASE PREVENTION IN LONG-DISTANCE APPALACHIAN TRAIL HIKERS: A HEALTH BELIEF MODEL APPROACH
Ticks known to transmit diseases, such as the blacklegged tick and the lone star tick, are prevalent along the Appalachian Trail (AT). Lyme disease, the most common tick-borne illness (TBI) among hiker populations, is transmitted primarily by three tick species that are found across the east coast and along the AT. Long-distance hiking on the AT

presents unique health risks related to tick exposure and TBI due to prolonged outdoor living, limited access to hygiene facilities, and restricted medical treatment options. These factors also pose challenges for hikers in implementing TBI prevention measures. Despite these challenges, little research has examined the health behaviors and perceptions of long-distance AT hikers regarding TBI prevention. Existing research has largely focused on TBI prevention strategies and risk factors among the general population, but there is limited knowledge available specific to long-distance hikers. Understanding the behaviors of this high-risk population is crucial for informing future public health interventions. Given the lack of research, a study is proposed that will use the health belief model as a framework to explore what strategies long-distance AT hikers implement to prevent TBI and their perceived risk and seriousness of TBI, beliefs about prevention effectiveness, barriers to implementing prevention measures, and self-efficacy. A survey will be conducted at the annual Trail Days festival in Damascus, VA: the world's largest celebration of the AT and gathering of long-distance AT hikers. Invitations to complete the survey will also be posted on various forums and online communities dedicated to long-distance hiking on the AT. Data collection will take place from April to May 2025, with findings presented in Fall 2025. The results from this study will enhance understanding of health behaviors in outdoor recreation spaces and inform future research on TBI risk among long-distance AT hikers.

Poster 67

Caroline Halliday, Recreation Management Undergraduate Student
Faculty Mentor: Mandy Harrison, Recreation Management and Physical Education
Co-Author(s): N/A

Title: EXPLORING THE CONNECTION BETWEEN TRANSFORMATIVE EDUCATIONAL EXPERIENCES AND RESILIENCE

Resilience is the ability to adapt and recover from challenges. It is a critical skill for students in Recreation Management, particularly in outdoor and experiential education settings. Previous research suggests that outdoor expeditions can foster resilience by exposing participants to physical, mental, and emotional challenges in a supportive, immersive environment. As there is limited research on how short-term expeditions impact resilience in undergraduate students, this study is needed to assess whether participation in a 4-day wilderness expedition influences resilience in Outdoor Experiential Education (OEE) students. These students who participate in the expedition will be compared to their peers who do not participate in the expedition with a pre and post test of resilience via an online survey. Comparing the resilience levels of OEE and Finance and Risk Management (FRM) students—who are at a similar academic stage—will help determine whether or not the expedition contributes to changes in resilience. The findings may inform curriculum development in higher education and experiential programming to better support student resilience and learning outcomes.

Poster 68
Isabel Schniper, Recreation Management Undergraduate Student
Faculty Mentor: Erik Rabinowitz, Recreation Management and Physical Education
Co-Author(s): n/a
Title: THE CORRELATION OF RECREATION AND REDUCING OFFENDING IN NORTH CAROLINA.
As populations continue to grow throughout the United States, communities become more densely packed into urban areas that do not always have access to recreational opportunities. Participation in recreation and leisure activities has been shown to increase self-esteem, and interpersonal, teamwork, and problem-solving skills, making it a protective factor. Without access to these programs, youth are at an inherent disadvantage when compared to their peers who participate in activities such as summer camps, organized sports, and other recreational programming. This disadvantage and potential negative psychological consequences can lead to an increased risk of antisocial behavior, which harms larger communities. Due to this correlation, this paper aims to explore how access to recreational opportunities in childhood and adolescence impacts criminal offense rates. This access will be assessed via county-level recreation funding, as well as youth crime rates within the counties.

Poster 69
Madi Heater, Recreation Management Undergraduate Student
Faculty Mentor: Erik Rabinowitz, Recreation Management and Physical Education
Co-Author(s): N/A
Title: ECONOMIC AND ENVIRONMENTAL IMPACTS OF HURRICANE HELENE ON THE BLUE RIDGE PARKWAY
Beginning September 25, 2024, the first bands of Hurricane Helene passed over Boone, North Carolina and the Appalachian Mountains in what meteorologists call a Predecessor Rain Event (PRE) (Figure 1). This meant that before Hurricane Helene even arrived in the mountains, many rivers were running high, and areas were already flooding after the PRE dropped 10-15 inches of rainfall across the region. On September 27th Hurricane Helene passed over western North Carolina dumping 30+ inches of rain in its path, leading to flooding surpassing that of the Great Flood of 1916. The extreme rain, along with strong winds, left Western North Carolina in shambles, including the Blue Ridge Parkway. Currently, the National Park Service has reported 23 different landslides that occurred between mileposts 224.9 and 421, as well as structure damage and thousands of down trees along the parkway. A 2022 news release from the National Park Service named the Blue Ridge Parkway as the most visited park within the system with 15.9 million visitors. 2023 topped that amount, with 16.8 million recreation visits spending an estimated $1.4 billion in local gateway regions while visiting the parkway (Figure 2). Throughout the year the levels of visitations vary, with fall being the busiest

time as people are coming to see the vibrant fall colors that the Blue Ridge Parkway is famous for. October is the most popular month, and September is a close second. With Hurricane Helene striking at the end of September, right before the biggest month of the year, revenue for the parkway and local communities was likely highly affected. As time progresses, more information is being gathered to truly see how much of an impact the hurricane had on the parkway and the surrounding communities. My intention is to synthesize this data into a full report on the environmental and economic impacts that the hurricane had on the Blue Ridge Parkway to help better understand the extent of the damages.

Poster 70
Gabrielle Engstrand, Psychology Undergraduate Student
Faculty Mentor: Kym Fasczewski, Public Health and Exercise Science
Co-Author(s): Samantha DuBois
Title: SUSTAINING PHYSICAL ACTIVITY IN MULTIPLE SCLEROSIS: THE ROLE OF MOTIVATION, COGNITION FUNCTION, AND CHARITY EVENT PARTICIPATION
Multiple Sclerosis (MS) is a chronic, neurodegenerative disease characterized by unpredictable demyelination of nerves, leading to impairments in physical function, coordination, strength, cognition, and overall quality of life. These challenges often result in reduced self-efficacy and lower levels of physical activity (PA) participation. However, engaging in regular PA has been shown to offer numerous benefits for individuals with MS, including improved physical function, cognitive performance, mood, and overall well-being. Yet, very few individuals with MS meet the recommended guidelines for PA. This longitudinal study aims to examine the motivation for sustained PA engagement among individuals diagnosed with MS who plan to participate in a PA-based charity fundraiser event within the next 12 months. Over the course of 12 months, the study will assess participants' PA engagement, cognitive function, and quality of life to better understand the facilitators and barriers of long-term PA adherence. Data will be collected through an initial survey, followed by monthly follow-up surveys to track changes over time. This research aims to identify key psychological and physical facilitators and barriers, providing insights to inform strategies that can enhance physical activity participation and overall well-being in individuals with MS. These findings could have implications for clinical practice, community-based programs, and broader efforts to support individuals with MS maintaining a healthier, more active lifestyle.

Poster 71
Ansley Patton, Exercise Science Undergraduate Student
Faculty Mentor: Jared Skinner, Public Health and Exercise Science
Co-Author(s): Breanna Gibson, Scott Collier, PhD.

Title: SLEEP DISTURBANCES IN PARKINSON'S DISEASE: THE IMPACT OF INSUFFICIENT SLEEP TIME ON SLEEP EFFICIENCY AND DEEP SLEEP STAGES.
BACKGROUND: Sleep disturbances are the leading non-motor symptom in Parkinson's disease (PD), experienced by 90% of patients, an substantially higher rate compared to the general population. According to NIH sleep recommendations, older adults should aim for 7–8 hours of sleep, which is linked to improved cognitive functioning and better overall health. This study examines the impact of reduced sleep time and sleep efficiency in persons with PD (PwPD) compared to older adults (OA). METHODS: A retrospective analysis was conducted using data from a 4-night sleep study with portable EEG monitors. Participants were categorized as "adequate" (OA: n=3, PwPD: n=1) or "insufficient" (OA: n=7; PwPD: n=9) sleepers based on their TST relative to NIH guidelines. Group differences in sleep outcomes, including TST, sleep efficiency, and sleep stages (N1, N2, N3, REM), were analyzed using ANOVA. RESULTS: TST and sleep efficiency were significantly lower in PwPD compared to OA ($p<0.05$). Both OA and PwPD insufficient sleepers spent significantly less time in N3 ($p<0.01$), and PwPD insufficient sleepers had lower percentages of TST in REM ($p<0.05$) and N2 ($p<0.05$). Correlation analysis showed significant relationships between TST and various sleep metrics, such as N1, N2, and N3 sleep, particularly in PwPD insufficient sleepers. CONCLUSION: Failure to meet NIH sleep guidelines is associated with impaired sleep quality in both OA and PwPD. Insufficient sleep is linked to reduced time spent in deep sleep stages, which may negatively affect cognition and overall health. These findings highlight the importance of sleep duration for individuals with PD and suggest that interventions aimed at improving sleep could improve health outcomes.

Poster 72
Katie Rhoades, Nursing Undergraduate Student
Faculty Mentor: Tammy Haley, Nursing
Co-Author(s): N/A
Title: MEANING MAKING IN MAYHEM: THE IMPACT OF PASTORAL CARE ON INPATIENT PSYCHIATRIC PATIENTS
Introduction: The intersection between pastoral care and inpatient psychiatric patients has seldom been addressed with limited studies identifying positive outcomes. In aiming to provide the best evidence-based nursing care to psychiatric patients, further exploration into the efficacy and reported effects of pastoral care is needed. Purpose: The purpose of this project was to explore the perceived impact of pastoral care for inpatient psychiatric patients from the provider's perspective. Methods: Six pastoral care providers were interviewed about their experience caring for inpatient psychiatric patients. An interview guide was created before interviews and field notes were taken throughout. Careful line-by-line thematic analysis of the field notes facilitated theme identification. Results: This project identified five major themes as perceived impacts of pastoral care for inpatient psychiatric patients: navigating the development of positive

self-regulation strategies, acceptance and affirmation through normalization and destigmatization, meaning making, “God is here too”: intentionality is exploring religious beliefs, and internalized negative self-concept. Implications to Nursing Practice: Results indicate that nurses should continually assess and converse with their patients, and be educated on pastoral care resources and referral procedures. Additionally, nurses should have a strong foundational understanding of the pastoral care provider’s role, and what resources their hospital offers. It is of the utmost importance that nurses seek out and attend applicable training regarding spiritual care.

Poster 73

Emily Bowles, Nutrition Graduate Student - Masters
Faculty Mentor: Alisha Farris, Nutrition and Health Care Management
Co-Author(s): Brook E. Harmon PhD RDN FAND, Heather Schier PhD
Title: EVALUATING THE IMPACT OF A CULTURAL FOODS COURSE THROUGH SEMI-STRUCTURED INTERVIEWS

BACKGROUND: Due to an increase in diversity among the US population and therefore healthcare clients, cultural competence among health professionals has become vitally important for providing effective services. Recent studies have shown that less than 20% of accredited nutrition and dietetics programs teach a course in cultural competence, and those that do focus on basic cultural knowledge and lack experiences to enhance students’ intercultural communication skills. The aim of this study was to evaluate the impact of a cultural foods course for students focused on improving cultural competence. METHODS: Students at Appalachian State University enrolled in a Cultural Foods course were recruited via email to participate in an anonymous, semi-structured interview about their experience in the course. The interview questions focused on the topics and assignments covered in the course, students’ confidence in their own cultural competence, how outside experiences impacted their cultural competence, and barriers to learning about different cultures. Responses were analyzed using thematic analysis. RESULTS: A total of three students participated in the semi-structured interviews. Major themes included: lack of exposure, food systems and acculturation, application, self-awareness, experiential learning. Activities that included that self-awareness and application to real world situations were two of the most common impactful aspects of the course. Participants believed increased personal sharing, guest speakers, and experiential learning would help students develop cultural competency more effectively in the future. CONCLUSION: Many themes can play a role in the development of cultural competence for healthcare students. The results of this study can be used to inform individuals teaching a course like cultural foods to develop educational materials which allow their students to apply self-awareness, personal sharing, and experiential learning.

Poster 74

Joey Hochstrasser, Biology Undergraduate Student
Faculty Mentor: Shea Tuberty, Biology
Co-Author(s): Marcus Planck, Camden Ryan
Title: RADON LEVELS IN WATAUGA COUNTY, NORTH CAROLINA
Radon is a colorless, odorless radioactive gas that seeps into the cracks and foundations of homes and is influenced by different rock and soil types in a specific area. It is the second-largest cause of lung cancer, after smoking. With historical levels, Watauga County is considered a part of North Carolina that is high in radon gas, (mean of >4 picocuries per L). The average level in Watuagua is 6.0 pCi/L according to 1,629 previous test results collected by the NCDEQ radon lab. Chronic, high-level radon exposure can happen through respiration and well-water ingestion. Children, smokers and chronically ill individuals have increased risk of lung conditions and cancers. One in four cancer deaths in Watauga are related to the lungs, which is higher than the national average of one in five. Chronic lower respiratory disease (COPD) is the third highest cause of death in the area, according to a 2015 Watauga chronic health report. We believe that high radon levels are the reason behind increased lung disease fatalities in Watauga, with low radon education as a contributing factor. In this research project, we collaborated with the NCDEQ radon lab, collected from twenty additional basements using test kits and reported our findings back to the homeowners. Using Jamovi and the NCDEQ data, we created diagrams of mean radon levels within Watauga (organized by zip codes) and in comparison to its surrounding counties. We created a map connecting geological formations in the area with radon levels.

Poster 75
Olivia Carter, Biology Undergraduate Student
Faculty Mentor: Ava Udvadia, Biology
Co-Author(s): Daneyda Rebollar Torres
Title: FUNCTIONAL TESTING OF ENHANCER DELETION MUTANTS PROMOTING GENE
Zebrafish are capable of regenerating their central nervous system (CNS), unlike mammals such as mice and humans. The ability of zebrafish to regenerate CNS nerves, such as the optic nerve, has been correlated with the upregulation of the gene encoding the Jun transcription factor in axotomized retinal ganglion cells. Identifying enhancer elements that specifically regulate genes during CNS regeneration is important for the design of next-generation gene therapy vectors that may be used for treatment of neurodegenerative diseases and injuries. Previous chromatin conformation studies in our lab led to the discovery of a putative 5 kb enhancer sequence downstream of the jun gene that associates with the jun promoter specifically in regenerating retinal ganglion cells. The goal of these studies is to functionally identify sequences within the 5 kb fragment that are necessary and sufficient to promote regeneration-associated gene expression. To this end, we have identified three regions within the 5 kb sequence,

totaling 1.4 kb, that are highly conserved across fish and amphibian species that are capable of CNS regeneration. We are generating a panel of mCherry reporter plasmids to compare the enhancer activity of the 1.4 kb fragment with that of fragments missing each one of the three conserved regions. These reporter plasmids will be microinjected into zebrafish at the one-cell stage to establish transgenic founder lines. Regeneration-specific enhancer activity will be assessed by evaluating mCherry reporter gene expression in larval retinal ganglion cells after optic nerve transection, by fluorescence microscopy. This work will investigate novel regulatory elements with the goal of defining regulatory elements that could be used in gene therapy vectors to express genes that promote regeneration for treatments of traumatic injuries and neurodegenerative diseases."

Afternoon Session 1 - Poster Presentations

Poster 81
Eric Bravver, Biology Undergraduate Student
Faculty Mentor: Brooke Christian, Chemistry and Fermentation Sciences
Co-Author(s): N/A
Title: STABILIZATION OF ALCOHOL DEHYDROGENASE BY TARDIGRADE-SPECIFIC CYTOSOLIC ABUNDANT HEAT-SOLUBLE PROTEIN Q
Tardigrades are a family of microorganisms that have been found to survive desiccation. Upon desiccative stress, tardigrades enter a state known as the tun state. The tun state is characterized by upregulated expression of a class of proteins called cytosolic abundant heat-soluble (CAHS) proteins. CAHS D is a novel protein that has been shown to be partly responsible for the ability of tardigrades to survive desiccation. CAHS D has been shown by our lab to prevent alcohol dehydrogenase (ADH) from denaturing when exposed to heat stress. This project focuses on another protein of interest within this class, CAHS Q. My hypothesis is that CAHS Q can stabilize ADH better than CAHS D. CAHS Q was recombinantly expressed in BL21 E. coli cells and purified via cation exchange chromatography. Purity of the protein was confirmed by SDS-PAGE. Activity of ADH from S. cerevisiae was monitored at 340 nm, which represents formation of NADH. In the presence of CAHS Q, alcohol dehydrogenase showed higher activity after heating than ADH alone. Future work will compare the abilities of CAHS Q to CAHS D in order to see which protein stabilizes best. Furthermore, we hope to use CAHS proteins to stabilize protein-based therapeutics such as insulin.

Poster 82
Grace Alvanos, Biology Undergraduate Student
Faculty Mentor: Brooke Hester, Physics and Astronomy
Co-Author(s): Darren Seals
Title: INVESTIGATING ELASTIC MODULUS CHANGES IN SRC527-EXPRESSING NIH 3T3 FIBROBLASTS AT DIFFERENT STAGES OF INVADOPODIA FORMATION
The elastic modulus of a cell describes its resistance to elastic deformation and is influenced by structural components such as the cytoskeleton. This mechanical property can provide insights into cellular processes, including the formation of invadopodia—actin-driven protrusions that degrade the extracellular matrix and contribute to cancer cell invasiveness. In this study, we investigate how the elastic modulus of cancerous NIH 3T3 fibroblasts expressing Srcc527 changes during invadopodia develop over time. The measurement of cell membrane stiffness is performed using optical tweezers, which trap a microsphere and monitor its displacement from being pushed by the membrane via a position-sensing detector. The microsphere is used to indent the cell membrane, and the force applied, along with the depth of indentation, are measured. These values are then used to calculate the elastic

modulus through the Hertz model. By monitoring the mechanical properties of the cell membrane as invadopodia grow, we aim to understand the dynamic relationship between cell membrane stiffness and the progression of invadopodia formation, providing insight into how changes in cell mechanics may relate to invasive behavior.

Poster 83
Isabela Rengifo Ramirez, Biology Undergraduate Student
Faculty Mentor: Michael Reddish, Chemistry and Fermentation Sciences
Co-Author(s): N/A
Title: STABILITY OF A HUMAN ADRENODOXIN - CYTOCHROME P450 27A1 FUSION CONSTRUCT THROUGHOUT EXPRESSION AND PURIFICATION IN ESCHERICHIA COLI
The human cytochrome P450 27A1 is an enzyme that catalyzes the hydroxylation of vitamin D and cholesterol analogues. Cytochrome P450 27A1 is important for maintaining lipid homeostasis and for cancer signaling. In living systems, P450 27A1 is localized in the mitochondrial membrane. When produced recombinantly, P450 27A1 is unstable without lipids or detergent. This instability limits the ability for in vitro characterization of enzyme structure and function. To acquire necessary electrons during its catalytic cycle, P450 27A1 utilizes a ferredoxin - ferredoxin reductase electron transport system. The active human ferredoxin is known as adrenodoxin. Adrenodoxin is a stable, soluble protein that appears to stabilize the P450 enzyme in solution. In this study, we have designed a recombinant fusion protein that contains the P450 enzyme, a peptide linker, and adrenodoxin into one protein. We present our progress in optimizing the production of the fusion protein and characterization of it, including evidence of expression in Escherichia coli, purification with nickel-affinity chromatography, and functional analysis of the protein.

Poster 84
Withdrawn

Poster 85
Audi Holloway, Biology Undergraduate Student
Faculty Mentor: Jennifer Geib, Biology
Co-Author(s): Caitlin McClear
Title: DETECTION OF ISRAELI ACUTE PARALYSIS VIRUS IN HONEYBEES IN WESTERN NORTH CAROLINA
This project aims to determine the presence of Israeli Acute Paralysis Virus (IAPV) in honeybee populations (Apis mellifera) near commercial apiaries in Western North Carolina. IAPV can cause lethal paralysis, and is one of the global causes of Colony Collapse Disorder (CCD), a condition characterized by a rapid increase in worker mortality resulting in the colony's inability to provide for itself. Studies of North

Carolina honeybee populations have focused on quantifying infection prevalence of Deformed Wing Virus (DWV-A and DWV-B), neglecting other known disease agents. Israeli Acute Paralysis Virus (IAPV) has been documented worldwide, Including Mexico (Garcia-Anaya et al, 2018) and in other states across the US. This study aims to address the limited surveying for this virus in the US, including North Carolina. Forty-eight honeybees were collected near two commercial apiaries in the Western Piedmont region of North Carolina. RNA was extracted from the specimens, and quantitative Polymerase Chain Reaction, (qPCR), will be performed to amplify and measure the presence of IAPV viral load. Increasing our awareness of honeybee viruses is the first step towards developing mitigation strategies against colony collapse disorder.

Poster 86
Michael Lowe, Chemistry Undergraduate Student
Faculty Mentor: Jefferson Bates, Chemistry and Fermentation Sciences
Co-Author(s): Jefferson E. Bates
Title: Magnetic coupling constants of bimetallic complexes through the lens of the random phase approximation Bimetallic complexes containing transition metal atoms are ubiquitous in inorganic chemistry. These complexes exhibit a wide range of properties depending on the ligand environment, metal identity and oxidation state. For bimetallic complexes, the metal atoms can be coupled through metal-metal bonding or through spin-spin interactions described by their magnetic coupling constants. In this work we present theoretical magnetic couplings for a range of first-row, bimetallic transition metal complexes in order to assess the performance of the random phase approximation (RPA) and beyond-RPA methods from density functional theory (DFT). Using a suite of semi-local and hybrid density functionals, the RPA and beyond-RPA results were computed to test the sensitivity with respect to the reference functional. Our results demonstrate that there is a significant sensitivity for copper complexes such that the choice of the reference functional influences the overall ferromagnetic or antiferromagnetic coupling obtained with RPA-like methods. Results for other transition metals show less sensitivity to the choice in reference functional, however the coupling constants are strongly influenced by the fraction of “exact exchange mixing” used in hybrid functionals when generating the reference determinant. By varying the fraction of exact exchange, we demonstrate the impact that different amounts of exchange mixing have on the resulting RPA predicted coupling constants. While RPA can serve as a higher-level check on semi-local functionals for reaction energies and structural properties, it is not always correct for magnetic coupling constants and indicates the difficulties of predicting spin-dependent properties with RPA as a post-Kohn-Sham method.

Poster 87
Seth Brahney, Chemistry Undergraduate Student

Faculty Mentor: Michael Reddish, Chemistry and Fermentation Sciences
Co-Author(s): N/A
Title: Development of LC-MS Methods for Measuring Cholesterol Oxidation by Human Cytochrome P450 27A1

Cholesterol is vital for many bodily functions such as the production of cell membranes, synthesis of hormones and vitamin D, and used to create bile in the liver. At high concentrations it can cause health issues such as cardiovascular disease. Oxysterols are a classification of molecules that retain the sterol core and have been further oxidized. This classification of biomolecules is related to immune system suppression and progression of certain cancers. The oxysterols 27-hydroxycholesterol (27-HC) and 27-hydroxyoncosterone (27-OC) can mimic estrogen and promote growth of estrogen receptor-positive breast cancer cells. Human cytochrome P450 27A1 (P450 27A1) is known to catalyze the oxidation of cholesterol and oncosterone into these oxysterols, but details of this reaction are unknown. The purpose of this project is to develop an efficient and reliable method for the quantification of oxysterols from enzyme activity assays. Another goal of the project is to validate if P450 27A1 does produce 27-OC and 27-HC and confirm using the developed liquid chromatography-mass spectrometry (LC-MS) method. LC-MS was selected due to its ability to provide sensitive and precise measurements with minimal sample preparation. Our LC-MS method detects the presence of 25-hydroxyvitamin D3 but vitamin D3 was silent in the MS. Both vitamin D3 analytes were confirmed to be present by UV absorbance. Cholesterol and 27-HC cannot be detected by UV absorbance. To verify 27-HC and cholesterol concentrations, a two-step colorimetric assay was employed using cholesterol oxidase and peroxidase measuring the absorbance at the wavelength 510 nm. This assay confirmed the presence of cholesterol and its oxidized form in the samples. Results showing the application of our LC-MS method to the cholesterol derivatives will be discussed. These findings could contribute to the development of new diagnostic and therapeutic approaches for diseases such as breast cancer and cardiovascular disorders.

Poster 88
Sarah Tucker, Chemistry Undergraduate Student
Faculty Mentor: Michael Reddish, Chemistry and Fermentation Sciences
Co-Author(s): N/A
Title: APPLICATION OF PROFLUORESCENT SUBSTRATES TO CYTOCHROME P450 27C1

The enzyme cytochrome P450 27C1 (CYP27C1) catalyzes the 3,4-desaturation of retinol (vitamin A).[1] In fish, CYP27C1 is expressed in the eyes and is thought to help fish eyes adjust to changing water salinity levels during migration.[2] However, human CYP27C1 is expressed in the skin. There is minimal research on human CYP27C1, and its physiological purpose is unknown. Studying activity with the native substrate, retinol, is difficult and time-consuming due to its light sensitivity. Studying activity with

profluorescent substrates is a high-throughput method and thus could be a helpful tool in CYP27C1 research. This project explores the activity of human CYP27C1 with the profluorescent substrate EOMCC. Here, we adapted a high-throughput fluorescence kinetics assay that has been established for human drug-metabolizing P450 enzymes.[3] In the future, more profluorescent substrates will be tested with CYP27C1, and the activity with these substrates will be compared in order to determine which are ideal for CYP27C1 research.

Poster 89

Matthew Manbodhe, Environmental Science Undergraduate Student
Faculty Mentor: William Anderson, Geological and Environmental Sciences
Co-Author(s): N/A

Title: ESTIMATING AQUIFER PARAMETERS OF A DISCRETE FRACTURE USING EARTH TIDES

The solid earth tide is a phenomenon where the Earth's crust expands and contracts due to the gravitational influence of the sun and moon. While this movement is quite small, its effects may be detectable in confined aquifers such as discrete fractures. Borehole data from a well drilled on Tater Hill in Watauga County, North Carolina, shows a large fracture at a depth of 78.6 meters at the boundary between an amphibolite upper layer and granitic gneiss beneath it. Time-series data logging indicates that this hydraulically-conductive fracture displays an earth-tide signal in its water-level data. Electromagnetic flowmeter datalogging reveals that this fracture is the only hydraulically-conductive fracture intersecting the borehole. We used a low-pass filter to remove environmental variations, thereby isolating the tidal signal. We were then able to determine porosity and specific storage by interpreting the filtered time series. We calculated tidal potential at the well using the well coordinates to determine the positions of the sun and moon at times corresponding with our water level data. Using the solar and lunar coordinates, which were derived from their position combined with NASA's Spice kernels, we calculated the total tidal potential generated between the Earth and the sun and moon respectively. We implemented the program Baytap-G to determine the amplitudes of the earth tide signal broken down by each solar and lunar tidal constituent. Our calculations show that the water levels in the well fluctuate a maximum of 2.5cm, display spring and neap tidal cycles, have a specific storage of 2.655E-07 per meter, and has an estimated porosity of 0.029. Assuming a fracture aperture of 1mm, we estimate a fracture permeability of 1.72E-13 square meters based on a cubic law. Further analyses will be used to estimate time variations in these parameters throughout a spring neap tidal cycle.

Poster 90

Adam Chastain, Exercise Science Graduate Student - Masters
Faculty Mentor: Kimberly Fasczewski, Public Health and Exercise Science

Co-Author(s): Chris Wing, Abi Cameron, Andrey Sanko, Kelli Okonek, Kimberly Fasczewski
Title: Riding the Flow: Investigating Flow State Experiences in Male and Female Mountain Biking, River Sport, and Snow Sport Athletes
Flow is a state of consciousness associated with enhanced performance and accelerated learning; both attributes are critical to progressing in action sports. An individual in "flow state" is automatically performing physically and cognitively at the peak of their ability. Physiological sex differences exist for various aspects of human performance; however, the impact of gender on how an individual experiences flow is not well understood. This study aimed to investigate how female-identifying and male-identifying athletes experienced flow in three male-dominated adventure sports: mountain biking, river sports, and snow sports. Data were collected from 644 athletes (340 mountain bike, 159 river sport, 145 snow sports) using a self-report survey. Results indicated overall, female athletes reported attaining higher levels of flow state than male athletes ($t = -8.568$, $p < .001$). There was no difference among sports in flow state experiences ($F(2) = 1.209$, $p < .299$). Examining gender by sport, there was a significant difference in flow state in mountain biking ($F(2,337) = 7.332$, $p < .001$; male = 16.6042, female = 18.1728), and in snow sports ($F(2,142) = 84.608$, $p = .003$; male = 13.2805, female = 15.3548). There was no difference between male and female flow states in river sports ($F(3,155) = 22.138$, $p = .078$). These results suggest that gender differences in flow exist in some capacity. Contrary to previous findings suggesting that male athletes in other extreme sports experience flow at higher levels than female athletes, the female athletes in the current study reported higher levels of flow. It is probable that these differences are not solely due to gender but also from additional contributing factors such as social contexts, goal orientation, motivation, and environmental antecedents. Future research should explore these additional factors to better understand the underlying mechanisms that contribute to gender differences in flow experiences in action sports.

Poster 91
Christian Diaz, Exercise Science Undergraduate Student
Faculty Mentor: Kym Fasczewski, Public Health and Exercise Science
Co-Author(s): Jessica Schmid, Paige Bramlett, Chris Wing, Kimberly Fasczewski
Title: Social Support and its Effect on Athlete Return to Play
Injury is a common reality for many athletes, with fifty percent of Division I collegiate athletes sustaining major injuries during their careers. Unfortunately, non-adherence to rehabilitation is common among athletes and prolongs recovery. Motivation and social support are two key factors in the likelihood for athletes to return to sports after sustaining an injury. The goal of this study was to examine the role of social support in the return-to-play process for injured collegiate athletes, focusing on self-efficacy, motivation, and rehabilitation adherence. Survey data were collected from 27 athletes (8

men, 19 women) from various collegiate sports who had recovered from injury within the past year. Results indicated a positive correlation between high levels of social support from a significant other (r = .472. p = .020), family members (r = .663. p = <.001), and friends (r = .499. p = .011) and an athlete's confidence in their ability to schedule and manage rehabilitation behavior. Additionally, social support from friends was positively correlated with an athlete's confidence in their ability to perform a rehabilitation task (r = .486. p = 011). Higher levels of intrinsic motivation was positively correlated with an individual's confidence in their ability to perform a rehabilitation task related to their injury (r = .477, p = .016). Qualitative data revealed that athletes felt supported by family and teammates but not always by coaches or institutions, with feelings of isolation noted for those lacking support. These findings emphasize the importance of social support in the rehabilitation process and suggest implementing programs to maximize rehabilitative outcomes for athletes. Based on the concerns the injured athletes mentioned, future research should focus on athlete injury from the perspective of programs and coaches. This would allow for a more complete understanding of the ability of coaches to offer adequate social support for their athletes.

Poster 92

Daliana Estevez, Exercise Science Undergraduate Student
Faculty Mentor: Jared Skinner, Public Health and Exercise Science
Co-Author(s): Robert Kowalsky and Ansley Patton

Title: COMPARING GAIT ACTIVITY TOOLS TO ASSESS FALL RISK IN PARKINSON'S DISEASE

Introduction: Walking impairments such as reduced gait speed, increased stride variability, postural instability, and freezing of gait (FOG) are hallmark motor symptoms of Parkinson's disease (PD) that significantly increase falls. These falls contribute to fractures, reduced quality of life, and increased disability. Traditional assessment tools like the Simple Physical Activity Questionnaire (SIMPAQ) and fitness trackers provide general activity data but lack sensitivity in detecting subtle gait deviations. Purpose: This study aims to evaluate the clinical utility of objective gait analysis tools in assessing fall risk in PD. By integrating the ActivPAL inclinometer for daily movement analysis and the PKMAS gait mat for laboratory-grade gait assessment, this study aims to identify the most reliable measures for detecting gait impairments and predicting fall risk. Methods: 24 participants (12 fallers and 12 non-fallers) will be required to meet statistical significance. The study will include a baseline in-lab visit, a seven-day home monitoring period, and a final lab visit. Baseline assessments involve the SIMPAQ questionnaire and PKMAS gait analysis. Participants will then wear an ActivPAL device for seven days to track activity and maintain an activity journal. The final visit will include a follow-up SIMPAQ and ActivPal data collection. Expected Results: We expect that increased stride variability, reduced step length, and impaired postural transitions

measured by PKMAS will correlate with higher fall risk. ActivPAL data is anticipated to show lower daily activity levels in fallers compared to non-fallers. Self-reported SIMPAQ data may underestimate mobility impairments relative to objective gait measures. Discussion: This study aims to improve fall risk assessment in PD by integrating objective gait analysis tools with self-reported measures. Findings may inform targeted fall prevention strategies, ultimately enhancing safety and quality of life for individuals with PD. Future research could explore implementing these tools in clinical settings to guide personalized interventions.

Poster 93
Withdrawn

Poster 94
James Bartlinski, Geology Undergraduate Student
Faculty Mentor: Andrew Heckert, Geological and Environmental Sciences
Co-Author(s): N/A
Title: AN INVESTIGATION OF ENAMEL DEGRADATION IN TEETH OF THE HOMESTEAD SITE MICROVERTEBRATE ASSEMBLAGES AT THE GARITA GREEK FORMATION, (LATE TRIASSIC: NORIAN) NEW MEXICO
The Homestead Site in the Upper Triassic Garita Creek Formation of New Mexico contains a high degree of diversity in its microvertebrate assemblage, including teeth preserving a variety of different forms of enamel degradation. This study examines this enamel degradation and categorizes it based on patterns of enamel loss. The two main types of enamel loss identified are “pitting,” or teeth characterized by irregularly distributed circular pits surrounded by a currently unidentified white deposit, and “stripping,” or teeth characterized by the total or near total loss of enamel, with any remaining enamel in elongate strips. Additionally, the stripped teeth can be further divided by grades of enamel loss, with one extreme displaying only a small amount of thinning of the surface enamel and the other extreme showing complete enamel loss. The pitted teeth are hypothesized to represent traces of invertebrate feeding behavior on the surface of the teeth, with the white deposit apparently being a byproduct of this behavior. The stripped teeth are hypothesized to be caused by the teeth being consumed by an organism with an especially long digestive period, resulting in the enamel being removed. While the agent responsible for the pitting remains unknown due to a lack of similar traces being reported in the literature, the stripped teeth are very similar to those that have been attributed to both modern and fossil crocodilian digestion. At the Homestead site, these could be the result of digestion by Phytosaurs or Temnospondyls, both of which are known from the site and have apparently converged upon a similar body plan and mode of life to crocodilians. Both of these ichnofossils could be very informative for reconstructing a food web of the site, as both display direct evidence of feeding interactions between organisms.

Poster 95
Joshua Crouch, Geology Undergraduate Student
Faculty Mentor: Andrew Heckert, Geological and Environmental Sciences
Co-Author(s): Ikaika Turner
Title: A VERTEBRATE ASSEMBLAGE FROM THE LATE CRETACEOUS (MAASTRICHTIAN) PEEDEE FORMATION OF GREENVILLE, NORTH CAROLINA
The Late Cretaceous (Maastrichtian) Peedee Formation is a well-known, well described Upper Cretaceous unit from the Coastal Plain, with outcrops in every major waterway in North and South Carolina, most prominently within the Cape Fear and Pee Dee rivers. The Peedee Formation represents a prolonged period of predominantly marine shelf sedimentation consisting of calcareous sands and clays. Since the first publications describing Cretaceous vertebrate assemblages in North Carolina by Ebenezer Emmons and Joseph Liedy, relatively few papers have been published compared to contemporaneous strata in the American West; however, most reviews of the Peedee Formation are from South Carolina, with none from Greenville, North Carolina, a city famous among private collectors for its fossiliferous outcrops. We have received and reviewed a collection of vertebrate fossils from the Greenville Wastewater Treatment Plant. The specimens were collected from a refuse pile believed to represent the Peedee Formation but may also contain contaminants from older Cretaceous units as late as the Campanian Tar Heel Formation. There are at least 25 chondrichthyan taxa represented within the collection, none described from Greenville, North Carolina, but with some representation in previously described Cretaceous selachian assemblages. The sawskates Ischyrhiza and Ptychotrygon are present, alongside first records from the Peedee of Kiestus texana and the rajiform Tomewingia problematica. The lamniforms Squalicorax, Serratolamna, and Scapanorhynchus, orectolobiforms Nebrius and Plicatoscyllium, and hybodonts Lissodus and Meristdonoides have been identified. A worn tooth may represent the theropod dinosaur Sauronitholestes, which has been described from South Carolina and may belong to the underlying Donoho Creek Formation. Crocodylomorph vertebrae within the collection may represent Deinosuchus. The Peedee Formation of North Carolina is an understudied, fossil-rich formation of the East Coast.

Poster 96
Orion Buckley, Geology Undergraduate Student
Faculty Mentor: Jamie Levine, Geological and Environmental Sciences
Co-Author(s): Gabriele Casale
Title: Deformation in Quartz and Calcite in Greenschist-Facies Rocks of the Alpi Apuane, Central Italy
The Alpi Apuane is a metamorphic core complex located in the Tuscan region of Italy, exposing a succession of tightly folded greenschist-facies quartz- and calcite-rich rocks.

We aim to determine how quartz and calcite respond differently to the same applied strain, particularly in these rocks, because they are interlayered on the millimeter scale. Using a petrographic microscope, we analyzed microstructures and fabrics, minerals present, grain sizes, types of recrystallization, and evidence of deformation in the samples. We also utilized electron backscatter diffraction (EBSD) to determine the crystallographic orientations of calcite and quartz. EBSD allows us to identify which slip systems are active in calcite and quartz, the temperatures of deformation, and whether the rocks experienced coaxial or non-coaxial strain. Calcite, quartz, chlorite, biotite, and muscovite are the dominant minerals in the samples. In these samples, quartz grains range from <10 μm in diameter to 100–200 μm in diameter, and calcite grains are coarser, at diameters of ~200 μm up to 700–1000 μm. Sigmoidal quartz porphyroclasts with tails and mica fish give a shear sense of top to the south. We also identified C' and S fabrics defined by recrystallized biotite and chlorite grains in these samples and preliminary findings from C' fabrics support top to the south shear sense. Initial EBSD data from quartz reveal interesting quartz c-axis pole figure results that suggest the shear zone has an atypical geometry. Further EBSD data was collected to compare how quartz and calcite respond to strain and better understand the shear zone geometry. We present our preliminary observations, including estimates of kinematic shear sense and deformation temperature based on quartz fabrics which constitute a relatively minor phase in the Alpi Apuane, and compare these results to existing estimates based on other more abundant phases.

Poster 97

Alana Olson, Psychology Undergraduate Student
Faculty Mentor: Shawn Bergman, Psychology
Co-Author(s): Tony Grebentsov, Lauryn Womble, Brenna McNamara, Claire Parson, Abigail Branco

Title: ASSESSING THE UTILITY OF A CAREER EXPLORATION PLATFORM FOR PSYCHOLOGY STUDENTS

Background. Psychology students are encouraged to continue studies beyond their bachelor's degree due to the field's longstanding emphasis on doctoral education (Appleby, 2018). As a result, many psychology baccalaureates struggle finding meaningful employment; this problem is particularly relevant as over 70% of undergraduates enter the workforce after graduation (Burning Glass Institute, 2024; APA, 2022). Employment struggles are often attributed to undergraduates' unawareness of career opportunities available without a graduate degree. To address this, the team created Eugene (eugene.appstate.edu), an online tool that showcases diverse careers for undergraduate psychology majors. On Eugene, students select courses from a list of psychology classes offered at Appalachian State. The site then displays competencies students gained during their classes, and jobs they may be qualified for (O*NET Online,

n.d.). Eugene is in its first year of implementation, therefore, the present research evaluates Eugene's goals, ease of navigation, novelty, and utility of output.
Methods. This study will utilize a survey to assess Eugene's ability to meet the intended goals. The survey will assess students' comprehension of the site's content, utility of the site, and likelihood of using the site in the future. Participants will complete the survey after their first use of the website. Expected Results & Implications. Expected results of the survey include information overload on Eugene, skipping instructions on the site, difficulty navigating the site, and misinterpretation of the numbers on the competencies output page. Additionally, it is anticipated that the tool will be most useful for students entering the workforce directly. Findings will be used to inform future updates and the integration of Eugene into the Psychology Department, ensuring that the platform is truly helpful in our goal of bridging the gap between psychology undergraduates and meaningful employment.

Poster 98
Drew Snipe, Psychology Undergraduate Student
Faculty Mentor: Shawn & Tim Bergman & Ludwig, Psychology
Co-Author(s): Jacob Leslie, Firzana Syazania, Mariana Solanilla, Nick Rupert, Shawn Bergman, & Tim Ludwig
Title: YOU'RE DOING IT WRONG! SAFETY REPORTING BETWEEN EMPLOYEES AND INDEPENDENT CONTRACTORS
Despite competition from other organizations, companies can readily attract top performers by focusing on safety culture. A strong safety culture shows employees that their organization cares about their well-being, which fosters a positive work environment. By comparing employee and independent contractor observations, the current study aims to demonstrate the effectiveness of a strong employee-led behavioral observation reporting program. We used two years of safety observation data from a major oil refinery company. We then selected the five departments with the most behavioral observations and incidents. Rolling sum time-series logistic regression was used to investigate the compliance data classified by employment. The results of the data analysis showed that while independent contractors' observations raised their median Odds Ratio (OR) of 1.012, staff observations dramatically decreased incident odds with a median OR of 0.986. Implications from these findings are that organizations investing in safety programs should prioritize the participation of their current employees to improve their efficacy in reducing injury probabilities. Encouraging employee participation in safety reporting promotes a healthier safety culture, lowers incidents, improves corporate culture, saves lives, and increases value.

Poster 99
Avery Blackwell, Psychology Undergraduate Student
Faculty Mentor: Andrew Smith, Psychology

Co-Author(s): N/A
Title: Examining the Relationship between Risk Taking, Maximizing, and Anxiety
Maximization, risk-taking, and anxiety are three traits that can impact an individual's decision-making. Maximization consists of two components: goal of choosing the best option and alternative search. The goal of maximization is to "optimize decision making by making the best choice," while alternative search "is the strategy of seeking out alternatives and comparing them." Interestingly, while previous studies have shown that maximization is positively related to both risk-taking and anxiety, this appears contradictory since risk-taking is typically negatively related to anxiety. This leads us to our central research question: How are maximization, risk-taking, and anxiety interrelated? We hypothesized: 1) anxiety will be negatively related to risk-taking, 2) anxiety will be positively related to both components of maximization, and 3) risk-taking will be positively related to both components of maximization. To conduct this study, participants completed measures of risk-taking, trait anxiety, and the two components of maximization (choosing the best and alternative search). Specifically, a nationally representative sample of 402 participants completed the General Risk Propensity scale, 7-item Maximizing Tendency Scale, Maximization Inventory, and the trait section of the State-Trait Anxiety Inventory. We did not find support for hypothesis 1, as anxiety was not significantly related to risk-taking. We found partial support for hypothesis 2 because anxiety was negatively related to choosing the best, but positively related to alternative search. Finally, we found partial support for hypothesis 3 because risk-taking was positively related to choosing the best but not related to alternative search.Our research clarifies the complex interplay between maximization, anxiety, and risk-taking. Further, it highlights the utility of examining the two components of maximization separately because they were differentially related to both anxiety and risk-taking.

Poster 100
Caroline Schnitzlein, Psychology Undergraduate Student
Faculty Mentor: Andrew Smith, Psychology
Co-Author(s): DeVaughn Burnett-Garrett, Olivia Hamilton, Abigail Branco, and Andrew Smith
Title: STEREOTYPES AS ENERGY-SAVERS: A REPLICATION AND EXTENSION OF MACRAE ET AL. (1994)
Introduction. Macrae's et al.'s (1994) research established stereotypes as "energy savers" that free mental energy or 'cognitive resources' to be utilized in simultaneous tasks. This study has been cited over 1,800 times, laying the foundation for understanding the development of stereotypes. However, this study's limitations; namely, a lack of sample diversity and a failure to examine alternative explanations for their results, make it a candidate for replication. Methods. The present study assigned participants to watch a video containing two simultaneous tasks. In the visual task, participants were asked to

watch a video and memorize a person's traits. They were assigned to one of three variants of the trait-recall task. The "stereotype consistent" group saw names, jobs, and traits stereotypically associated with said job (ex. Riley-Teacher-Caring), the "stereotype-inconsistent" group saw traits not stereotypically associated with the job (ex. Riley-Teacher-Brash), and the "label-absent" group only saw names and traits (ex. Riley-Caring). In the auditory task, they were asked to memorize facts about Indonesia. Participants were asked to recall information from both provided tasks. Results. Macrae's assertion that stereotypes serve a cognitive benefit was built upon their finding that participants in the stereotype-consistent condition performed better on both tasks. Participants in the present study's stereotype-consistent condition performed significantly better on the trait recall task ($p = 0.04$, $\eta p2 = 0.045$); however, there was no significant difference between groups' secondary task performance ($p= 0.87$, $\eta p2 = 0.002$). Discussion. The absence of improved performance on the secondary task indicates that Macrae's findings were not successfully replicated and implies that stereotypes are not a beneficial cognitive shortcut and do not contribute to external task performance. This challenges the long-standing assumption that stereotypes free up cognitive resources.

Poster 101

Gracie Streeval, School Psychology Graduate Student - Masters
Faculty Mentor: Crystal Taylor, Psychology
Co-Author(s): Sophia Chapdelaine

Title: EMPOWERING EDUCATORS: CONSULTATION TO IMPROVE CLASSROOM MANAGEMENT AND REDUCE STRESS

Classroom management is the practice of fostering a positive classroom environment where relationships and communities can grow through prosocial behaviors. Literature suggests effective classroom management practices improve academic engagement and achievement, decrease disruptive behaviors, and increase positive behavioral outcomes. Ineffective classroom management has been found to have the opposite effect on academics and behavior. Classroom-based consultation is one way to improve these skills for teachers who may lack experience and formal training in classroom management. This study examines how consultation using a classroom management intervention, The Classroom Check-Up (CCU), impacts teachers' classroom management abilities and feelings of stress. Previous research investigated CCU and visual performance feedback with four elementary school teachers. Findings indicated that CCU increased praise and decreased reprimand rates in the classroom. This project aims to replicate findings from this study while also examining internal impacts on teachers' feelings of stress. Using a concurrent multiple baseline design across participants, researchers will examine the impact of classroom management on teacher- and student-level variables, including teacher stress. Key research questions include the effects of CCU on teacher praise, reprimands, student behavior, academic engagement,

and teacher stress, as well as its perceived validity by teachers. Four elementary teachers participated in the study. Teachers were asked to self-monitor their rates of praise as well as any other classroom management strategy they planned to implement. Results indicated minimal change between their baseline rate of praise and the teacher's rate of praise following consultation meetings and self-monitoring. Teacher 1 and Teacher 4's average praise rate remained the same (0.19 and 0.5, respectively). Teachers 2 and 3 had a slight increase in their average rate of praise (0.71 to 1.03 and 0.04 to 0.15, respectively). Disruptive behavior remained the same across all four teachers between baseline and intervention. Limitations, future directions, and implications for practice will be discussed.

Poster 102
Emily Reigard, School Psychology Graduate Student - Masters
Faculty Mentor: Jamie Yarbrough, Psychology
Co-Author(s): Gracie Streeval, Anhminh Nguyen, & Nicole Iturbide
Title: IMPACT OF FACULTY RACE ON STUDENT REFERRAL AND SUSPENSION RATES
Literature has shown that there is a significant disproportionality in suspension rates of diverse students. Researchers have also found that the teacher's race/ethnicity may predict the severity of discipline given to the student (Blake et al., 2022). The goal of this study is to determine if there is a relationship between student race, teacher race, administrator race, and the likelihood of an office disciplinary referral or suspension. It is imperative that educators understand the impacts of teacher race on disciplinary referrals and actions. To research this, we investigated these research questions: What is the risk-ratio (RR) for ODRs for students of various races and ethnicities? Is there a relationship between student race, teacher race, and the likelihood of suspension? Is there a relationship between student race, administrator race, and the likelihood of suspension? We found that risk ratios for ODRs: Black students (2.2x) and Hispanic students (1.35x) more likely to receive ODRs than White students. There was a significant main effect for teacher race. There was a significant interaction between student and teacher race/ethnicity. There was a significant main effect for administrator race). There was not a significant interaction between student and administrator race/ethnicity.

Poster 103
Lauren Perrone, Sociology Undergraduate Student
Faculty Mentor: Dr. Ellen Lamont, Sociology
Co-Author(s): N/A
Title: "Bitch Better Pay for It": Fathers' Claims of Alienation in Family Court
Objectives.

This paper examines the narratives of alienation and vindictiveness that fathers utilize against mothers in contentious custody cases which may contradict popular ideas about how family courts favor mothers over fathers. It has been established that mothers often get primary custody of their children over fathers. This is due in part to gendered stereotypes of women as caregivers. Thus, I ask how are fathers mobilizing claims of alienation and vindictiveness which trouble these stereotypes. How is this impacting the actual and stated constructions of parenthood? Methods. This project focuses on the narratives utilized in court by fathers as well as how they are received by others in the courtroom. As such, I conducted an ethnography of a courthouse by attending regular family court sessions and obtaining audio recordings of past trial proceedings. I was able to get 10 hours of in-person observation and 10 transcripts. During in-person observation sessions, I recorded rough notes which were then compiled into polished field notes. After this, I coded the field notes and transcripts for narratives of alienation, vindictiveness, legal actor response, and others. I have chosen an inductive approach to analysis in which I utilize the data to instruct my findings.
Findings. Preliminary findings suggest that fathers make claims of vindictiveness by arguing that their right to parenthood is being infringed upon by the mother through claims of alienation and vindictiveness. Thus, I will situate gender and custody cases as a battleground in which the legal construction of parenthood is being negotiated. The implications of this research are an expansion of the popular belief around the fairness and gender discriminatory effects of custody courts as well as a contribution to the literature at the intersection of legal and sociological research on the construction of parenthood.

Poster 104

Michael Ayiku, Sustainable Technology Graduate Student - Masters
Faculty Mentor: Arezou Sadoughi, Sustainable Technology and the Built Environment
Co-Author(s): N/A

Title: CARBON IMPACT OF MODULAR MASS TIMBER

The construction industry is increasingly considering green construction technologies and materials as countries turn their focus to curbing carbon footprint. In achieving carbon neutral building structures, modular mass timber construction offers a novel solution. This paper looks into the carbon implications of the modular mass timber systems that combine the advantages of mass timber including carbon neutrality and low embodied energy with the precision of modular building techniques. When these two innovations are employed, there is a high promise of reduction in the carbon throughout the life of the building. This proposal presentation addresses the issue of carbon-neutral technology for construction without loss of economic efficiency by explaining the application of modular mass timber on the construction industry.

Poster 105

Duncan Burns, Technology Graduate Student - Masters
Faculty Mentor: Sohad Abu-elzait, Sustainable Technology and the Built Environment
Co-Author(s): Bradley Del Vecchio
Title: SOLAR-POWERED WATER PURIFICATION SYSTEM
Hurricane Helene significantly impacted Western North Carolina (NC), causing widespread flooding, landslides, and infrastructure damage. One major concern was water quality deterioration. Floodwaters carried pollutants, including chemicals and waste, into rivers and streams, contaminating drinking water sources and posing health risks to humans and wildlife. The increased turbidity and harmful substances made water unsafe for consumption and disrupted aquatic life. This highlighted the need for improved disaster preparedness, environmental conservation, and water quality management. Our Solar-Powered Water Purification System project addresses the critical need for clean drinking water post-hurricane. This student designed and built solution purifies water using solar power, essential for public health and preventing waterborne diseases. The system is compact, portable, and operates off-grid, making it useful during disasters and for off-grid farms and residences. System components include solar panels, water pump, pressure tank, filtration system, storage tank, and control system. Water samples, collected around campus, are tested for water quality pre and post filtration in the labs of the Department of Chemistry and Fermentation Sciences. The samples are evaluated against the standards of the National Primary Drinking Water Regulations and the NC Department of Environmental Quality. Several initiatives work to provide clean water to communities affected by Hurricane Helene in Western NC: Waves for Water, a disaster relief mission providing portable water filtration systems, Captains for Clean Water, a hurricane relief effort supporting clean water resources, and NC Department of Health and Human Services, providing guidance on water safety and preventing waterborne diseases. This project complements ongoing efforts, providing a sustainable, long-term solution for clean water access in areas with compromised infrastructure.

Poster 106
Abigail Putnam, Nutrition Graduate Student - Masters
Faculty Mentor: Melissa Gutschall, Nutrition and Health Care Management
Co-Author(s): Susan Hedges, PhD, Sydeena Isaacs, PhD, RD, LDN
Title: DIETARY PATTERNS OF YOUNG ADULTS WITH INTELLECTUAL DISABILITIES ANALYZED BY PHOTO-ASSISTED RECALL: TAILORING NUTRITION EDUCATION INTERVENTIONS
Individuals with intellectual disabilities are at higher risk for obesity and comorbidities related to food selection, planning, and preparation abilities. Additionally, young adults with intellectual disabilities have unique nutrition education needs. A partnership between a university nutrition department and a 4-year transitional program for young adults with intellectual disabilities aims to provide nutrition education to improve

food-related behaviors for independent living. The purpose of this project was to explore participants' food selection behaviors for tailoring future interventions. Participants were second and third year students in the campus-based transitional program (n=12). Photo-assisted recalls were collected from participants during the 2023-24 academic year with assistance from program support staff. Participants were instructed to submit photos of all meals over a 3-day period each semester. Photos were coded by a faculty member experienced with qualitative methods and a trained graduate student using a constant comparative thematic analysis. A total of 153 usable meal photos were evaluated. Common themes included a 16% increase in home-cooked meals during the second semester as compared to restaurant or dining hall meals; lack of fruits and vegetables (<1 serving per meal); more fruits and vegetables in meals from the dining hall; multiple starchy vegetables at one meal; and sugar-sweetened beverages with 72% of meals. With ongoing nutrition education and skill-building, participants cooked more meals at home during the spring semester, although these meals were less balanced. Future nutrition education for this target audience should focus on creating simple balanced meals at home and making healthier beverage choices.

Poster 107

Ryan Musgrave, Nutrition Graduate Student - Masters
Faculty Mentor: Brook Harmon, Nutrition and Health Care Management
Co-Author(s): Nathan West, PhD; Adam Hege, PhD

Title: CLERGY PERSPECTIVES ON DESIGNING A FAITH-BASED PHYSICAL ACTIVITY PROGRAM INFORMED BY THE SOCIO-ECOLOGICAL MODEL

Introduction: Clergy experience a high prevalence of certain chronic health conditions as well as mental health concerns (e.g, anxiety). Research shows clergy experience barriers (e.g., 24/7 on-the-go vocation) to engaging in healthy behaviors. Findings from physical activity (PA) interventions aimed at reducing these barriers have been mixed. This qualitative study aimed to understand what clergy need to participate in PA programs. Methods: Virtual, in-depth interviews were conducted lasting approximately 45 min-1 hour. NVivo and SPSS were used for thematic analysis and demographic data, respectively. The Socio-Ecological Model was used to organize findings. Results: On average, participants (N = 27) spent 17.3 (SD=10.98) years in ministry and were 44.3 (SD=11.57) years old. Most participants were white (48%), female (52%), and affiliated with the Presbyterian denomination (89%). Discussion: At the Individual level, clergy spoke of programs needing to have a Holistic Health Focus, provide Bite-Sized Tips and Tools, and provide forms of Motivation. At the Interpersonal level, creating Community with Other Clergy along with acknowledging their roles as Spiritual Leaders and Parents were discussed. At the Institutional level, clergy stated needing supportive cultures with their Congregational and Denominational. At the Community level, themes related to Accessing Resources and Using Technology (e.g., social media) emerged. Conclusion: Culled data indicate multi-level interventions are needed to account for the various

factors engagement in PA. Helping clergy social networks, congregations, and denomination leadership understand the importance of clergy health may be necessary for long-term, sustainable individual-level change.

Poster 108
Therese Kafant, Nutrition Graduate Student - Masters
Faculty Mentor: Danielle Nunnery, Nutrition and Health Care Management
Co-Author(s): Dr. Manan Roy, PhD
Title: SOCIO-DEMOGRAPHICS, SEVERE MATERNAL MORBIDITY, & OBSTETRIC OUTCOMES RELATED TO HOSPITAL CLOSURES IN NORTH CAROLINA
Severe maternal morbidity (SMM) is a key indicator of the quality of health care in a community. These events include preterm birth, hypertensive disorders of pregnancy, Cesarean sections, sepsis, and blood transfusions. Rural communities, in particular, have increased risk for poorer obstetric outcomes. Many health disparities exist between rural and urban communities, but those related to maternal health care outcomes are especially harmful. There are many risk factors related to rurality that contribute to these disparities, such as geographic isolation, hospital closures, socioeconomic status, education, emergency department use, racial disparities, and frequency of prenatal checkups. North Carolina Emergency Department Hospital Discharge data from 2008-2022 was used to examine incidence of SMM events such as Cesarean birth, hypertensive disorders of pregnancy (HDP), gestational diabetes, low birth weight, preterm birth, history of diabetes, gestational diabetes (GDM), or stillbirth, and determine relationships between these outcomes and demographic factors, such as race, socioeconomic status, rurality status, linkage to a rural hospital closure, previous obstetric history, and insurance status. Throughout NC, there were 12 counties with maternity ward closures from 2014-2023. The Index of Concentration at the Extremes was used to determine relationships between race and income related to ward closures. Women were more likely to identify as White and fall into low to middle income tertiles in counties with ward closures in western NC, whereas, women were more likely to identify as Black/African American or Hispanic and fall into low to middle income tertiles in counties in central/eastern NC. Medicaid status ($p = 0.00$) and incidence of GDM ($p = 0.014$) were both statistically significant for women who were living in a county with a ward closure. This data has highlighted populations most affected by closures and provides one step closer to finding solutions.

Poster 109
Elyssa Wiggins, Nutrition and Foods Graduate Student - Masters
Faculty Mentor: Sydeena Isaacs, Nutrition and Health Care Management
Co-Author(s): Amanda Hege, Andrea Anderson
Title: FARM TO EARLY CARE AND EDUCATION PILOT PROGRAM- WESTERN NORTH CAROLINA HIGH COUNTRY INTEREST SURVEY

Farm to Early Care and Education (ECE) initiatives bring three core elements– gardening, food and agriculture education, and local food purchasing– into the ECE setting. Farm-to-ECE initiatives promote child health and increase the accessibility of fresh foods through experiential learning and community engagement. Currently, there are no longstanding farm-to-ECE programs in Watauga County, North Carolina. Our collaborative team wanted to learn more about the current awareness, knowledge, and interest in farm-to-ECE initiatives in the Western NC High Country. To do this, we developed a survey to send to directors and assistant directors of ECE centers in the Western NC High Country. The study aimed to collect data on potential barriers and opportunities in piloting a collaborative team of ECE centers interested in farm-to-ECE initiatives. The survey was disseminated to 80 different ECE programs in Ashe, Avery, Alleghany, Mitchell, Watauga, Wilkes, and Yancey counties. Fifteen total responses were gathered. Results indicate some of these initiatives are currently in practice, such as nutrition education lessons with the children, utilizing local food sourcing options, and creating gardens at ECE centers for children to be involved in. The survey helps the research team better understand the potential barriers ECE centers believe would impact their involvement in farm-to-ECE initiatives, with finances being the largest. Knowing this information, our team can help centers understand and apply for grant funding for local food purchasing, helping alleviate this potential barrier. Our hope for the future is to create a replicable model for expanding farm-to-ECE initiatives throughout the Western NC High Country. The data from this survey can be a stepping stone to understanding the current state of awareness and interest in creating a collaborative team of ECE centers.

Poster 110

Hunter Corman, Physics Graduate Student - Masters
Faculty Mentor: Zach Russell, Physics and Astronomy
Co-Author(s): N/A

Title: AUTOMATIC PRINT AND RELEASE 3D PRINTING SYSTEM.

3D printers are becoming an integral part of the engineering and science world by streamlining the troubleshooting process and part prototyping. One of the unfortunate downsides of 3D printing is the long wait time that can exist between print jobs because traditionally you have to manually clear the bed and start the next job. Due to this process there are time restrictions that arise when trying to process large print queues, leading to wasted time where the printers sit idle waiting to be cleared and reset. The solution to this problem is for the printer itself to be capable of clearing the bed and being told to continue onto the next print job, and to achieve this you need an automatic release bed. Automatic release print beds use the concept of differential cooling to cause pressure on the printed object which in turn causes the object to become unattached from the bed. Using two widely available fused deposition modeling (FDM) 3D printers, an automatic print and release system was made to create the ability of

nonstop printing with minimal maintenance. The process of resetting a printer after a large print job can be time consuming and wastes time during hours when the printers cannot be directly looked after. Utilizing the VAAPR bed, which cooling causes prints to release from the surface with minimal force, a slanted printer orientation, and a plow like attachment to the printer head, 3D prints can be pushed off the surface of the printer into a collection area and the process of printing starts again. With this process, print queues can be set hours or days in advance for continuous printing.

Poster 111
Emma Ingram, Physics Undergraduate Student
Faculty Mentor: James Sherman, Physics and Astronomy
Co-Author(s): Lifei Yin
Title: INITIAL STUDIES OF CLOUD CONDENSATION NUCLEI FROM THE APPALAIR FACILITIES
Atmospheric aerosols are seen as haze, dust, and smoke, with high levels of summer haze in the Southern Appalachian Mountain region. Aerosols affect the solar energy budget and climate directly by scattering and absorbing sunlight and indirectly by serving as cloud condensation nuclei (CCN). The AppalAIR facilities at Appalachian State University are home to one of the two largest continuous long-term set of atmospheric aerosol measurements in the U.S. as part of the NOAA Federated Aerosol Network (NOAA FAN), the NASA Aerosol Robotic Network, and NASA Micro-pulsed Lidar Network. As part of an NSF grant, our research group is working with colleagues from Georgia Tech to train a machine learning model to predict aerosol liquid water content (ALWC) and cloud condensation nuclei (CCN) using only measurements of dry and humidified light scattering at APP. This is important for two reasons: (1) ALWC and CCN spectra are critical for climate models; and (2) ALWC cannot be directly measured, and there are few sites in North America with CCN measurements. My research focuses on the CCN instrumentation and measurements, which were initiated in June 2024 and continued through our initial fall field campaign to train the model to predict CCN. This presentation focuses on the measurement of CCN and initial data from our fall field campaign. The concentration of aerosol particles capable of serving as CCN depends on the relative amounts of organic and inorganic aerosols and, most importantly, on the size of the particles. Decreasing amounts of sulfate aerosols resulting from reduced emissions from coal-burning power plants in the southeastern U.S. will likely lead to a smaller fraction of particles capable of serving as CCN, with implications
to clouds in the region.

Poster 112
Ian, Will Orrell, Allport, Physics Undergraduate Student
Faculty Mentor: Christopher Thaxton, Physics and Astronomy

Co-Author(s): Maggie Stevens, Jake Arnold, and Dominic Caraveo
Title: MODELING THE EFFECTS OF SEAFLOOR OBJECT SHAPE, ORIENTATION, AND INSTANTANEOUS BURIAL DEPTH ON SCOUR AND BURIAL PROCESSES USING CFD

Water flowing around seabed objects induces turbulence, intensifying sediment dynamics near the object as compared to the far field, which may enhance or suppress object scour at various points along the object, as well as its overall burial. Current empirical models of object scour and burial based on far-field parameterizations exhibit high predictive uncertainties. Appalachian State's Applied Fluids Lab aims to improve these models by deriving an equilibrium burial depth amplification factor from OpenFOAM simulations across various object shapes, burial depths, orientations, and flow conditions. For all objects simulated, we examine stress, vorticity, turbulent kinetic energy (TKE), and TKE dissipation rates (and other variables) below the midpoint of the object, where applied stresses can directly mobilize, entrain, and/or transport sediment, and above the midpoint, where flows are mostly limited to transporting sediment already entrained into the mid-to-upper boundary layer. Results show that for rectangular solids and cylinders, upstream horseshoe vortices change the effective object shape, providing subsequent flows a "ramp" that allows flows to circumvent the object more amply than for spheres and pyramids, where "unmasked" stresses couple directly to the sediment near the object. Object shapes and orientations generating upstream turbulent structures likely reduce direct bed sediment-flow coupling at the object and suppress scour (except at the edges). In addition, as flows increase beyond the critical far-field Shields parameter, turbulence production and dissipation rates increase markedly, as does the relative contribution of applied stresses to entrainment and transport processes. Results are quantified relative to the cylinder, the basis for traditional scour and burial models. We propose a scour and burial amplification factor that integrates object shape, burial depth, and orientation into predictive models for a wide range of forcing conditions.

Poster 113
Sophie Hoffmann, Physics Undergraduate Student
Faculty Mentor: Adam McKay, Physics and Astronomy
Co-Author(s): N/A
Title: MEASURING THE VOLATILE COMPOSITION OF 41P/TUTTLE–GIACOBINI–KRESÁK WITH NARROWBAND PHOTOMETRY DURING ITS 2017 PERIHELION PASSAGE

Comets are small, ice-rich bodies that orbit the Sun and are considered to be primitive leftovers from the formation of the solar system. Studying a comet's molecular composition can reveal physical and chemical properties experienced by the solar system during its formation and early stages. Scientists suggest that molecules found within a comet's coma may have been fundamental in the production of life on Earth.

The aim of this research is to predict what molecules were present during the formation of the solar system and how these molecules could have aided in the development of life on the early Earth. 41P/Tuttle–Giacobini–Kresák is a comet which was discovered independently by Horace Tuttle (1858), Michel Giacobini (1907), and Ľubor Kresák (1951). 41P's orbit is heavily influenced by Jupiter's gravitational influence, leading to its classification as a Jupiter-family comet. The April 2017 apparition of 41P was the closest approach to Earth that 41P will have during the 21st century, making this an ideal time for a detailed study of the comet. Observations of 41P were made from February 2017 to June 2017 at McDonald Observatory in Texas. Using narrowband image filters that reveal emissions of OH, C2, and CN molecules from the comet's coma. The molecules' production rates and mixing ratios will be analyzed pre- and post-perihelion and compared to results found by other astronomers' observations made during 41P's 2017 apparition.

Poster 114
Lily Pratt, Physics Undergraduate Student
Faculty Mentor: Zach Russell, Physics and Astronomy
Co-Author(s): Hunter Corman
Title: VALIDATION OF COST-EFFECTIVE 3D PRINTED OPTOMECHANICAL COMPONENTS FOR PRECISION OPTICS
Optomechanical equipment used for precision alignment in optics experiments are usually limited to larger labs and research groups that can afford them due to their steep prices. We have begun development of 3D printed alternatives to many standard components, which will dramatically reduce costs, while also increasing flexibility and utility of these components. In order to validate the use of these 3D printed designs as substitutes for traditional materials, we must create a validation experiment to measure the performance characteristics of these new designs. The goal in this validity experiment would be to prove that 3D printed optical equipment has the same integrity that the original optical equipment has, but we also have a secondary goal of making this validation setup more cost effective so that other labs using the 3D printed optics can expand on our designs and create and validate their own. In order to achieve this, a four segment photodiode, low power laser, and an inexpensive microcontroller will be used to test the vibrations of a laser that is directed at the photodiode center. Each photodiode segments' light intake is recorded to measure the voltage differences between them. The more the laser fluctuates, due to the vibrations from the environment which are not damped by the mounting equipment, the more light one segment of the photodiode will intake. A computer program will read this data and output a graph to show the vibrations the laser is receiving. This work will focus on the design and execution of the four-segment photodiode circuit for the validation studies. To detect the small changes in the light, due to the small vibrations of the laser, the photodiode signal needs to be amplified enough so that changes can be recorded and

seen. In order to achieve this, a transimpedance amplifier was used for each segment of the photodiode. Observing these amplified signals over time will allow us to characterize the 3D printed replacement components.

Poster 115
Ian Wharton Wharton, Physics Undergraduate Student
Faculty Mentor: Zachary Russell, Physics and Astronomy
Co-Author(s): Shaun Go Lily Pratt Hunter Corman
Title: DEMOCRATIZING OPTOMECHANICS: CREATING AN OPEN SOURCE 3D PRINTED OPTOMECHANICAL ECOSYSTEM
The field of optomechanics is incredibly dynamic and has been used in many applications from standard optical lens research to measuring gravitational waves to quantum mechanics. Complex arrangements of lenses, mirrors, lasers, and other components can be used to measure tiny forces, observe invisible waves, or reduce thermal noise. The atomic clocks providing precision time measurements for GPS systems, the LiDAR sensors used in self-driving cars, and fiber optic data transmission are just a few examples of the enormous impact of optomechanics. Our research mainly focuses on the mounts and stages component of these mechanisms, which can on their own cost hundreds or thousands of dollars, and have few existing options for cheap aftermarket alternatives. We propose that 3D printing is a viable manufacturing method for optomechanical components, offering rapid prototyping, cost efficiency, and design flexibility. Due to an abundance of infill patterns and material selection, we believe that 3D printed alternatives for optomechanical parts can perform at the same level or better than industry level components when it comes to vibration dampening and structural integrity. By replacing screw and through holes with heated inserts, we effectively maintain compatibility with existing mounting mechanisms and attachments, while at a fraction of the cost. By changing the infill patterns and density, we can also fine tune the vibration dampening capabilities of our components. As we continue to modify and test our designs, we aim to refine their performance to meet or exceed the metrics of industry standard mounts and stages. By sharing our findings openly, we hope to encourage broader adoption of an ecosystem of 3D printed optomechanics in both research and industry. Ultimately, our goal is to make high-precision optical setups more accessible and affordable without compromising on performance, helping to advance the field of optomechanics as a whole.

Poster 116
Ethan Grant, Economics Undergraduate Student
Faculty Mentor: Ash Morgan, Economics
Co-Author(s): Jeffrey Blackham, Nicolas Mishue, Parker Nevius, Riley Carroll, and Alex Pecoraro
Title: ECONOMIC IMPACT OF BLUE RIDGE GUIDE ASSOCIATION

The Blue Ridge Guide Association is a nonprofit focused on preserving the local waterways of the South Holston and Watauga rivers. The services they provide are primarily guided fishing tours, and these tours contribute greatly to the economies of Northeastern Tennessee and Western North Carolina. An online survey was administered to these anglers in order to gather data that could be applied to the estimated number of anglers for 2024. Respondents answered questions on their expenditures over ten categories, including entertainment, lodging, restaurants, and souvenirs. The average total spending per party was $1,119, with respondents staying on average 3.1 nights. An estimate of the number of float trips in Tennessee on the Watauga and South Holston River is 12,000. Adding expenditures in these categories over the total number of visitors totaled direct spending of $15.1 million across all parties. It was the objective of the App State NABE charter to estimate this impact this direct spending has on employment, taxation, and overall economic activity. This is done by utilizing a geographically specific input-output model (IMPLAN) that captures multiplier effects. The total economic impacts of the BRGA are estimated as $22.5 million in economic activity (sales), 208 jobs, $3.5 million in tax dollars generated and $7.4 million in labor income.

Afternoon Session 2 - Poster Presentations

Poster 121
Avery Beck, Communication Sciences and Disorders Undergraduate Student
Faculty Mentor: Wendy Olsen, Rehabilitation Sciences
Co-Author(s): N/A
Title: COUGH IN POMPE DISEASE: WHAT CAN WE PREDICT?
Late Onset Pompe Disease (LOPD) is a rare, inherited genetic disorder that arises due to a mutation of the lysosomal acid alpha-glucosidase (GAA) enzyme. The GAA enzyme is unable to properly metabolize glycogen leading to an accumulation of the molecule in muscular tissue and neural regions of the central nervous system. This inability to synthesize glycogen leads to proximal limb muscle weakness as well as progressive diaphragm weakness. Respiratory muscle weakness in these patients minimizes cough effectiveness making it difficult for necessary airway clearance. As a result, individuals with LOPD are more susceptible for developing respiratory infections (i.e., bronchitis, aspiration pneumonia, etc.) due to ineffective cough mechanisms. Unfortunately, individuals living with LOPD often become fatigued during routine clinic visits and it makes it very difficult to conduct a wide range of pulmonary function measures. Further, there is a lack of pulmonary metrics available to determine airway defense within this population. This study aimed to identify key cough waveform metrics that predict disease state within 13 individuals living with LOPD. Results indicated that cough peak flows ($p < 0.05$), cough inspiratory volume duration ($p = 0.002$), and cough inspiratory volume ($p < 0.05$) were key features of the cough epoch that accurately identified disease severity within a cohort of LOPD patients. Further metrics, such as area under the curve (AUC), revealed that LOPD patients rated as more severe had significantly smaller areas associated with “work of breathing” than those patients with less severe ratings ($p < 0.05$). Future studies should include mathematical models integrating patient data to inform clinical guidelines for the management of airway defense protocols.

Poster 122
Nathan Gordon, Exercise Science Undergraduate Student
Faculty Mentor: Jared Skinner, Public Health and Exercise Science
Co-Author(s): N/A
Title: STRENGTH AND STRIDE: INVESTIGATING THE RELATIONSHIP BETWEEN LOWER BODY STRENGTH AND SPATIOTEMPORAL GAIT PARAMETERS IN OLDER ADULTS WITH AND WITHOUT PARKINSON'S DISEASE
BACKGROUND: Spatiotemporal gait parameters are crucial for assessing mobility, particularly in older adults (OA) and those with Parkinson's disease (PWPD). While higher lower body strength has been linked to better gait outcomes in OA, its impact on

PWPD is unclear. PURPOSE: To explore the relationship between lower body strength and spatiotemporal gait parameters in OA with and without PD. METHODS: This study examined the relationship between strength and gait parameters in PWPD and age-matched OA without PD. Gait parameters were measured using an instrumented walkway system, capturing gait speed (m/s), step length (cm), double support time (%), and step time variability (%). Lower body strength was assessed through 10-repetition maximum tests on the leg press, leg curl, and leg extension. A Fatigue Scale for Motor and Cognitive Functions (FSMC) was used to assess fatigue. RESULTS: In OA, leg press strength was positively correlated with velocity and swing phase percent ($p<0.05$) and negatively correlated with stance phase percent ($p<0.05$). Leg curl strength was positively correlated with step time, stride time, and swing phase percent ($p < 0.05$), and negatively correlated with stance phase percent ($p<0.05$). In PWPD, leg curl strength was positively correlated with velocity and swing phase percent ($p<0.05$) and negatively correlated with stance phase percent ($p<0.05$). Leg extension strength showed no significant correlations with gait parameters in OA, but in PWPD, it was negatively correlated with stance phase percent and positively correlated with swing phase percent ($p<0.05$). Fatigue, assessed by FSMC, was mild in OA (22.67) and moderate in PWPD (54.33). CONCLUSION: Lower body strength is associated with improved spatiotemporal gait parameters in OA and PWPD. Findings emphasize the importance of strength training for gait in both populations.

Poster 123

Abi Cameron, Exercise Science Undergraduate Student
Faculty Mentor: Kimberly Fasczewski, Public Health and Exercise Science
Co-Author(s): Chris Wing, Andrey Sanko, Kelli Okonek

Title: FLOW UNDER PRESSURE: THE INFLUENCE OF RISK ON ADVENTURE SPORT ATHLETES

Flow state is an optimal psychological state when a balance of perceived challenges and skills within an activity allows an individual to complete tasks with control, focus, and proficiency, often achieving peak performance. However, the role of risk in facilitating or hindering flow remains under investigation, and gender-based disparities in settings involving individual and group dynamics are insufficiently understood. The research aimed to explore the attainment of flow state in athletes who participate in adventure sports. Upon initial analysis, researchers realised levels of perceived and actual risk have the potential to influence the ability of men and women to enter and sustain flow states in adventure sports differently. Therefore, the purpose of the current project is to assess and classify risk factors such as skill level, the environment, and external components. Using statistical risk ratios, minor injury, major injury, and death rates, this project aims to develop an appropriate risk stratification for adventure sports. This approach will allow us to analyse how different risk perceptions and actual risk influences the flow experience across a range of adventure sports. Comprehending the dynamics between

flow state and risk in adventure sports will contribute to maximising athlete performance, improving safety through risk management, and expanding our understanding of human limitations and potential.

Poster 124
Mackenzie, Anna Knapp, Capannola, Exercise Science Undergraduate Student
Faculty Mentor: Jared Skinner, Public Health and Exercise Science
Co-Author(s): Ansley Patton
Title: EXPLORING THE IMPACT OF BALANCE CONFIDENCE AND FREEZING OF GAIT ON SPATIOTEMPORAL GAIT PARAMETERS IN OLDER ADULTS WITH AND WITHOUT PARKINSON'S DISEASE
Background: Parkinson's Disease (PD) is a progressive neurodegenerative disorder that affects movement and balance, often leading to balance and mobility impairments such as freezing of gait (FoG). Balance confidence, or an individual's perceived ability to maintain stability during daily activities, may be a key factor in understanding mobility limitations in PwPD. Although FoG and balance confidence have been examined independently, the relationship between balance confidence and FoG remains underexplored, particularly in comparison to healthy older adults (OA). Purpose: This cross-sectional study aimed to examine the relationship between balance confidence and FoG in PwPD and compare these findings to OA.Methods: A cross sectional, retrospective study was conducted on adults aged 50 and over, including 10 individuals diagnosed with PD and 10 OA. Balance confidence was assessed using the ABC scale and FoG was assessed using the FOG-Q. Results: PwPD demonstrated significantly lower ABC scores compared to OA, with median scores reduced by 30% (SE: 9.34, $p < 0.01$). A significant negative correlation was observed between balance confidence and FoG severity in PwPD ($r = -0.996$, $p = 0.05$), indicating that individuals with lower balance confidence experienced more severe FoG symptoms. Conclusion: The ABC scores differed between PwPD who were less confident vs more confident in their balance, while the older adults were generally confident in their ability to balance. Looking towards the FOG-Q, those with a higher balance confidence had a lower freezing of gait score. These findings suggest that diminished balance confidence in PwPD may contribute to greater mobility impairments, emphasizing the need for interventions that target both physical and psychological factors to mitigate FoG and enhance functional mobility.

Poster 125
Kathleen Plesh, Geology Undergraduate Student
Faculty Mentor: Andrew Heckert, Geological and Environmental Sciences
Co-Author(s): Josef Stiegler

Title: FILETS OF FISH: SEGMENTING COMPUTED TOMOGRAPHY (CT) SCANS TO DESCRIBE THE MORPHOLOGY OF RAY-FINNED FISH (ACTINOPTERYGII) FROM THE UPPER TRIASSIC (REVUELTIAN) SNYDER QUARRY OF THE PETRIFIED FOREST FORMATION IN NORTHERN NEW MEXICO

The Snyder quarry, located in the Upper Triassic Petrified Forest Formation of northern New Mexico, is known primarily for its abundant larger vertebrates, but it also yields a diverse assemblage of microvertebrate fossils, especially of osteichthyans (bony fish). The osteichthyan microvertebrate fossils collected thus far are primarily scales, bone and toothplate fragments, and, rarely, complete teeth, in the collections of the New Mexico Museum of Natural History (NMMNH). The lineages represented are predominantly actinopterygians (ray-finned fish), namely semionotids, redfieldiids, and palaeoniscoids, though there are also a few indeterminate sarcopterygians (lobe-finned fish) represented by probable coelacanth fossils. However, this range of diversity is not mirrored by the macrovertebrate fossil record, as the only osteichthyan recovered previously was a small (51 mm) incomplete, compressed skeleton of a semionotid (NMMNH P-29043). Articulated fossil fish skeletons from the Chinle in general are rare, however, in the 2023 field season, three articulated, relatively three-dimensional actinopterygian fish skeletons were collected from the Snyder quarry. Computed tomography (CT) scans of these specimens were taken at the Analytical Instrumentation Facility (AIF) at North Carolina State University and were used to create 3D models of the fish skeletons in Dragonfly. The goals of this project are to analyze the skeletal morphology of the specimens and compare them to other known Triassic actinopterygian lineages, especially those present in the macro- and microvertebrate assemblages of the Snyder quarry. Currently, the skull bones of SQ23-11 and SQ23-12 are in the process of being segmented. The bones have been flattened and crushed, making identification difficult. SQ23-11 appears to mostly have cranial bones, while the bones of SQ23-12 have not been segmented enough to begin making identifications, but appears to have crushed cranial bones and gill rakers.

Poster 126

Lydia Fisher, Nutrition and Foods Graduate Student - Masters

Faculty Mentor: Danielle Nunnery, Nutrition and Health Care Management

Co-Author(s): Alisha Farris, PhD, Adam Hege, PhD, Toyin Babatunde, PhD, Elizabeth Wall-Bassett, PhD, Maureen Berner, PhD, Rebecca Hagedorn-Hatfield, PhD, Jessica Soldavini, PhD, Annie Wolf

Title: A Multi-Campus Study of the Impact of Food Insecurity on North Carolina College Students

Food insecurity among college students is extremely prevalent and can lead to negative outcomes, both physical and mental. This study estimates the recent level of student food insecurity across universities within the University of North Carolina college system. A cross sectional qualtrics survey was distributed to students attending five

North Carolina colleges and universities (one private institution and four UNC-system public institutions) during the spring 2023 semester (February to May). A random sample of student email addresses were generated from four of the institutions. Institutional Review Board Approval was obtained by co-principal investigators at each institution. Five North Carolina colleges and universities (one private institution and four UNC-system public institutions). Three thousand forty-three undergraduate and graduate students. Of 3,462 students who completed the survey 3,043 answered a sufficient number of questions for food security analysis. Over half of the sample (54%, n = 1640) had high food security, (17%, n = 508) were marginally food secure, (13%, n =393) had low food security, and (16%, n = 502) experienced very low food security. Food insecurity has been increasing among college students and not all students have the privilege to ask family for help. College students who experienced food insecurity have been shown to have poorer dietary intake, higher rates of chronic health conditions, and increased mental health problems.

Poster 127
Ella Mayfield, Physics Undergraduate Student
Faculty Mentor: Adam McKay, Physics and Astronomy
Co-Author(s): Anita Cochran, Michael Kelley
Title: EVALUATING POSSIBLE INFLUENCE OF SOLAR ACTIVITY ON OBSERVED [OI] EMISSION IN COMETARY COMAE
Comets formed during the earliest stages of the solar system, meaning their composition provides a unique window into the physical and chemical conditions present during that time. Specifically, studying the composition of volatile ices in comets, i.e. substances that sublimate off a comet as it approaches the sun, is crucial to understanding both current cometary activity and overall evolutionary processes. Carbon dioxide is one of the most abundant volatile species present in comets, but also one of the most difficult to measure using ground-based methods because of the strong presence of CO_2 in Earth's own atmosphere. Measuring flux ratios for three "forbidden" emission lines of atomic oxygen and using them to calculate an overall "oxygen line ratio" has been proposed as a proxy for direct CO_2 measurement in comets. However, the photochemistry governing atomic oxygen's release from a comet is not well understood, and using laboratory/theoretical release rates when calculating these ratios often yields different results than using empirical release rates determined in conjunction with space-based measurements. Because photodissociation in comets is caused by incoming radiation from the sun, we hypothesize that the accuracy of the release rates could depend on the level of solar activity at the time the comet is observed, a parameter that fluctuates over an eleven-year cycle. We present analysis of oxygen line ratio measurements in one comet observed near solar maximum (when the sun is most active), C/2014 Q2 (Lovejoy), and one near solar minimum (when the sun is least active), C/2007 N3 (Lulin). We use empirically-determined release rates to derive

inferred CO2 abundances for these comets and compare to contemporaneous space-based measurements of CO2 obtained with the Spitzer Space Telescope (Lovejoy) and AKARI spacecraft (Lulin). We will discuss our results and implications for the role of solar activity on observed oxygen line ratios in cometary comae.

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Withdrawn

Poster 129
Aydan Gibbs, Engineering Physics Graduate Student - Masters
Faculty Mentor: James Sherman, Physics and Astronomy
Co-Author(s): Ethan Parkhurst
Title: INITIAL MEASUREMENTS OF ATMOSPHERIC AEROSOL SIZE DISTRIBUTIONS FOR TRAINING A MACHINE LEARNING MODEL TO PREDICT AEROSOL LIQUID WATER AND CLOUD CONDENSATION NUCLEI
The Appalachian Atmospheric Interdisciplinary Research Facility (AppalAIR), a NOAA and NASA funded atmospheric aerosol monitoring site, is home to the largest suite of long term aerosol measurements in the SouthEastern United States, with datasets used in the most recent Intergovernmental Panel on Climate Change Assessment Report. Situated at the top of the nature preserve, AppalAIR is able to collect suspended particles, or aerosols, in the lower troposphere and study their composition. New measurements of particle size distributions, cloud condensation nuclei(CCN) , and aerosol chemical speciation are facilitating the first integrated study of aerosol liquid water content (ALWC) and CCN spectra, both critical parameters in climate and chemical transport models. The first step of this study involved a NSF-funded collaborative field campaign with Georgia Tech to train a machine learning model to predict ALWC and CCN, using only regionally representative aerosol size distributions and measurements of dried and humidified aerosol light scattering. Two of the measurements we collected, the aerosol size distributions and the hemispheric backscattering fraction, have a well known relationship. In the past, this relationship has mostly only been studied via simulations, but by taking the data that was collected during our field campaign, we can test this relationship practically. We hope to confirm the relationships shown by the simulations with our practical data and find out to what extent these two data sets are correlated.

Poster 130
Withdrawn

Poster 131
Elizabeth Payne, Psychology Undergraduate Student
Faculty Mentor: Lynn Siefferman, Biology

Co-Author(s): N/A
Title: THERE ARE NO PERFECT PARENTS: PERSONALITY AND PROVISIONING IN BREEDING TREE SWALLOWS
Individual variation in behavior, often termed 'personality,' can have important ecological and evolutionary consequences. In many avian species, both personality traits and food provisioning behaviors are linked to reproductive outcomes, yet the connections between these two factors remain poorly understood. Here, we investigate the relationship between parental personality and nestling feeding rates in Tree Swallows (Tachycineta bicolor). We captured and individually marked breeding birds and then used standardized predator trials to quantify boldness of parents toward predators. Adults were categorized along a continuum of personality types based on specific defense behaviors, such as diving and circling in proximity to a simulated nest predator. Concurrently, we recorded provisioning efforts—including the frequency of feeding visits per chick—to assess how boldness to predators might predict parental investment. This study aims to identify potential trade-offs or pathways through which personality traits influence fitness-related behaviors. Our findings reflect that boldness is negatively linked to provisioning behavior in Tree swallows. Particularly among females, there are tradeoffs between spending time feeding young and defending their nest from predators. Although the trends are modest, these data demonstrate that such tradeoffs, which are generally found in males, also apply to females.

Poster 132
Hailey Church, Biology Undergraduate Student
Faculty Mentor: Rachel Bleich, Biology
Co-Author(s): Cooper Brown, Chequita Brooks, Suzanna Brauer, Rachel Bleich
Title: THE MICROBES BEHIND THE MUCK: MICROBIAL COMMUNITIES EFFECTS ON GREENHOUSE GAS EMISSIONS IN SOUTHERN APPALACHIAN PONDS
Small ponds have been shown to contain greenhouse gases in their water column and sediment, which can contribute to emissions into their local environment. However, man-made ponds without natural filtration systems can accumulate anoxic conditions necessary for microbial respiration which can further increase their contribution of gases. To understand the effect of microbial methanogenesis and methane metabolism on greenhouse gas emissions from natural and man-made ponds, samples were collected from the Appalachian State duck pond and two natural ponds on the Pond Mountain Game Lands in Ashe County, NC. Samples from the spring, summer, and fall of 2024 and winter of 2025 were collected to explore the influence of seasonal changes on gas concentrations and microbial abundance. The methane concentrations were collected from the water column and sediment samples. DNA was extracted from the water and sediment, and quantitative PCR was performed to determine the abundance of the mcrA and pmoA gas-cycling genes using a standard curve. The mcrA gene is linked to methanogenesis (methane production) and the pmoA gene is linked to the

metabolism of methane. The man-made duck pond had the lowest mean methane concentrations in its sediment (138M) for spring through fall, and the naturally occurring Buckeye pond on Pond Mountain had the highest mean methane concentrations in its sediment (780M) for those seasons. We hypothesize that the ponds with the highest methane concentrations will have the highest abundance of the mcrA gene expressed in methane production and the lowest abundance of the pmoA gene expressed in methane metabolism. We also hypothesize that microbial abundance will decrease in the colder seasons. This information can help improve the understanding of how methanogens and methanotrophs within ponds can contribute to local greenhouse gas emissions in Southern Appalachia and how they can play a role in climate change overall.

Poster 133
Isabella deBlaquiere, Biology Undergraduate Student
Faculty Mentor: Shea Tuberty, Biology
Co-Author(s): Audi Holloway, Casper Roark, Daniel Orton, Dr. James Wilkes, Dr. Carol Babyak
Title: CONCENTRATIONS OF TOXIC METALS IN HONEY BY LAND USE OVER TIME
Honey bees collect pollen from their environment, so their honey can be used as a proxy for the conditions of the environment surrounding their hives. For our project, honey samples were collected yearly for 24 years near the Carolina Dozer excavation site in Watauga County, NC from Faith Mountain Farm hives, including samples from before and during the development of the site. These samples will be acid digested and then measured for toxic metals utilizing Inductively Coupled Plasma- Optical Emission Spectrometry (ICP-OES). ICP-OES will measure levels of arsenic (As), lead (Pb), cadmium (Cd), nickel (Ni), chromium (Cr), and cobalt (Co). The aim of this longitudinal study is to determine the relationship between land development and toxic metal concentration in the nearby environment. Previous studies have shown contaminants at levels that are currently of little concern for human health with consumption. This study hopes to provide a framework to analyze environmental toxicity, and help honey bee farmers understand how land use within their bee's foraging radius impacts the health of the land and their bees.

Poster 134
Christopher Cafasso, Biology Undergraduate Student
Faculty Mentor: Ashely Adams, Biology
Co-Author(s): Mia Dziwanoski, Hei-Young Kim, Jeremy Ferrell
Title: EFFECTS OF ORGANIC AMENDMENTS ON SOIL COMMUNITIES.
The influx of nutrients from mineral fertilizers in agriculture systems has caused long-term problems including dramatic changes to soil communities. However, organic

amendments such as compost and biochar are possible solutions for more sustainable agriculture. Compost and biochar amendments improve the soil by increasing organic matter content, water holding capacity, and allowing soil microbes and microfauna to control nutrient cycling. However, how soil communities, including the microfauna, are affected by different levels of compost and biochar combined is largely unknown. In this experiment, I am collaborating with the NEXUS Project at Appalachian State University in a greenhouse study on the effects of these organic amendments on spinach growth. There were four treatments including a control potting medium, medium with compost-only, medium with compost + 5% biochar, and the medium with compost + 10% biochar. Each treatment was replicated 8 times. In each pot, spinach was grown and then harvested after 8 weeks. Using potting medium samples collected from each of these replicates, I am extracting microfauna (nematodes, tardigrades, rotifers, etc.) using the Baermann funnel technique, and then identifying and counting these to the trophic group to test how amendments affect microfauna abundance and community structure. I hypothesize that microfauna abundance will display a positive relationship, with increasing levels of compost + biochar in the soil due to favorable changes to their habitat (e.g., elevated moisture and nutrients). My goal is to obtain a better understanding of the microfauna community structure and how they react to diverse soil amendments so that we may be able to more sustainably grow crops. Additionally, this project would hopefully lead to more studies on soil microfauna and their vast impacts on the soil.

Poster 135
Morgan Gill, Biology Graduate Student - Masters
Faculty Mentor: Ashley Adams, Biology
Co-Author(s): N/A
Title: PERSISTING IMPACTS OF COMPOST AMENDMENTS ON MICROBIAL DIVERSITY AND FUNCTIONS IN RANGELAND SOILS
Rangelands cover vast areas of land in the US and are important carbon sinks. Amending rangeland soils with organic matter increases carbon (C) sequestration, thus mitigating climate change. One-time compost amendments can increase C storage for decades post amendment with maximum soil C peaking between 10 to 15 years. However, important aspects of long-term impacts of compost amendments remain understudied: first, the long-term impact of these amendments on microbial diversity and community structure, and, second, microbial functional roles such as C sequestration, nutrient cycling, nitrogen fixation, and decomposition. My thesis aims to evaluate the long-term impact of a one-time compost amendment on microbial diversity and function. I hypothesize that microbial communities are shaped by environmental factors including soil texture, pH, organic matter content, and moisture. I also hypothesize that compost-amended soils will have greater microbial abundance, richness, and activity compared to control soils. I will analyze soils sampled from both

control and compost-amended plots at 12 sites across California that were the subject of USDA Natural Resources Conservation Service early studies of compost as a method of carbon mitigation. I will measure soil microbial diversity and functions via a metagenomic sequencing approach and pair this with tests of carbon cycling activity in both amended and control soils. This study will increase the knowledge on how microbes may be mitigating C sequestration in the long term. Understanding the role of microbes in C sequestration is key to making better management decisions geared towards climate mitigation.

Poster 136
Monica Webster, Biology Undergraduate Student
Faculty Mentor: Jennifer Geib, Biology
Co-Author(s): N/A
Title: Bumble Bee Diversity in the Southeast: My Work as a Citizen Scientist for the 2024 Bumble Bee Atlas
Bumble bees (Bombus sp.) are crucial pollinators in our environment, and as such they are prime supporters for our ecosystems, agricultural health, and overall diversity. Unfortunately, many bumble bee species have recently experienced severe population declines, likely due to habitat loss, pesticides, climate change, and diseases from commercial pollinators. Yet, the true distributions and conservation status of most species remains unknown. The Southeastern Bumble Bee Atlas (SEBBA) is part of a nationwide community science project managed by the Xerces Society for Insect Conservation that aims to rapidly increase our understanding of bumble bee populations and locate any endangered, vulnerable, and other species not previously recorded in the area.. Here I report results from my non-lethal photographic sampling of bumble bees for SEBBA from May to September 2024 across 27 sites in North Carolina and Tennessee. I observed eight species total, including one unique species record for the SEBBA project, the majority of which were located in North Carolina (85.2%) and Tennessee (14.8%.) The findings from this field work provide a better summary and account of bumble bee distribution and highlight the need for specific conservation strategies.

Poster 137
Mallory Hagen, Biology Undergraduate Student
Faculty Mentor: Lynn Siefferman, Biology
Co-Author(s): Sarah Knutie
Title: MANIPULATED INCUBATION TEMPERATURE ON NESTLING MATURITY IN EASTERN BLUEBIRDS (SIALIA SIALIS)
Climate trends demonstrate more frequent and intense weather fluctuations in the Southern Appalachians including warmer and wetter summer weather. Increased temperatures could reduce the chances of female songbirds successfully completing the

energetically expensive incubation stage and incubation temperature may have carryover effects that affect nestling growth and fledging success. These disruptions could lead to reduced reproductive success and long-term population impacts, thus an understanding of temperature fluctuation is important in animal conservation. We manipulated nest temperatures during the incubation period in a Southern Appalachian population of Eastern Bluebirds. This is a high elevation population (~100m) with a relatively cold and rainy climate. Nests were randomly assigned to one of three treatments—cold, control, or heat—for 7 days during the 2nd half of the incubation phase. Next, we monitored hatch success, fledgling success and nestling growth rates. We also explore whether measures of the mothers' quality interact with treatment to influence measures of nestling growth.

Poster 138
Caitlyn Weems, Biology Undergraduate Student
Faculty Mentor: Jennifer Geib, Biology
Co-Author(s): N/A
Title: Evaluating the Efficacy of Artificial Domiciles for Bumble Bees Across Diverse Environments
Pollinator populations have been steadily declining over the past 30 years, with North American bumble bee (Bombus spp.) numbers dropping by 50 percent since 1974 (USFWS). This decline is concerning, as bumble bees are essential pollinators that support biodiversity and ecosystem stability. Bumble bee population loss is impacted by multiple factors, including pesticide exposure, climate change, disease, parasites, and most critically, habitat loss. One potential solution to mitigate habitat loss is the use of artificial domiciles, also known as nest boxes, that are used to provide shelter for bumble bee queens to establish colonies. This study aims to evaluate how environmental conditions influence the colonization of artificial domiciles by bumble bees. Nest boxes will be deployed in the Elk Valley Nature Preserve in Avery County across diverse habitats, including open fields, wetlands, cove forests, and riparian forests. HOBO data loggers will be used to monitor environmental variables, and domiciles will be checked weekly to assess colonization rates. By identifying the conditions that promote successful nesting, this research will provide valuable insights into pollinator conservation and inform strategies to support declining pollinator populations.

Poster 139
Bryce Beatson, Biology Undergraduate Student
Faculty Mentor: Mary Kinkel, Biology
Co-Author(s): N/A
Title: INVESTIGATING INTESTINAL GENE EXPRESSION PATTERNS AND RECEPTOR FUNCTION USING THE ZEBRAFISH MODEL

Gastrointestinal disease is highly prevalent, affecting up to 70 million people in the United States alone. Causes of gastrointestinal disease are commonly rooted in gut motility disorders, which are characterized by excessive increases or decreases in the rate of movements along the digestive tract. Little is known about these disorders, leaving much research to be performed. The purpose of this project was to investigate 1) gene expression patterns of intestinal genes and 2) receptor function in zebrafish, a model organism. The genes investigated were ghsra, which encodes the ghrelin receptor, and mlnr, which encodes the motilin receptor. Both receptors are G-protein coupled receptors that have essential roles in detecting food or food waste in the gut and triggering gut motility in response. The slc10a2 gene, which encodes the sodium/bile acid cotransporter, was also investigated. To map gene expression patterns, RNA was isolated from specific regions of the intestine, purified, and reverse transcribed to cDNA. The cDNA was amplified using PCR to determine which regions of the intestine express the genes of interest. We found that the ghsra gene is expressed throughout all regions of the intestine. Furthermore, we found that slc10a2 is expressed only in the small intestine and the colon. Mapping studies for mlnr and additional genes are ongoing. For functional studies, the motilin receptor function was tested by treating zebrafish with the receptor antagonist ANQ-11125 to inhibit function. The effect on gut motility was observed using a gut transit assay to detect the movement of gut contents along the digestive tract. The assay showed that inhibiting the receptor slowed gut transit times. These experiments help to set the path for further research regarding gene expression mapping and receptor function, as well as the uses for agonists/antagonists and how they can aid in understanding and treating gut motility disorders.

Poster 140

Ally Lawing, Biology Graduate Student - Masters
Faculty Mentor: Rachel Bleich, Biology
Co-Author(s): N/A

Title: QUANTIFYING BIOFILM-RELATED EXPRESSION BETWEEN CROHN'S-ASSOCIATED AIEC AND ENTEROCOCCUS FAECALIS

Crohn's Disease (CD) is a type of Inflammatory Bowel Disease (IBD) characterized by chronic inflammation throughout the gastrointestinal (GI) tract. Adherent Invasive Escherichia coli (AIEC) is a pathobiont implicated in the pathogenesis of IBD, often found in excessive amounts in the GI tract, leading to chronic inflammation. AIEC can thrive in biofilms, which enable adherence to epithelial cells, compromising the stability of the mucosal barrier in individuals with CD and promoting the persistence of the bacteria in the GI tract. Enterococcus faecalis (E. faecalis) is a commensal bacterium normally present in the GI tract but has also exhibited a high colonization rate in individuals with IBD. This research investigates the interaction between CD-related AIEC and IBD-associated E. faecalis to identify beneficial microbe-microbe interactions contributing to their persistence. Our previous studies have reported a wrinkling

phenotype when these IBD-related strains are grown together in co-culture, suggesting biofilm accumulation. To explore the microbial interactions displayed by these bacteria in co-cultured biofilms, AIEC/non-AIEC strains isolated from individuals with CD are grown either individually or in combination with a novel murine isolate of E. faecalis in equal ratios (1:1). Following the development of mature colonies for both monocultures and co-cultures of AIEC/non-AIEC strains, quantitative reverse transcription polymerase chain reaction (RT-qPCR) is employed to quantify the expression of genes crucial for the formation of E. coli biofilms. The gene expressions of fimH, csgD, bscA, and luxS are examined with 16S as a control. The results of RT-qPCR are expected to show an increased expression of these genes in AIEC co-cultures compared to non-AIEC co-cultures. Further investigations will explore these interactions under various growth conditions and at different time points to examine changes in biofilm gene expression and RNA transcription.

Poster 141
Gabriela Gonzalez Caquias, Biology Undergraduate Student
Faculty Mentor: Daniel Chi-Wei chen, Biology
Co-Author(s): N/A
Title: RRM2 as a Key Therapeutic Target to Combat Chemoresistance in Ovarian Cancer
Ovarian cancer is one of the leading causes of cancer-related deaths among women, with poor outcomes often linked to chemoresistance and aggressive tumor progression. Ribonucleotide reductase subunit M2 (RRM2), a key enzyme in dNTP synthesis, is frequently overexpressed in ovarian cancer and correlates with worse survival rates and therapy resistance. Recent advances have highlighted RRM2 as a promising therapeutic target. Inhibitors such as osalmid, Didox, Triapine, COH29, and 4,4'-Dihydroxystilbene (DHS) disrupt RRM2 activity, impairing DNA synthesis and reducing tumor growth. Preclinical studies have demonstrated that these agents can overcome chemoresistance, particularly in ovarian cancer. Using data from the KM Plotter and The Cancer Genome Atlas (TCGA), we confirmed elevated RRM2 expression in ovarian cancer tissues, which is associated with poor survival outcomes. TCGA analysis further suggests that ovarian cancer cells are particularly susceptible to RRM2 inhibitors, supporting their therapeutic potential. Our findings establish RRM2 inhibition as a viable strategy for treating ovarian cancer. Ongoing studies will focus on the preclinical validation of these inhibitors and their combinatorial potential with standard chemotherapy to enhance therapeutic outcomes.

Poster 142
Bailey Sauls, Biology Graduate Student - Masters
Faculty Mentor: Jon Davenport, Biology
Co-Author(s): Dr. Benjamin Fitzpatrick

Title: ASSESSING NICHE OVERLAP OF ISOTOPIC AND MORPHOLOGICAL SPACE IN PLETHODONTID SALAMANDERS

Approximately 2.16 million living species have been identified on Earth. Species are expected to differentiate along at least one dimension of niche space to reduce resource overlap or else eventually become extinct. The southern Appalachians are a biodiversity hotspot for salamanders, specifically plethodontids. Small-bodied plethodons play vital roles in the communities where they are found, yet the mechanisms for coexistence remain unknown. Southern Zigzag salamanders, Plethodon ventralis, and Southern Redback salamanders, Plethodon serratus, are two small-bodied woodland salamanders with areas overlap in the Great Smoky Mountains National Park. A total of 17 populations, 8 sympatric sites, 5 allopatric P. ventralis sites, and 4 allopatric P. serratus sites, will be studied to determine if niche overlap exists in isotopic niche and morphological space. Tail tissues approximately 5mm in length were collected in the field and processed for stable isotope analysis while photos of live individuals will be digitized and processed in geomorph, an R package. Based on preliminary results, overlap in isotopic niche space exists between all populations of P. ventralis and P. serratus. Morphological data are undergoing analysis.

Poster 143

Zac Spicer, Biology Graduate Student - Masters

Faculty Mentor: Jon Davenport, Biology

Co-Author(s): N/A

Title: DIVERSITY OF TERRESTRIAL SALAMANDER ASSEMBLAGES ALONG ELEVATIONAL GRADIENTS IN THE SOUTHERN APPALACHIANS

The Southern Appalachian Mountains are a biodiversity hotspot, especially for plethodontid salamanders. While the ranges of some salamander species are well understood, much less is known about how environmental parameters affect their diversity and abundance. To investigate these patterns, we conducted repeated nighttime visual encounter surveys along 25 x 4m transects throughout western North Carolina and East Tennessee across a range of elevations (500-2,000 m) during the summer of 2024. Each of the 128 transects were searched at least 3 times, and 93 were searched a fourth time. Throughout the active season, we counted 2,673 individuals representing 17 species. Using the R package spAbundnce, we estimated the abundances of the five most common species encountered (Desmognathus orestes, Eurycea wilderae, Plethodon cylindraceus, P. montanus, and P. yonahlossee). Preliminary results indicate that the abundances of these species are predicted by similar covariates, such as elevation. Our findings will enhance the understanding of what environmental parameters shape terrestrial salamander communities and provide valuable data to inform their conservation and management.

Poster 144

Cassidy Ferraro, Biology Undergraduate Student
Faculty Mentor: Lynn Siefferman, Biology
Co-Author(s): Sarah Hill, Sarah Knutie, Lynn Siefferman
Title: Effects of Manipulated Incubation Temperature on Baseline Corticosterone Levels in Eastern Bluebirds (Sialia sialis)
Recent climate trends have increased the frequency and severity of aberrant weather. Extreme weather could disrupt homeostasis and negatively impact the likelihood that female songbirds complete the energetically expensive incubation stage. Indeed, historical data demonstrate that cold snaps and heat waves can cause females to abandon nests during incubation. Glucocorticoids are metabolic hormones that orchestrate plastic responses to environmental stimuli including temperature. Under extreme temperatures, baseline corticosterone levels help maintain energy balance so that birds continue with reproduction. We manipulated nest temperatures during incubation in a Southern Appalachian population of eastern bluebirds. Females were randomly assigned to either cold, control, or heat treatments for 7 days. Next, we took a maternal blood sample to measure circulating baseline corticosterone levels. We also measured body condition and plumage color- traits associated with female reproductive effort and success in this species. Although hatching success did not differ with treatment, the heated clutches took longer to hatch- especially later in the breeding season. Yet, nestlings from heated clutches were also slightly more likely to fledge the nest. We expect females will have higher corticosterone after early-season cold treatments and late-season heat treatments. We also explore whether measures of female quality interact with treatment to influence corticosterone levels; high-quality females may be less likely to elevate corticosterone in response to temperature stress.

Poster 145
Luke Darney, Chemistry Undergraduate Student
Faculty Mentor: Brooke Christian, Chemistry and Fermentation Sciences
Co-Author(s): N/A
Title: MECHANISM OF PROTEIN STABILIZATION BY A TARDIGRADE CYTOSOLIC ABUNDANT HEAT SOLUBLE PROTEIN
Tardigrades are microscopic organisms known for their ability to survive extreme conditions, such as desiccation, ionizing radiation, and extreme temperatures. Tardigrade desiccation survival has been attributed to a class of proteins called cytosolic abundant heat soluble (CAHS) proteins. These proteins are intrinsically disordered and form gels in a concentration dependent manner. One protein in this class, CAHS D, can stabilize desiccated enzymes such as lipoprotein lipase and lactate dehydrogenase from inactivation under heat stress. We are interested in using CAHS D to stabilize proteins in solution. CAHS D can prevent temperature-induced inactivation of alcohol dehydrogenase (ADH) in solution, and this project investigates how this stabilization occurs. His-tagged CAHS D was expressed recombinantly in Escherichia coli and

purified using immobilized metal affinity chromatography. Purity of CAHS D was verified by SDS-PAGE. To determine whether stabilization of ADH by CAHS D depends on ion-ion interactions, we tested stabilization of ADH in solutions ranging from pH 6 - 8.5 and increasing concentrations of NaCl. Stabilization of ADH by CAHS D was pH- and salt-dependent, indicating that electrostatic interactions mediate stabilization. Understanding the nature of CAHS D-mediated protein stabilization could aid in future experiments focused on stabilizing protein-based therapeutics to increase their shelf life and accessibility.

Poster 146
Tyler Witham, Anthropology Undergraduate Student
Faculty Mentor: Alice Wright, Anthropology
Co-Author(s): Matthew Knowles
Title: POINTS OF CONNECTION: DIACHRONIC PATTERNS OF LITHIC PROCUREMENT IN NORTHWESTERN NORTH CAROLINA
Working with data from a 50-year-old survey of the New River valley in Northwestern North Carolina, our team has examined diagnostic projectile points from a number of pedestrian surveys. Looking at point typology and raw material type dating from the Transitional Paleoindian to the Late Woodland periods, we have made some preliminary interpretations of procurement, trade and migration patterns. We hope that our research may show one way of revisiting old data that has been otherwise collected and forgotten about.

Poster 147
Jackson Adams, Political Science Undergraduate Student
Faculty Mentor: Nancy Love, Government and Justice Studies
Co-Author(s): n/a
Title: Indigenous Sovereignty and the State: An Examination of the Recognition of Indigenous Legal Sovereignty in International Legal Systems
My research analyzes forms of legal recognition of Indigenous Peoples as subjects in Federal and International law. As Robert A. Williams (Lumbee) argues in The American Indian in Western Legal Thought, specific legal doctrines legitimized and imposed colonial rules of law. With this in mind, it is necessary to explore principles that support, rather than undermine, legal sovereignty for Indigenous nations while also resisting assimilatory legal practices imposed on them. My research is broken down into an analysis of landmark legislation and court cases regarding Indian Affairs, the role of Indigenous recognition by political structures, and enforced principles and models that represent the facilitation of tribal sovereignty. I also incorporated studies on the role of legal pluralism and the Rights of Nature in examining methods of legal recognition for Indigenous peoples in International law. The former, in its establishment of community-based legal systems, has the potential for the recognition of Indigenous legal

autonomy. The latter is the belief that land ecosystems enjoy the same legal rights as persons or corporations. It can also be a method where Indigenous legal theory and Environmental Justice converge, acting as a necessary avenue to dismantle legal frameworks that deny Indigenous sovereignty. With further research, I will include other methods that recognize Indigenous legal sovereignty. I hope my research will shed light on emerging legal discourses that can facilitate a new relationship between settler states and Indigenous nations.

Poster 148
Otto Smith, Sustainable Development Undergraduate Student
Faculty Mentor: Alexia Witcombe, Sustainable Development
Co-Author(s): N/A
Title: PHOSPHORUS BUDGET OF THE APPALACHIAN STATE SUSTAINABLE DEVELOPMENT FARM
The STEPS project at App State seeks to both address the use of mined phosphorus fertilizer, as well as to reduce excess phosphorus in the environment. Within STEPS, The High Country Farm Phosphorus project aims to understand local farm-gate phosphorus budgets and phosphorus-related management practices. As part of this research, we conducted surveys with local farm managers, and this specific project focuses on one local farm. To calculate the phosphorus budget, the survey gathered data on any phosphorus entering the farm through inputs (e.g., pelletized chicken manure fertilizer) and any phosphorus leaving the farm through outputs (e.g., harvested vegetables). I used the survey information to first identify potential phosphorus sources and then to determine the quantity of phosphorus introduced. For the 2023/2024 calendar year, the survey data indicated that while phosphorus left farm fields as harvested crops and residues, only small amounts of phosphorus left the farm. I used published fertilizer content values and literature values for phosphorus contents of crops/harvested products. This research helps characterize the different phosphorus sources used by smaller scale, organic or close to organic farms in the High Country that focus mainly on diversified vegetable production. This research will also be used to create a phosphorus budget of the Appalachian State Sustainable Development Farm.

Poster 149
Hannah Wallace, Psychology Undergraduate Student
Faculty Mentor: Jessica Doll, Management
Co-Author(s): Natalee Jamerson, Levering White, Brody Behm, Allison Renegar, Jessica Doll, Tim Huelsman, Kristl Davison
Title: WE'RE ALL A FAMILY: INVESTIGATING HOW DIVERSITY INTERACTS WITH FEELINGS OF MATTERING,BELONGING, JOB SATISFACTION AND WELL-BEING.
Belonging in the workplace refers to employees feeling valued and integrated within the organization (Thissen et al. 2023). Mattering is the experience of being perceived as

important or noteworthy by others (Deas et al. 2023). In the workplace, mattering is linked to higher productivity and job satisfaction (Bucher et al. 2019). Employees lacking a sense of belonging may experience irritability, stress, and demotivation, negatively impacting workplace health (Thissen et al. 2023). However, limited research exists on how belonging and mattering are experienced within specific groups, especially those whose work is often stereotyped or undervalued in society (Jung, 2015). This study will explore how diversity factors such as race, gender, sexual orientation, mental and physical disabilities, and neurodiversity influence employees' sense of belonging and mattering at work. It will examine the broader effects of these experiences on well-being, job satisfaction, and performance. The study will test three hypotheses: Hypothesis 1: People identifying with a single diverse characteristic will experience lower levels of belonging and mattering, leading to lower job satisfaction, performance, and well-being. Hypothesis 2: People identifying with multiple diverse characteristics will experience even lower levels of belonging and mattering compared to those with just one. Hypothesis 3: People identifying with at least one dominant characteristic will experience higher levels of belonging and mattering, correlating with higher job satisfaction, performance, and well-being. Participants will be 18 or older and employed for at least six months. A survey administered through Qualtrics will collect data on demographics, well-being, belonging, and job performance. This research will provide insights into how belonging and mattering affect underrepresented groups, influencing employee satisfaction, motivation, and mental health. Findings could inform more inclusive workplace practices that enhance both well-being and performance.

Poster 150

Ethan Fountain, Psychology Undergraduate Student
Faculty Mentor: Shawn Bergman, Psychology
Co-Author(s): Madhu Sukumar, Rachel Weaver, Cassidy Zekas, Oliver Sullivan

Title: ENHANCING CAREER OUTCOMES: EVALUATING THE IMPACT OF THE PSYCHOLOGY CAREER ADVISOR AT APPALACHIAN STATE

Introduction. Psychology bachelor's degree holders face higher underemployment (working a job outside your major) than the general graduate population (Burning Glass Institute, 2024). In Spring 2024, the psychology graduating class was surveyed; the findings suggest a disproportionately high level of awareness with a low level of utilization of career resources in the student population. In response to the data collected the psychology career advisor position was introduced with the aim of improving career resource utilization and quality. The current study is an expansion of last year's survey and assesses the career advisor’s impact on career resource usage and evaluates future career confidence and students' needs. Student responses will be used to improve career resources provided by the Appalachian State University Psychology Career Advising Center with the broad goal of helping students gain a better understanding of future career prospects. Methods. A needs assessment survey was

conducted to identify career resource awareness/utilization, career confidence, and future career plans, in order to evaluate the effectiveness of the psychology career advisor. Students were asked to self-report levels of knowledge, skills, and abilities developed through core courses of the psychology major. This year's sample was expanded to include juniors and seniors, and 380 responses were collected. Research assistants read a script outlining the purpose of the study, then prompted the students to take a self-administered Qualtrics survey. Results and Implications. Data revealed that 91% of students who met with the career advisor viewed the resource as helpful. Regarding career confidence, there was a slight decrease in students with little to no confidence in their career plans and a marginal increase in those who felt moderately to very confident about their success. However, resource utilization remained consistent with findings from the 2024 Student Needs Assessment. These findings suggest that the psychology career advisor position is a promising first step in combating underemployment among psychology undergraduates at Appalachian State University.

Poster 151

Nicole Iturbide, Psychology Graduate Student - Masters
Faculty Mentor: Jamie Yarbrough, Psychology
Co-Author(s): Gracie Streeval, India Horn, Sara Hehn, Mlynn Wooden, Emily Reigard, Anhminh Nguyen, Hannah Schulze, Kristian Terry, & Elliana Hamilton

Title: THE BRAVE NEW WORLD OF AI AND ACADEMIC INTEGRITY

As artificial intelligence (AI) becomes more available to students, educators are faced with the unique challenge of preserving academic integrity. It can be difficult for educators and other professionals to distinguish between students' work and AI-generated work. ChatGPT is a new AI technology that quickly responds to complex and specific questions. The purpose of this study is to investigate the ability of human graders to distinguish between essays produced by undergraduate students and essays produced by ChatGPT. Previous research comparing student essays and ChatGPT essays found that both students and professors were unable to distinguish between the two types of essays, and they tended to give higher scores for ChatGPT-generated essays. The results of similar studies have varied, with some indicating that human judges can distinguish between the two with 52%-71% accuracy. This research examined whether human graders could distinguish between student-generated essays submitted online and those generated by ChatGPT, as well as between student-generated essays produced during a handwritten in-class test and those generated by ChatGPT. Researchers used ChatGPT to generate responses to the same prompts that the students received. Graduate students were asked to identify which essays were actual student work and which essays were ChatGPT-generated through an online survey. Using two 2x2 factorial designs, researchers concluded that human graders are more likely to think that AI-generated work is student-generated. They are more accurate at detecting student-generated work, regardless of how the work was produced. The results of this

study provided information for educators to consider when making decisions about how to incorporate these new technologies into their teaching and grading. This study has the potential to provide valuable insights into educator preparedness for the impact of open-access AI on the education system.

Oral Presentations - Morning Session 1 - 9:00-10:20am Room 415 Plemmons Student Union

Oral 1

Anna Nall, Political Science Undergraduate Student
Faculty Mentor: Nancy Love, Government and Justice Studies
Co-Author(s): N/A
Title: ACTIONS SPEAK TO WORDS: AN ANALYSIS OF POLITICAL RHETORIC AND VIOLENCE
It is by now no secret that American politicians at every level use fear-mongering language to incite voters to give them support. Using Cognitive Appraisal Theory of Emotion initially developed by Richard Lazarus can illuminate how rhetoric centered on crime, violent migrants, and welfare abusers evokes feelings of anxiety, anger, and resentment, particularly towards nonwhite citizens and migrants. Studies have shown these same emotions in perpetrators of domestic terrorist attacks carried out in the name of white supremacy (Schils & Pauwels, 2016, p. 79). By synthesizing this research I will show how the political rhetoric of our leaders is reflected in the manifestos of white supremacist domestic terrorists and indeed perhaps motivates them. I will then use the same framework to analyze nonviolent rhetoric of community leaders and how they are able to encourage toleration and connectedness in their communities. My goals are to discover any correlations between the dog-whistles and white supremacist rhetoric used by political leaders and domestic terrorist attacks carried out against racial minorities and determine if nonviolent rhetoric could work in the same way to prevent further violence and foster community.

Oral 2

CJ Burns, Building Sciences Undergraduate Student
Faculty Mentor: Sharareh Shirzad, Sustainable Technology and the Built Environment
Co-Author(s): Sharareh Shirzad, Jonathan Culpepper
Title: THE EFFECT OF BIOCHAR PARTICLE SIZE ON PHYSICAL AND MECHANICAL PROPERTIES OF CEMENT PASTE AND MORTAR
Abstract: A consistent increase in global annual concrete production is a leading factor in the declining state of the global environment, however, the integration of Biochar - a carbon-negative material derived from waste materials - within cement paste can be a sustainable alternative the construction industry should consider. Two different variants of biochar were evaluated in this study, along with a control sample. One variant is a wood-waste-based biochar produced at the Appalachian State University NEXUS facility, and the other is a commercially available sample from Wakefield Biochar. This investigation analyzes the specific effects of particle size variation within different biochar samples through a series of tests. Biochar particle sizing through rotary ball milling at varying time intervals results in samples with different median diameters,

which is perfect for the manipulation of mortar mixtures to perform strength and workability tests. Utilizing scanning electron microscopy (SEM) can also reveal underlying molecular features of biochar such as pore sizing and hydration patterns, allowing for mixture tuning and ultimately resulting in a sustainable and workable cement paste featuring high compressive strength and toughness.

Oral 3

Alex G. Langlais, Exercise Science Undergraduate Student
Faculty Mentor: Martie Thompson, Public Health and Exercise Science
Co-Author(s): N/A

Title: Concussion and Mental Health Associations among Youth Before and During the COVID-19 Pandemic: An Empirical Assessment

Youth experiencing concussions are found to have an increase in mental health problems. Limited studies have examined if and how concussions are associated with suicide risk. Concussion protocols recommend a quick return to physical/social activities for positive effects on recovery, including mental health symptoms. Due to the COVID-19 lockdown, concussion patients, like all youth, endured increased isolation and the effects were detrimental. During the 2020-2022 period, the severe mental health crisis for adolescents manifested by an increase in self harm, suicidal ideation and attempts. This study investigated if youth with a concussion diagnosis during COVID-19 were at higher risk of mental health crisis and suicidal behaviors. We used data from the 2017, 2019, 2021, and 2023 Youth Risk Behavior Surveillance System to examine associations between suicidal behaviors (ideation, made a plan, attempt) and concussions in a nationally representative sample of U.S. high school students. Using SPSS, we conducted logistic regressions, stratified by sex, to determine if the likelihood of suicide risk increased based on the occurrence and number of concussions a youth sustained. Results showed a significant increase in the magnitude of associations between concussion status with suicide attempts from prior to post COVID in females (1.99 in 2019 females with 2+ concussions to 3.84 in 2021). The magnitude of associations among males, while still significant, decreased slightly (4.24 in 2019 males with 2+ concussions to 3.34 in 2021). Risk of suicide attempt increased as concussion quantity increased. The association of concussions with the ideation and made a suicide plan variables remained relatively constant through all the years in both sexes. Health providers should be made aware of the increased risk in suicidality for concussed youth. Implications of the findings and their consistency with other COVID-19 mental health data for youth is discussed.

Oral 4

Rylee Strassner, Biology Graduate Student - Masters
Faculty Mentor: Ashley Adams, Biology
Co-Author(s): N/A

Title: COMPARING CARBON STORAGE BETWEEN NATURAL SUCCESSIONAL DECIDUOUS FORESTS AND PLANTED CONIFEROUS FORESTS IN THE SOUTHERN APPALACHIAN MOUNTAINS

Forests are the largest terrestrial carbon (C) sink, where C is stored in trees, deadwood, leaf litter, soil, and roots. Deadwood C storage is often overlooked due to complexities in its size, abundance, and decomposition. Additionally, forest type influences C storage, particularly in the Southern Appalachian Mountains, where forests are either natural successional deciduous or planted coniferous, based on past management. This region offers a unique opportunity to compare ecological processes. I hypothesize that coniferous forests store more C than deciduous forests, particularly in trees, deadwood, and soil, with differences influenced by past land management. I also expect variations in forest structure and diversity. To test this, I established six study plots at Appalachian State University Robert Gilley Field Station, conducting a two-year forest survey on tree size, diversity, leaf litter fall, and deadwood decomposition. While my C budget calculations suggest higher C storage in coniferous forests, statistical analyses show no significant differences in total C between forest types. Similarly, woody debris and leaf litter abundance are comparable. However, my calculations indicate a greater C flux from coniferous plots. These findings suggest that past land management may influence forest structure and C storage. Long-term monitoring and refined methodologies would improve C estimations.

Oral Session 2 - Morning Session 10:40am - 12:00pm Room 417 Plemmons Student Union

Oral 5

Jonathan Culpepper, Technology Graduate Student - Masters

Faculty Mentor: Dr. Sharareh Shirzad, Sustainable Technology and the Built Environment

Co-Author(s): Dr Sharareh Shirzad

Title: EFFECTS OF ARUNDO DONAX BIOCHAR AND CLASS F FLY ASH ON THE MECHANICAL PROPERTIES OF HYDRAULIC CEMENT MORTAR

With global industrialization continuing to become more prevalent, the atmospheric CO_2 content continues to increase. Concrete construction is a key part of development with cement production contributing 8% of the carbon emissions related to the concrete industry. Studies have been done looking at using Supplementary Cementitious Materials (SCM) such as steel slag, silicon fume, and fly ash. Particle size, metal oxide content, and absorption capacity contribute to selection. Cement has long been supplemented with a type of SCM known as a Pozzolan, such as volcanic ash by the ancient romans. More attainable materials like fly ash produce a similar product and have been used as early as the 1930s. Class F fly ash obtained from a local source will be one of the SCMs used in this study. Other materials such as biochar, a carbon rich material derived from biomass undergoing pyrolysis with carbon sequestering

properties, has been investigated as an SCM when certain biomasses are used. Arundo donax grass is the biomass of choice for this study due to its high regeneration rate, local availability, and the opportunity to repurpose a plant species with potential to harm other species. Additionally, the biochar used was produced by other graduate students at Appalachian State University. This study aims to investigate and determine the optimal cement replacement ratio of Class F fly ash and Arundo donax biochar by performing various tests (compressive strength, workability, slump, setting time, and setting time).

Oral 6
Christiana Wright, Computer Science Graduate Student - Masters
Faculty Mentor: Nazia Sharmin, Computer Science
Co-Author(s): Shahash Kandel, Amanda Carr
Title: RISK SCORING IN THE RECONNAISSANCE PHASE
Reconnaissance is a critical phase in cyberattacks, enabling adversaries to gather intelligence and identify system vulnerabilities. Traditional cybersecurity measures primarily focus on detecting and mitigating threats in later attack stages, often leaving reconnaissance activities inadequately addressed. Deception-based techniques offer a proactive defense by misleading attackers, yet existing approaches lack a structured framework for assessing reconnaissance risks and dynamically deploying deception strategies. This research introduces the Deception Approach Based on Reconnaissance Risk Scoring (DRRS), a mathematical framework designed to quantify reconnaissance risks and optimize deception deployment. DRRS consists of three core components: Reconnaissance Risk Scoring - Evaluates reconnaissance activities using a weighted scoring system based on factors such as source reputation, frequency, and targeted assets. Deception Selection - Maps risk scores to tailored deception strategies. Dynamic Adaptation - Continuously refines risk assessments and deception responses in real time. By integrating deception with risk-based decision-making, DRRS increases the complexity of adversarial operations, reduces the success of reconnaissance, and enhances cyber resilience. Through simulation-based evaluation and empirical validation, this research demonstrates DRRS's effectiveness in mitigating reconnaissance threats across industries such as government, finance, and healthcare. The findings contribute to the broader field of cyber deception by providing a scalable, adaptive defense framework that strengthens early-stage cybersecurity postures.

Oral 7
Katie Baker, Chemistry Undergraduate Student
Faculty Mentor: Christian Wallen, Chemistry and Fermentation Sciences
Co-Author(s): N/A

Title: SYNTHESIS OF ELECTRONICALLY DIVERSE METAL-ORGANIC COMPLEXES FOR HYDROGEN SULFIDE CAPTURE

Hydrogen sulfide exists naturally in “sour” gas, which is the main source of natural gas. Due to hydrogen sulfide being toxic in small concentrations, industrial processes for its capture have been established. The state-of-the-art treatment is the Claus process with secondary treatment, but there are fundamental limitations to the known secondary treatment processes that lead to inefficiencies. Improving these processes requires investigation of metal-hydrogen sulfide bonding. The Wallen group focuses on synthesizing metal complexes with second-sphere hydrogen bonding to bind hydrogen sulfide and protic sulfur species in an effort to discover fundamental strategies for improving catalysts and capture methods for hydrogen sulfide. The synthesis of a family of electronically diverse sulfonamidate ligands and their coordination to earth-abundant transition metals will be presented, along with spectroscopic and structural characterization data and investigations of reactivity with protic sulfur species.

Afternoon Oral Session 1 - 1:00-2:00pm Room 415 Plemmons Student Union

Oral 8

Caitlin McClear, Biology Undergraduate Student

Faculty Mentor: Jennifer Geib, Biology

Co-Author(s): Matthew Johnson, Maryam Ahmed, Audi Holloway

Title: Viral Spillover from Honeybee Apiaries in Native Bumble Bee Populations

My study aims to quantify the prevalence of honey bee virus infections in populations of Bombus impatiens, a native bumble bee species, collected near commercial honeybee apiaries in Western North Carolina. There are 18 viruses known to infect commercial honeybees, some of which have been demonstrated to infect native bee populations via shared floral resources. I collected samples of B. impatiens from the Western Piedmont region of North Carolina and tested for two variants of a known honeybee disease: Deformed Wing Virus (DWV). Despite past studies finding no evidence of DWV in North Carolina native bees, my study revealed some DWV-positive individuals near commercial apiaries. Native bee species make up an estimated 70-90% of pollinator species in Western NC, and help sustain many native plant species through their pollination. Understanding the risk of these pathogens on native bee species is vital towards the protection and preservation of these important pollinators, the plants they support, and the protection of their ecosystems.

Oral 9

Asher Rockriver, Physics Undergraduate Student

Faculty Mentor: Brooke Hester, Physics and Astronomy

Co-Author(s): Dr. Brooke Hester

Title: IMPLEMENTATION OF SURFACE ENHANCED RAMAN SPECTROSCOPY IN THE BIYOSEF LASER TWEEZER RAMAN SPECTROSCOPY (LTRS) SYSTEM

Surface Enhanced Raman Spectroscopy (SERS) is a technique used to increase detection of Raman scattering, which is studied in Raman Spectroscopy. Raman scattering occurs when light incident upon a molecule scatters with a changed wavelength due to energy shifts in the vibrational modes of the molecule. In SERS, Raman scattered light is amplified by use of metallic nanoparticles or rough metallic nanosurfaces. The number of occurrences of Raman Scattering is increased for two reasons: plasmon activity at the metal dielectric interfaces and intramolecular charge transfers. When light is incident upon a rough metallic surface or metal nanoparticles with dielectric interfaces, plasmons may be excited. Surface plasmons are coherent oscillations of electrons at the metal dielectric interface. Localized surface plasmons occur at the interface of a very small metallic particle and its dielectric surrounding or core. These electron oscillations amplify departing scattered light. So when a sample is placed next to such a surface, light that may experience Raman scattering in the sample will be amplified, and therefore Raman scattering will be easier to detect. SERS is a promising technique that should allow for the detection of Raman spectra in the Biyosef LTRS system. In the Biyosef lab SERS will be applied to see if Raman Scattering may be observed.

Oral 10

Jessica Horton, Physics Undergraduate Student
Faculty Mentor: Andrew Bellemer, Biology
Co-Author(s): Andrew Bellemer

Title: UNDERSTANDING THERMAL NOCICEPTION BEHAVIOR ANALYSIS OF THE DROSOPHILA CONNECTOME

As technology advances and our understanding of the brain evolves, a convergence between programmatic data analysis and cellular/molecular neuroscience emerges, allowing for a more comprehensive and systematic investigation of both the brain and the behavior of model organisms. An example of this are recent connectomics studies conducted with respect to the Drosophila melanogaster; these studies have mapped the location of every neuron and synapse present in the Female Adult Fly Brain (FAFB), and the resulting dataset has recently been made available to the public as an open scientific resource. My goal is to use this dataset with the intention of investigating the processes behind thermal nociception, or the neurological processing that results in an organism reacting to harmful temperatures in the environment. By analyzing the first-order input, output, and reciprocal neurons which are known to be involved in thermal nociception, we can begin to analyze different patterns and statistical correlations in these neurological pathways that were once overlooked. This analysis holds the keys to novel insights regarding the process of thermal nociception and neural control of behavior.

Oral 11

Claire Kennedy, Religious Studies Undergraduate Student
Faculty Mentor: Randall Reed, Philosophy and Religion
Co-Author(s): N/A
Title: S[AI]NTS: EXPLORING THE USE OF GPTS FOR SPIRITUAL CONVERSATION
Using Open.AI's ChatGPT, I created three separate chatbots with three unique specializations and personalities: one St. Francis of Assisi, one St. Thérèse of Lisieux, and one St. Thomas More. I trained these GPTs on information about their respective saint's lives, works, and beliefs using a mix of primary and secondary academic sources. The s[ai]nts were then made accessible through a web app. The users engaged in conversation with the Chatbots and completed a survey on whether or not their experience was meaningful to their religious experience. My presentation will detail the development of the s[ai]nts, investigation of their reception within religious communities, and explanation of results of this project. The project involves a survey where users described their experiences with the various GPTs, outlining what they liked, disliked, found comforting, found disturbing, and more immediately after usage. I reached out to professors, religious studies classes, local Catholic, Episcopalian, and Presbyterian campus ministries, and various churches for participants. Data collection is ongoing through the end of March. I will examine differences in engagement and explore correlations with general political, theological and social perspectives in general. I suspect in more liberal churches there may be more openness towards AI and contrarily, in more conservative communities, more resistance to the use of AI in religion and wariness towards the chatbots. My goal is through surveys of participants who use the chatbots and engage in consistent traditional prayer to try to gauge their respective enjoyment, understanding participants' preferences and their general feelings about AI in religion.

Thank you for supporting the Office of Student Research!