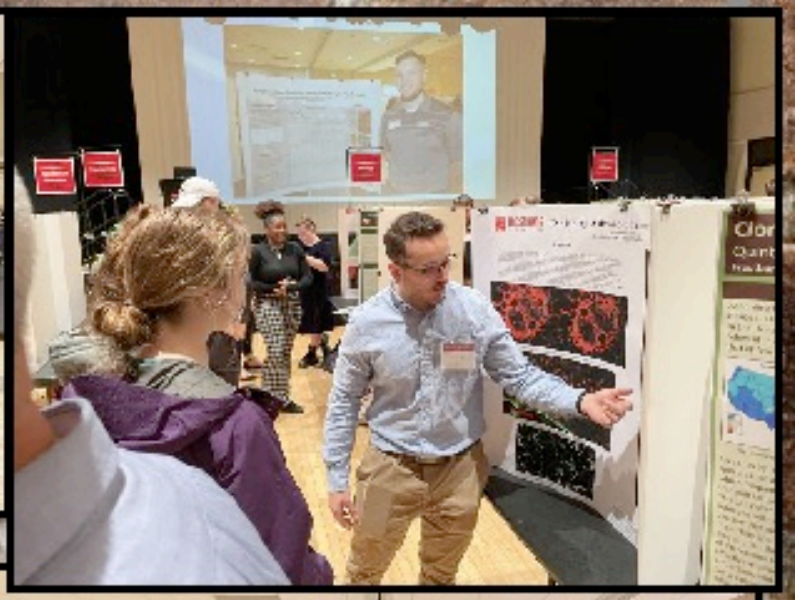
FROSTBURG STATE UNIVERSITY

One University. A World of Experiences.

2023 FSU Undergraduate Research Symposium



Lane Center

May 5th, 2023
10:30 a.m.-2:00 p.m.

TABLE OF CONTENTS

THE ABSTRACTS

This Symposium includes 75 presentations featuring the work of 138 students, mentored by 34 Faculty and Staff from the Honors Program, the Office of Diversity, Equity, and Inclusion, and all three Colleges of Frostburg State University. The projects presented at this Symposium took place in 2022 and 2023 and include coursework and independent study activities. Abstracts are organized alphabetically by university program, office, or college, then by department or college program, and finally by project title. The location of the poster or physical display in parentheses following the title refers to the table locations in the ARMAH. Oral presentations are scheduled in Lane Center 108, 111 and 113. A map of the ARMAH and the schedule for the oral presentations are at the end of this abstract booklet. Each presentation includes the following information:

Project Title (Poster or Physical Display with Table #, Oral Presentation with Room # and Time)

Name(s) of presenting student(s)
Name(s) of contributing student(s) (if applicable)
Name(s) of faculty/staff mentor(s)

HONORS PROGRAM

Understanding the Push and Pull of Appalachia to Create a Resilient Future (Physical Display: Table 21)

Presenting Student: Savannah Kent
Contributing Students: Avery Holmes, Aaron Liang, Jason Lipscomb, Lorena Pintar, Ava Rankin, Christian Santos, Ave Ebersole, Lindsay Aldridge, Valerie Boards Buchanan, Meghan Farrar, Kathryn Loar, Eva Morrison, Lacey Moyers, Wyatt Newcome, and Aniya Schmidt (Exhibit includes photographs by FSU alumnus Matthew Knies.)
Faculty Mentor: Dr. Kara Rogers Thomas

Frostburg State University Honors students enrolled in the interdisciplinary course, Experiencing Appalachia, completed a community listening project in Fall 2022, "Understanding the Push and Pull of Appalachia to Create a Resilient Future." During the Fall semester, students set up listening stations at multiple regional events inviting residents to respond to the following questions: what issues and concerns do you see in your community; what are your community's strengths; and what direction should your community take as you move into the future? Responses from that project were featured in an exhibit designed by FSU Honors Student Savannah Kent, which was displayed at the Allegany Museum this winter as part of a companion exhibit to the Smithsonian's Museum on Main Street traveling exhibit, *Crossroads: Change in Rural America*. FSU students also planned a weekly series of public events and performances to complement these exhibits including a discussion panel on community assets and pathways to a sustainable future; a story slam asking area residents to share short stories and memories of life in western Maryland, and an open mic afternoon with songs inspired by the region. Collectively, this project was part of the Appalachian Teaching Project supported by the Appalachian Regional Commission and administered through the Center for Appalachian Studies at East Tennessee State University. FSU has been long time participant in that program, which encourages Appalachian college students to engage in applied research with community organizations to support economic development in their communities and gain critical leadership skills.

OFFICE OF DIVERSITY, EQUITY, AND INCLUSION

Desensitization: The Psychological Impact of Police Brutality in the Media on African Americans (Oral Presentation: Room 108 from 10:30-11:00)

Presenting Student: Angel Young
Staff Mentor: Mrs. Robin V. Wynder

In the United States, incidents, and media coverage of police brutality against African Americans have risen in the past three years. Exposure to images of police brutality has been found to have negative health impacts on individuals within the African American community. African Americans exposed to images of police brutality are at an increased risk of developing symptoms of distress, mood/anxiety disorders, and PTSD. Many studies have examined the correlation between police brutality and symptoms of psychological distress, but few have examined police brutality in relation to desensitization. In my future graduate research, I plan to address this dearth of knowledge by asking the question of whether increased viewing of police brutality in the media results in a desensitization effect among African American viewers.

COLLEGE OF BUSINESS

MANAGEMENT DEPARTMENT

History of Divine 9 Greek Organizations at Frostburg State University (Poster: Table 4)

Presenting Students: Javon Blackmon, Erin Hughes, Morly Metayer, Vitoria Tulloch
Faculty Mentor: Dr. Rebecca M. Chory

Divine 9 fraternities and sororities have given thousands of black students a sense of support and community while attending college and beyond. This review dives into the history of these organizations at Frostburg State University. The purpose of our study is to discover how these organizations started at Frostburg State and how they impacted the community. Throughout our research process, we interviewed faculty members of such organizations, inquiring about their experiences and the impact the organization had on their lives. We also used other resources such as peer-reviewed journals and historical archives. This review aims to shine a light on the experiences of black students attending a predominantly white institution.

The History of Dining Options at FSU (Poster: Table 4)

Presenting Student: Kamara Jeremiah
Contributing Students: George Allison, Tyrell Maust
Faculty Mentor: Dr. Rebecca M. Chory

The purpose of our study was to explore, examine, and describe the history of the dining options at Frostburg State University. In doing so, we reviewed the history and evolution of Chesapeake Dining Hall and the restaurants in the Lane University Center. This research is important to the field of Management because it shows how Classical Management in the form of span of control, initiative, work/life domains, and division of work and labor have been applied to dining at Frostburg State University. This research also goes in depth on the topic of the organizational chart of management and structure of the dining options, which impacts the last 125 years of the evolution of dining at Frostburg State University**.**

The Role of Power: "Lost" City of Frostburg State University (Poster: Table 4)

Presenting Students: Jada Jones, Braden Poling, Tashawnna Thomas
Faculty Mentor: Dr. Rebecca M. Chory

Leadership and forms of power play a big part in how communities are shaped, and in this circumstance, replaced. Modes of power and leadership often coincide, but in the case of the city of Brownsville, power, and leadership were opposing forces. Coercive power was used to force the people of Brownsville out of their community. Knowing that this was wrong, individuals of the community took a stand, becoming leaders and guiding their people toward a better life outside of Brownsville. This demonstration will further prove the dynamics of leadership, and certain qualities or personality traits that these individuals obtain. We will also note the differences in power, and how that power can often be abused.

COLLEGE OF EDUCATION

RECREATION AND PARKS MANAGEMENT

The Perceived Effectiveness of Sport-Based Incentives on Student Attendance at Athletic Events (Poster: Table 9)

Presenting Students: Mayah Morant, Isaiah Sewell
Contributing Students: Malachi Haynes, Don Woodworth, Aronne Dutton, Beau Meehan, Joseph Mades, JaMarcus Holt, Demetric Denson
Faculty Mentor: Dr. Martin Barrett

Sport-based incentives such as sales promotions and atmospheric efforts such as augmenting the core product with entertainment programming are widely used in sport to increase attendance at events. Following reclassification from NCAA Division III to II, the Frostburg State Athletic Department has increased their engagement with the campus community through various initiatives. However, little is known about the perceived effectiveness of marketing and promotion activities on motivating and persuading students to attend athletic events on campus. This research study sought to understand how frequently students attend athletic events, which students are attending athletic events, how effective students perceive specific marketing and promotion activities, and how effective students perceive specific methods in communicating marketing and promotion activities. Surveys collected from students on-campus (N=327) in the Fall 2022 semester revealed that almost three-quarters of students attend athletic events between up to once a month and once a week. In addition, student-athletes and residential students living either on-campus or close to campus attended up to twice as many games as non-athlete students and commuters. Among the perceived most effective marketing and promotion activities were tailgating before and receiving free giveaways during events; whereas the perceived least effective marketing and promotion activities were watching the event from a special VIP area and receiving a 'shout out' on the stadium videoboard or via arena public address announcer. Finally, social media was perceived as the most effective method of communicating marketing and promotion activities – specifically Instagram, TikTok, and Twitter. The results of this research should help guide the types of marketing and promotion activities the Athletic Department use to incentivize student attendance at athletic events, who these activities are targeted toward, as well as the way they are communicated. As one example, the Athletic Department should look to establish an app-based loyalty scheme for student-athletes to help log and reward attendance at athletic events. Additional examples will be discussed as part of the poster presentation.

COLLEGE OF LIBERAL ARTS AND SCIENCES

BIOLOGY DEPARTMENT

A Review of the Importance of Wildlife Rehabilitation to Conservation Efforts (Poster: Table 16)

Presenting Student: Brice Blankenship
Faculty Mentor: Dr. Thomas Lambert

There are several methods currently used by wildlife conservationists to mitigate decreasing numbers of raptor populations. There are several contributing factors to the current decline of raptors due to human interference, such as logging and hunting. Raptors are important members of their ecosystems and environments due to their role in their respective ecosystems, either as scavengers or apex predators. Of global raptor populations, 52% are declining and 18% could be faced with extinction. Humans have been found to be responsible for most wildlife rehabilitation center admissions. The majority of admissions to these centers have been due to dog/cat attacks, orphaned young, and vehicle collisions. With their numbers declining, this has potential to influence the entire ecosystem and bring forth new challenges for both humans and other species within those birds' habitats. Here, I compare two types of raptors of different conservation concerns, the California Condor, and the Red-tailed Hawk. The California Condor is a raptor of high conservation concern and is listed as critically endangered by the IUCN (International Union for Conservation of Nature), and the Red-tailed Hawk is a raptor of least conservation concern. Techniques of conservation for the California Condor have required more active engagement with local environment and legislative actions, while techniques for the Red-tailed Hawk have utilized more hands-off methods for conservation. Being a species of highest concern by the IUCN, the California Condor has been the focus of conservation efforts such as the California Condor Recovery Team. This team was responsible for successfully breeding and releasing California Condors in captivity, including 20 young per year. This team also discovered that the condors would not survive long term due to lead poisoning from lead shot in their area. Further legislation is recommended if the species is to thrive in their natural habitat. In regard to the Red-tailed Hawk, 95% born in the wild survive, compared to a survival rate of 73% of rehabilitated and released birds. In comparing hatch-year versus adult rehabilitated hawks, the mortality rate of the young is higher (34%). The general public may not see value in wildlife rehabilitation due to their lack of understanding of the ecological systems. The California Condor serves as a disease-eliminating species to the local ecosystem such as rabies and anthrax. This is a natural cleansing system to control these diseases in the California area. The Red-tailed Hawk is responsible for population control within their ecosystems due to their role as a top predator. They are key in controlling local rodent populations. The literature review yielded a variety of consistent recommendations for the continual conservation of these species, including continual monitoring, public education, land and water protection, and more active legislation.

Advanced Microscopy Techniques (Poster: Table 11)

Presenting Student: Skyler Slimmer
Faculty Mentor: Dr. Rebekah Taylor

Microscopy allows us to see objects that otherwise could not be seen with the unaided eye. Using various advanced techniques in microscopy you can discover indefinite possibles of structures on an object, even to the atomic level. Additionally, some of the advanced techniques are specifically designed to amplify the object or certain structures of the object which provides for continued significant discoveries in science. Some of the advanced techniques observed or utilized in this project include: brightfield, dark field, phase contrast, differential Interference contrast, polarized light, fluorescence, and scanning electron microscopy. Using these various advanced techniques has allowed me to obtain a gallery of diverse images of multiple specimens for comparison.

American Robin Migration (Poster: Table 12)

Presenting Student: A'laurenye' McBeth
Faculty Mentor: Ms. Clara Thiel

The American Robin *(Turdus migratorius)* is a small, migratory passerine common in the United States. They are considered to be partial migrants, meaning that some of the population migrates to other areas while some remain year-round residents. Although these birds are very common, there are still some questions that need to be answered regarding their migratory, breeding, and wintering patterns. Over the course of the summer of 2022, we studied their migration by analyzing data from 2020 robins and tagging our own robins with GPS tracking units to hopefully be retrieved at a later time. Various Google Earth maps were created from the 2020 robin data. Two maps showcased the routes each robin went during migration, one map showed breeding seasons for both birds, and the last map showed where the robins wintered during the year. With these maps we were able to answer different questions related to distance, location, and timing of migration. Each robin had traveled significantly far during migration, with one flying as far as Alabama during fall migration to get to its wintering grounds. The next steps for this study involve trying to resight the robins tagged in 2022 and to hopefully gain more information about robins and their migratory habits.

Analyzing Antibacterial Effects of Spices (Poster: Table 2)

Presenting Student: Jasmine Harper
Faculty Mentor: Dr. Kumudini Munasinghe

Spices are natural ingredients that can prevent the growth of harmful bacteria in the human body. The research conducted gathers evidence that specific spices can prevent bacteria growth and may

even promote the growth of helpful bacteria. The Kirby Bauer Method is used to determine the resistance of bacteria when in the presence of a specific spice. With fresh Mueller Hinton agar, about 100µL of bacteria broth was spread evenly on the agar with a cotton swab. Paper disks saturated with each spice were placed on the Mueller Hinton plate. After an overnight incubation, the inhibition zone around the disks containing the spice that prevented bacteria growth was recorded. In addition, any promotion of bacterial growth was noted. Kokum and Gamboge displayed bacterial growth inhibition for *Bacillus cereus* and *Alcaligenes faecalis*. Additionally, red pepper powder displayed bacterial inhibition for *Corynebacterium pseudodiphtheriticum* and *Alcaligenes faecalis*. Most of the spices, such as fennel seeds and coriander, showed enhanced bacterial showed for most of the bacteria. In addition, the tube dilution method will be used to determine the needed concentration of Gamboge, red pepper powder, and Kokum to inhibit bacterial growth. This research is important to determine the spices that prevent harmful bacteria and promote helpful bacteria growth in the human body so that these spices can be incorporated more into the human diet.

Assessing Changes in Genetic Expression of Olivetolic Acid Cyclase in *Cannabis sativa* (Poster: Table 8)

Presenting Student: Maxwell Sykes
Faculty Mentor: Dr. David Puthoff

Recent improvements to the advent of recombinant DNA paved the way for in-depth analysis into the finer details of biochemical pathways. Biochemists in the lab are able to utilize the methods of isolating, amplifying and cloning DNA from separate organisms to create novel hybrid species that may express some beneficial, desirable trait. With this methodology, also comes the ability for scientists to either silence or upregulate specific genes within an organism through various techniques in DNA purification and processing. In the case of *Cannabis sativa*, current research into the pharmaceutical efficacy of cannabinoid metabolites (THCA/CBDA and their decarboxylated derivatives) has further elucidated the potential pathways responsible for their synthesis by utilizing recombinant DNA in plasmid vectors. The exact pathway for cannabinoid synthesis is, yet unknown; however, recent studies have shown that a small enzymatic protein, olivetolic acid cyclase – OAC, works in conjunction with other enzymes such as tetraketide synthase, TKS, and aromatic prenyltransferase to produce the unique carbon-scaffold and cyclic structural moieties common to cannabinoids. OAC plays the crucial first role in the synthesis of the cannabinoid precursor, cannabigerolic acid, which, when acted upon by either THCA synthase or CBDA synthase, produces the respective metabolite. Within this experiment, DNA from a species of hemp was isolated and combined with the RNA primers for THCAsyn and OAC (gathered from NCBI). The cloned DNA can then be analyzed and compared against a control sample to observe the changes in gene expression of the cis-regulatory elements associated with OAC either in the presence or absence of THCAsyn. Once sequenced, the results from this experiment could yield insight on previously unknown protein-protein interactions involved within cannabinoid synthesis, giving further control over strain modifications.

"Beyond the Net: Exploring eDNA Detection Methods for Threatened Pollinators in Appalachia." (Oral Presentation: Room 111 from 11:00-11:30)

Presenting Student: Cameron Garland
Faculty Mentor: Ms. Clara Thiel

Pollinators are essential to many ecosystems' health and productivity. However, many pollinator species are threatened, making their conservation a critical priority. Specifically, bumble bee populations have been declining due to habitat loss, pesticide use, and climate change, making their conservation an important issue for farmers and natural resource managers. In recent years, a new approach has emerged that uses environmental DNA (eDNA) to detect the presence of pollinators without physically capturing and potentially injuring them. Insect netting is the traditional method for collecting and identifying insect species. However, lethal sampling via netting can be invasive and potentially harmful to the population. Additionally, netting is constrained to daylight hours, during which pollinators are most active. This temporal restriction can limit the range of pollinator diversity captured. eDNA techniques offer a cost-effective and non-invasive method for monitoring arthropod communities. Using these new eDNA techniques, we developed two distinct projects with the overall goal of managing and improving bumblebee health. The first one aims to investigate the relationship between environmental factors and parasite diversity in the Common Eastern Bumble bee (Bombus impatiens) midgut. This project will utilize the 18S marker to identify parasites and examine their distribution in relation to temperature, precipitation, and land use. The findings have the potential to advance our understanding of the factors that contribute to parasite infection in bumble bees and inform the development of effective strategies to protect pollinator populations. The second project will focus on analyzing the data we collected from Maryland bumble bee populations using insect netting and eDNA methods. This analysis will provide insights into the state's distribution and abundance of bumble bee species and inform conservation efforts.

Cloning ospA of *Borrelia burgdorferi* for Transformed Plant Expression (Poster: Table 7 and Oral Presentation: Room 111 from 12:00-12:30)

Presenting Student: Quinton Browne
Faculty Mentors: Dr. Rebekah Taylor, Dr. David Puthoff

Borrelia burgdorferi bacteria is the causative agent of Lyme disease, the most common vector-borne disease in the United States. It is transmitted to humans by blacklegged (deer) ticks that have fed from infected animals, commonly mice. Our goal is to design an oral vaccine which decreases infection rates in mice by inserting outer surface protein A (ospA) of *B. burgdorferi* into a plant vector: pCambia 1201B. *Agrobacterium tumefaciens* was used as a means of introducing the vector (bearing *B. burgdorferi* ospA) into *Arabidopsis thaliana*. The pCambia vector was introduced into *A. tumefaciens* competent cells after being purified from transformed E. coli. The successfully electroporated *A. tumefaciens* was then plated and colonies were picked and grown as liquid cultures. Liquid cultures transformed with both the ospA bearing pCambia and a control pCambia

were used for floral dip of *A. thaliana*. These dipped plants' seeds have been tested for successful transformation, and two plants have been found to contain the sequence for ospA. Continued floral dips will be undertaken to increase the number of positive plants and develop a control for vaccine efficacy testing. Additional seeds of positive plants will be planted and crossed.

Compare Minimum Inhibitory Concentration and Bactericidal Effects of Antibiotics on the Growth of *Burkholderia cepacia* Complex and *Burkholderia cenocepacia* (Poster: Table 2)

Presenting Student: Sophia Bishoff
Faculty Mentor: Dr. Kumudini Munasinghe

Burkholderia cenocepacia (B. cenocepacia and *Burkholderia cepacia (B. cepacia)* belong to a group of bacteria to which healthy humans are often not susceptible. Regardless of this fact, they both pose a significant problem to people with weakened immune systems. *B. cepacia* is a bacteria complex that has an especially high resistance to antibiotics and other treatments. The research conducted tested the minimum inhibitory concentration and the minimum bactericidal concentration of both *B. cepacia* and *B. cenocepacia,* along with how it is inhibited by various antibiotics. These bacteria were tested against three antibiotics used for this specific treatment, Polymyxin (PXB 300), Ticarcillin (TIC 75), and Ticarcillin with Clavulanic Acid (TCC 85), along with general antibiotics, such as Ampicillin (AM10), Chloramphenicol (C30), Erythromycin (E15), Penicillin (P10), Streptomycin (S10), and Tetracycline (TE30). The Kirby-Bauer test was used against each of these, and the results of the main three antibiotics are as follows: PXB 300 had an average inhibition of 1.28 mm in diameter for *B. cepacia* and no inhibition for *B. cenocepacia,* TIC 75 had an average inhibition of 3.08 mm in diameter for *B. cepacian* and 0.30 mm in diameter for *B. cenocepacia,* TCC 85 had an average inhibition of 3.68 mm in diameter for *B. cepacia* and 0.22 mm in diameter for *B. cenocepacia.* P10, AM10, and E15 had no inhibition zone against *B. cepacia,* while P10, AM10, E15, and S10 had no inhibition zones against *B. cenocepacia.* In *B. cepacia,* C30 had an average inhibition zone of 1.98 mm in diameter, TE30 had an average inhibition zone of 0.88 mm in diameter, and S10 had an average inhibition zone of 1.03 mm in diameter. For *B. cenocepacia,* C30 had an average inhibition zone of 2.15 mm in diameter and TE30 had an average inhibition zone of 1.73 mm in diameter. The minimum inhibitory concentration, or MIC, and the minimum bactericidal concentration, or MBC, were tested as well. The MIC of *B. cenocepacia* against C30 was 10^-8 M and the MBC was 10^-5 M and against TE30, there was a MIC of 10^-2 M and an MBC of 10^-1 M. When *B. cepacia* was tested there was a MIC of 10^-4 and an MBC of 20^-1 against TE30 and a MIC of 10^-5 and an MBC of 10^-1 against C30. This research is being continued to determine more MICs and MBCs of these bacteria. While this research is not important to a large portion of society, it is applicable to people with illnesses, especially those with cystic fibrosis. It is vital to know what antibiotics are effective and efficient in treating and killing these bacteria to increase the safety of the people at risk.

Comparing Incidence of *Borrelia burgdorferi* in Sideling Hill Tick Populations (Poster: Table 11)

Presenting Student: Alexander McNemar
Faculty Mentor: Dr. Rebekah Taylor

Controlled burning is often used as a method of controlling the health of a forest, including reducing the fuel load in an attempt to reduce forest fires. This also reduces the amount of shade that is favorable for tick survival. *Borrelia burgdorferi* is the causative spirochete of Lyme disease in both humans and other animals. Controlled burning was conducted at the Sideling Hill Creek Reserve. Ticks collected in the Summers of 2021 and 2022 were collected in areas where controlled burning was conducted, and areas where controlled burning was not conducted. These ticks were analyzed by extracting their DNA, then PCR and gel electrophoresis were used to determine the presence of *Borrelia burgdorferi* in both populations.

Examining Problem Solving in Cats Using Thorndike's Puzzle Boxes (Poster: Table 16)

Presenting Student: Abigail Rickard
Faculty Mentor: Dr. Thomas Lambert

The ability of an animal to learn to solve puzzles can provide insights into their cognitive ability. The majority of research to date has been conducted on primates and dogs, with relatively little on domestic cats. Previous studies have shown that cognitive ability relates to physical health and can decline with age. My study utilized Thorndike puzzle box to examine the effect of age on cognition in cats. Cats were divided in age classes of kitten (< 6 months) and adult (> 1 year). Animals from the Antietam Humane Society in Waynesboro, PA were placed in a crate with a wood door held in place with a latch that is pulled up when a pedal is pushed down allowing the door to open. Each time the cat was put in the crate, it was timed until escaped. Mean escape time was compared between the two groups.

Feather and Distribution Characteristics of Seabirds Vary with Avian Ecologies (Poster: Table 8)

Presenting Student: Mick Lynch
Faculty Mentor: Dr. Kate L. Sheehan

Without their wings, birds cannot fly (far) and would look quite disturbing. Even with wings, some birds are flightless, and use their anterior appendages to swim and/or thermoregulate. The efficiency with which a bird can travel, whether in the air or in the water, is not only aided by the presence of wings, but also by their shape, i.e., their morphologies. Take the Andean Condor for

example, a large Cathartid vulture (wingspan of up to 10 feet) that uses its broad wings to catch thermals and soar for long distances as it forages. Alternatively, the gentoo penguin, a seabird that uses its wings not for flight but for high-speed swimming, reaches speeds of 22 mph. The wings of birds are key features in their daily activities, and understanding their wing morphology is a key step in understanding avian ecology. Seabirds are a diverse subgroup of avifauna with distinct behaviors along spectra of foraging and migration strategies. The morphologies of their wings and feathers are likely to correspond with the ways that they fly, and the strategies used while foraging. Here, we assess the wing feathers of four species of seabirds: Northern Fulmar (*Fulmarus glacialis*), Northern Gannet (*Morus bassanus*), Thick-billed Murre (*Uria lomvia*), and Red-throated Loons (*Gavia stellata*). These species exhibit different foraging strategies, ranging from plunge diving, surface diving, plunging, or surface dipping. Furthermore, some of these species will actively swim underwater using a combination of foot and wing propulsion. The flight patterns of these birds also differ seasonally, when during breeding season flights between nesting colonies and foraging grounds occur, and in the non-breeding season, flight durations at sea are much longer. Here we compare the morphologies of the feathers among our focal species to learn how their ecologies impact their morphologies. To accomplish this, we plucked all the feathers from at least one wing of each species, assessed for condition (pin feathers, broken, missing, or infected with parasites), and photographed each feather. The carcasses of seabirds were donated to the FSU Parasites & Plastics Ecology Lab and maintained at -20°C until processing. We measured the inner diameter of each feather with a series of steel gages, and feather length was determined from photographs using ImageJ (Fiji with Java 8) software. We present comparisons of the surface area of flight feathers of the wing with each bird's body mass to determine the wing load of each species and discuss their similarities and differences based on ecological niche. With this information, we help document variation in the form and distribution of feathers on a seabird's wing within an ecological context.

From Paper to Trees: Creative Writing and the Natural World (Oral Presentation: Room 111 from 12:30-1:00)

Presenting Student: William O'Boyle
Faculty Mentor: Ms. Clara Thiel

Creative writing has been at the forefront of gaining interest and the sharing of ideas to the general population for centuries, including the natural sciences. Writing, especially printed content stands as a tribute to a commitment to a written truth. The research conducted was a literature review of scientific and popular writings spanning four centuries (1599-2019), over 40 cited works, and nearly 20 authors. Several authors are well known and gained notoriety not just for their skills in literature but their pursuits in the ways of science and there are also several authors who are relatively unknown and are only recently published. The review then looked at the rhetoric of each piece as well as the author's arguments within their work along with the influence their writing had or currently has on U.S. literature and the fields of forestry, agriculture, and wildlife conservation. The research concludes that in the modern age where access to information is no longer an issue through technological advancement, it is important that the expression of these ideas adapt and contain

several things. Firstly, an entertaining and well written format to capture attention and present understandable arguments that can be understood by any reasonable person. Secondly, factual and understood information that has been tried by the scientific method. Thirdly, it must have a call to action that the information that they are being given can be useful, less it becomes a strange kind of news journalism. The research also discusses the importance for undergraduate students in writing majors to be given greater opportunity within their majors to pursue comprehension of the natural sciences; likewise, there is equal importance for undergraduates in natural science majors to expand their knowledge in writing and the arts.

Identifying Mycorrhiza Fungi Favorable for Crop Production (Poster: Table 2)

Presenting Student: Geneva Palatini
Faculty Mentor: Dr. Kumudini Munasinghe

Mycorrhizae fungi increase the surface area of plant roots and enhance nutrient absorption such as nitrogen, phosphorous, and potassium, favorable for crop yields. The main objective of this research is to isolate and identify Mycorrhizae fungi and incorporate Mycorrhizae into organic fertilizers used for corn plants. Several commercially available fertilizers such as Mycomax, Dynomyco, and Mycobliss were used to isolate Mycorrhizae fungi. Then the fungi were identified in the microbiology lab at Frostburg State University, Maryland. Each fertilizer was diluted and applied onto the Sabouraud Dextrose Agar plates and incubated at room temperature. There were ten different fungi isolated and identified using prepared microscope glass slides. For identification, fungal morphological characters such as spores, color, and filaments were examined. Once all the fungi are identified, they will be incorporated into organic fertilizer and conduct test trials with corn plants in the greenhouse.

Impacts of Fish and Biofilm Abundance on Planktonic Communities in a Subarctic Lake (Poster: Table 7)

Presenting Student: Ethan Weaver
Faculty Mentor: Dr. Kate L. Sheehan

In freshwater communities, most organisms do not discriminate about what they are willing to eat – if they can fit a food item into their mouth, it is fair game. Adaptations to reduce predation allow for the coexistence of a diverse suite of organisms, that in turn, function as the prey base for small fish. Additionally, zooplankton can serve as hosts to trophically-transmitted parasites. In Cheney Lake in Anchorage, Alaska, planktonic copepods (Cyclopoidea: Crustacean) are the first intermediate host of the tapeworm Schistocephalus solidus. For the parasite to transition to its next life stage, the copepods must be eaten by the threespine stickleback (Gasterosteus aculeatus). Inside the fish, the parasites increase their body size by more than 1,000%, and those life stages are of particular interest for ecological and evolutionary biology. In summer of 2022, we searched Cheney Lake for

wild copepods. We noticed that certain parts of Cheney Lake contained large quantities of biofilm. Biofilm is often comprised of mat-forming protists like algae that can cover rocky and sandy substrates, but also can detach and float freely on/under the water's surface. We suspected that biofilm could serve as a refuge for zooplankton. Here, we present our analysis of the planktonic communities in Cheney Lake given abundances of biofilm refugia and local population estimates of the predator, G. aculeatus. We sampled for zooplankton using hand-thrown plankton nets with 64□m screen. The volume of water sampled was estimated from the aperture of the plankton net and the length of water sampled for each tow. Although we collected samples from various locations in Cheney Lake (n=12, between the hours of 9am and 4pm), the majority of collections came from the northern peninsula. For each plankton tow, we performed a field survey to document biofilm coverage and the density (ranked) of G. aculeatus swimming through the collection area. Samples were processed at the University of Alaska, Anchorage Ecology and Biomedical Systems Laboratory, where each morphospecies was counted under stereoscope (4-16x magnification), and we developed a pictorial key of morphospecies. In sum, we found 4,387 organisms from 33 morphospecies, of which 13% were copepods. The alpha diversity of each sample was calculated using the Shannon-Weiner index (H'). As H' increased, the abundance (volume-extrapolated) of copepods also increased. Thus, it appears that we were most likely to find lots of copepods when many other zooplankton were also present. When it came to biofilm, we found a nonlinear relationship for copepod abundance, where copepods were most frequent when a moderately high area of biofilm was present. Copepods (and other zooplankton) were largely absent from sites with little-to-no biofilm, and in sites where biofilm was super-abundant. This suggests that biofilm at moderate levels does support zooplankton communities. The fish density did not appear to influence the frequencies of zooplankton or the abundances of copepods in Cheney Lake. Thus, we conclude that, when seeking out copepods, one should target sites where there is moderate to high biofilm present, and not worry about the presence or abundance of G. aculeatus predators.

Isolation and Sequencing of CBDa Synthase and RNA from Hemp Samples at Different Stages of Development (Poster: Table 8)

Presenting Student: Ayden Roberts
Faculty Mentor: Dr. David Puthoff

Molecular biology focuses on understanding interactions on the genetic level. Understanding what makes a gene turn on helps to determine what the plant is doing at stages in its life cycle. To this end, also looking at what conditions outside of the life cycle whether the plant is expressing due to stress conditions. This research showcases both a dive into the DNA and RNA aspects of molecular biology by isolating and cloning CBDa synthase in hemp plants and by isolating RNA to create cDNA to process. We will present the cis elements gathered from the sequenced cloned CBDa synthase and sequences gathered from cDNA produced by RNA gathered from flowering hemp samples at various stages of development.

Microplastic Consumption and Cestode Infections in Threespine Stickleback Fish (Poster: Table 6)

Presenting Student: Zach Barnard
Faculty Mentor: Dr. Kate L. Sheehan

In Alaska, anglers are attracted to the area in pursuit of Pacific halibut (*Hippoglossus stenolepis*), salmonoids (*Oncorhynchus* spp.), and other game fish. However, a non-game species is also of particular interest there, the threespine stickleback (*Gasterosteus aculeatus*). *G aculeatus* are secondary consumers/predators found in most riverine and lacustrine systems in latitudes above 30° N. They are recognized as a model species for evolutionary studies and assessments of environmental disturbance. A unique population of *G. aculeatus* occurs in Cheney Lake in Anchorage, Alaska, where nearly 100% of the fish are parasitized by the tapeworm *Schistocephalus solidus.* This cestode has a complex life cycle, that includes 3 different hosts. The first intermediate host is a copepod (Arthopoda), the second intermediate host is *G. aculeatus* (Osteichthes), and the definitive host includes various water birds (Aviformes). These parasites are transmitted trophically and infection with the parasite impacts the behavior of the copepods and the fish hosts, making them more likely to be consumed by predators. These behavioral changes could also impact the way that the fish hosts eat. A relatively new item that *G. aculeatus* is now encountering as a possible food is microplastic pollution. Microplastics are now recognized as ubiquitous environmental contaminants, and freshwater systems in Alaska are no exception. In this study, we evaluated the frequencies of microplastics and cestodes in *G. aculeatus* to learn how and why these organisms interact in Cheney Lake. We assessed for parasite infections of the body cavity and plastic inclusion of *G. aculeatus* diet by evaluating the gut contents under stereoscope. We found that fish that grew to larger sizes were both more likely to be infected with *S. solidus* and more likely to have consumed plastics. In fish collected in summer (n=129), we found that this trend was quite strong, but in winter (n=106), it relaxed, in large part, because the mean size of all fish was much smaller. Additionally, *G. aculeatus* collected in the winter were found to be mostly gravid, adding an additional variable to be compared amongst body size and incidence of plastics and cestodes.

"Microscopy: Through the Lens" (Poster: Table 11)

Presenting Students: Quinton Browne, Mackenzie Freeze, Hannah Hieronimus, Skyler Slimmer
Contributing Student: Mariah Pritts
Faculty Mentor: Dr. Rebekah Taylor

Microscopy opens the door to a whole new world as it allows us to see beyond what our eyes can detect. Distinct types of microscopy allow us to explore various aspects of each specimen. Brightfield microscopy allows us to examine internal and external structures of specimens that we struggle to see with our eyes. Through fluorescence microscopy, we can observe different binding sites of substances or the colocalization of different molecules. Scanning electron microscopy (SEM) allows us to view surface textures in great detail. Light microscopy uses a light source and a series of lenses

to probe the specimen. Fluorescence microscopy uses fluorescently tagged molecules that emit a light at a greater wavelength than the wavelength of light that excited the molecules. Electron microscopy produces images by using a beam of electrons and a series of magnetic lenses rather than using visible light. However, each type of microscopy comes with its own skillset and set of challenges. The goal of this project is to share part of the new world that microscopy can allow us to explore by sharing images that were taken using various types of microscopy.

PCR-Based Identification of Two Species of Cottontail Rabbits (Poster: Table 11)

Presenting Student: Skyler Slimmer
Faculty Mentor: Dr. William Seddon

Western Maryland is home to two species of cottontail rabbits, the eastern cottontail (*Sylvilagus floridanus*), and the Appalachian Cottontail (*Sylvilagus obscurus*). The two species are only distinguishable through morphological measurements on deceased individuals, or through complex DNA analysis. Using DNA extracted from rabbit tissues, we are evaluating the use of two different sets of primers to develop a simple, noninvasive PCR method of species identification. The first set of primers (designated LGL331 and LGL335) have been used successfully to accurately identify sex of animals within numerous species using a previously established protocol. The second set of primers (Designated Rabbit R and Rabbit F) have been used to determine sex of individuals in several species of European rabbits and hares. Both primer sets target DNA sequences common to both the X and Y chromosomes of mammals. PCR products will be analyzed using gel electrophoresis and RFLP analysis, if necessary. Preliminary results show amplification of DNA by both primer sets. PCR protocols will be optimized for each primer set to refine the results and determine the usefulness of the protocol in species determination.

Phenotypic Differences in CBDCa Synthase Genes Throughout Varying Strains of Hemp (Poster: Table 7)

Presenting Student: Michael Tyler
Faculty Mentor: Dr. David Puthoff

It is well understood that the structure of a protein depends largely on the sequence of DNA that encodes it, and that the transcription of DNA is heavily regulated. The promoter region is where the regulation of genes occurs due to the binding of transcription factors and other regulatory machinery located on the gene. This project aims to observe differences in base pairs in the promoter region of the cannabidiolic acid synthase (CBDAS) gene across strains of hemp (*Cannabis sativa L.*) containing low, medium, and high levels of CBD and eventually identify whether the singular difference at a certain position in the promoter causes a noticeable change in chemotype of the expressed protein. DNA was isolated from hemp samples and amplified via PCR. Gel electrophoresis was performed on the PCR product to qualitatively assess the success of the

amplification, then the product was purified, cloned, and sequenced. The sequencing step has yet to be completed, but the plan is to analyze in total about 1200bp of the promoter to determine what transcription factors they encode as well as their functions. So far, amplification from two sets of primers have been successful and they are in the process of being cloned. Once their sequences are obtained, the sequence analysis and possible chemical analysis can begin. The results of this project will provide useful insight into the amount of variance that a single nucleotide polymorphism can induce and may benefit those studying hemp based on their levels of expression of a specific regulated gene.

Protein Content of the Tapeworm *Schistocephalus solidus* at Different Developmental Stages (Poster: Table 8)

Presenting Student: Max Summerfield
Faculty Mentors: Dr. Kate L. Sheehan, Dr. Holly Currie

Recently, we made an exciting discovery where mature individuals of the parasitic tapeworm *Schistocephalus solidus* occurred free in the waters of Cheney Lake in Anchorage, Alaska. These parasites infect three hosts: a copepod, a fish, and a warm-blooded vertebrate. In their advanced larval stage (the plerocercoid) *S. solidus* cannot survive outside of its fish host. Further, it can only mature when in the thermal and physiological environment of its definitive host, typically a bird. We suspect that the source of these worms is the moderately large community of ducks, geese, and grebes on Cheney Lake. The parasite is highly prevalent (nearly 100% infection rate) in the fish, and it is likely that the birds consuming the fish are so heavily infected, that the worms pass through the system in short order, having only enough time in the gut to sexually mature before they are passed with the host's feces. Once mature, the adult worm cannot successfully infect a new host, even when it is consumed, so this passage of whole worms is ultimately a death sentence. Interestingly, shed *S. solidus* adults could serve as a food source for other consumers. We have observed shorebirds foraging near large clusters of free worms, and here, we investigate the likelihood of S. solidus as a nutritious meal for other animals. The FSU Parasites & Plastics Ecology Lab has teamed up in a collaborative effort with the Department of Chemistry to assess the macronutrient concentrations of S. solidus. We collected free worms and extracted plerocercoids from the fish hosts of Cheney Lake during summer 2022 and winter 2023. Extracted worms were 1) preserved immediately following extraction, 2) retained in culture media for various periods of time under refrigeration & moderate temperatures, and 3) allowed to mature at high temperature (40^{o}C). This allows us to evaluate the degree to which the nutritional quality of a worm might change as it progresses through its life cycle. To determine the energetic value these parasites could provide to predators, we are assessing protein, carbohydrate, fat, and total calorie content. Here we present preliminary results for protein content, where we used the Bradford Assay (absorbance spectroscopy) on samples that had been frozen, cryogenically ground, and lyophilized. These data, once combined with our future assessments, will increase our understanding of the role of S. solidus as a food source in both traditionally consumed, and free worm forms.

Techniques in Microscopy (Poster: Table 6)

Presenting Student: Quinton Browne
Faculty Mentor: Dr. Rebekah Taylor

As technology advances, available techniques for viewing the natural world allow for greater and greater specialization. This specialization allows for increased variation amongst the specimens which are viewed, as well as amongst the specific attributes of the specimens that are viewed. This project attempted to provide a broader understanding of the natural world in a purely observatory fashion: by documenting the differences between traditional brightfield techniques and other techniques such as polarized light, fluorescence, and electron microscopy. By comparing samples under different conditions, much can be learned about how the environment surrounding an object changes our perception of it. This introduction of environmental bias in many ways mirrors the personal bias that each person brings into their work. What we see is inherently limited to a small sliver of what actually exists, and by highlighting the different information that can be obtained from a specific sample (often at the exclusion of other information types), the complexity of viewpoints can be highlighted. The purpose of this project is twofold- to explore the unseen world of everyday life, and to exemplify the different ways that a subject can appear to the viewer under different conditions. The first was achieved by collecting images which allow for the observation of a feature that would typically be invisible to the naked eye, such as individually labeled nuclei or the details of trichomes on a leaf. The second goal was achieved by collecting multiple types of images of single samples- ranging across brightfield, polarized light, fluorescence, and SEM. This was done for several samples, so that the most dramatic differences could be highlighted.

The Beauty of the Microscopic World (Poster: Table 6)

Presenting Student: MacKenzie Freeze
Faculty Mentor: Dr. Rebekah Taylor

Microscopy allows us to get a glimpse of what life looks like at a microscopic level. Advancements in microscopy include discovering ways to capture an image at a high magnification with high resolution, while maintaining efficiency and simplicity. Not only does microscopy allow us to visualize microscopic organisms, but it also allows us to gain knowledge about the microscopic world. Light microscopy produces images using visible light and a variety of lenses. Fluorescence microscopy captures an image using autofluorescence or immunofluorescence, which is the use of specific biological fluorescent tags to gain an understanding of the location and specificity of the molecules and structures that are present in the specimen. Scanning electron microscopy uses a beam of electrons to produce an image with high resolution that appears to be three-dimensional. As technology continues to advance, microscopy will continue to evolve.

The Effect of Tannin Concentration on Eastern Gray Squirrel (*Sciurus carolinensis*) Foraging and Caching Behavior (Poster: Table 16)

Presenting Student: Maree Dieterich
Faculty Mentor: Dr. Thomas Lambert

Maintenance of diversity in Eastern Hardwood forests is reliant on the actions of the Eastern gray squirrel (*Sciurus carolinensis*) as both seed predators and dispersers. *S. carolinensis* has been found to prefer caching Northern red oak (*Quercus rubra*) and black oak (*Quercus velutina*) due to their high tannin concentration. However, previous literature has yet to explore how *S. carolinensis* receives the cue to cache these high tannin concentration acorns over other low concentration acorns. *S. carolinensis* could be relying chemical cues from the tannins, or they could be receiving visual cues from the different acorn appearances. To test this, tannins were extracted from Northern red oak (*Quercus rubra*) acorns, diluted into several concentrations, and corn was then soaked in varying concentrations. The fate of the corn was tracked using bobbins. Additionally, almonds were soaked in 100% and 25% tannin concentrations and white oak scent and the caching fate of the nuts were observed. To observe caching and reforging habits, peanuts soaked in tannin extracts of 100% and 25% concentrations or treated with white-oak scent and were buried in fake caches and observed. The results displayed a positive correlation between high tannin concentration and likelihood of being cached, despite the uniform appearance of the corn, suggesting that *S. carolinensis* completes this behavior using chemical cues.

The Magnificent World of Microscopy (Poster: Table 6)

Presenting Student: Hannah Hieronimus
Faculty Mentor: Dr. Rebekah Taylor

Included on the poster will be a compilation of several images captured during the advanced microscopy lab time. Many microscopy techniques will be shown. Such as images generated from: fluorescence microscopy, bright-field, dark-field, phase contrast, and SEM. Many image editing techniques will be shown. For example, deconvolution, image stacking, and image tiling will be demonstrated. Further, there will be histology slides that were treated with antibodies to show location of certain cellular structures via fluorescence microscopy. Each technique will be meticulously explained.

Trees in the Cloud: Using GIS and Experiential Learning to Inform TreeCampus Initiatives at Frostburg State University (Poster: Table 13)

Presenting Students: Alexander Donley, William O'Boyle
Faculty Mentors: Ms. Clara Thiel, Dr. David Puthoff

Tree Campus USA is an initiative by the Arbor Day Foundation with the goal of promoting green campuses across the nation. Frostburg State University is recognized by Tree Campus as a tree friendly campus and has been since 2011. The goal of this project was to survey the trees on Frostburg's campus using the ArcGIS program Survey123 in coordination with the Biology and Geography departments. The information for each tree was measurements of height, canopy cover and diameter at breast height, the tree's overall health, GPS coordinates, an identifying image, and the species of individual. Data collected was used to inform Tree Campus on the status of trees on Frostburg's campus. Data may also be used to benefit urban forest planning as well as any projects students, researchers, or campus grounds maintenance may need such data for. Potential future projects include Dendrology labs, Lichen sampling, and canopy cover mapping.

Understanding the Effects of Stocking Density and Biofouling Control Practices on Biofouling on Off-Bottom Oyster Grow-Out Bags (York River, VA) (Poster: Table 12)

Presenting Student: Zophia A. Galvan
Faculty Mentors: Ms. Clara Thiel, Julia M. Grenn, Dr. William C. Walton

Virginia, the top producer of *Crassostrea virginica (*Eastern Oyster) in the United States, supports a fast-growing commercial shellfish aquaculture industry valued at over $30 million. Biofouling is the adhesion of aquatic communities to submerged structures that can have ecologic, biologic, and economic impacts on aquaculture operations. Colonized bags have increased weights that affect handling and blockages that can impede essential water flow, which could affect conditions within grow-out bags. Biofouling contributes to 5-10% of production costs and 20% of the direct costs of an oyster's final market price. This study aimed to (1) quantify and identify fouling communities on floating oyster bags and (2) determine the effects of biofouling control practices (air drying periodically vs not) and stocking density (high, normal, and empty) on biofouling communities growing on mesh settlement plates attached to floating oyster bags. Results indicate that colonizing organisms (tubeworm fouling and bryozoans) were the most prominent taxa found across most settlement mesh plates. Air drying frequently effectively reduced biofouling, producing significantly lighter wet weights on both mesh plates and grow-out bags than non-air-dried treatments ($p < 0.01$). Stocking density reduced biofouling to some degree in non-air-dried treatments, albeit not significantly. Understanding which biofouling communities grow on oyster bags and developing mechanisms to control fouling growth can help researchers provide better data for oyster farmers so they can make more informed husbandry decisions.

Using Forestry Techniques to Examine Oak Regeneration Following Natural and Anthropogenic Disturbances (Poster: Table 13)

Presenting Students: Alexander Donley, Theodore Hoxie
Faculty Mentor: Ms. Clara Thiel

The oak-hickory forests of the Mid-Atlantic region are at risk due to long-term chronic regeneration mismatch and failure resulting in forest mesification. Both timber harvest and fire are potential remedies for this problem, but it is still being determined how effective these land management practices are at altering forest succession. This study examines regeneration in hardwood forests in Western Maryland following disturbances of select cut logging and prescribed burns. We used forestry techniques to examine the composition of trees, seedlings, and saplings to quantify forest succession. Data collected was used to investigate how logging and fire disturbances affect succession differently, with a focus on determining how this practice alters future force composition.

Using Forestry Techniques to Inform Management of Hemlock Woolly Adelgid at Deer Valley Camp, Somerset, Pennsylvania (Poster: Table 12)

Presenting Students: Isabella Briney, Jacob Newell
Contributing Students: Kayla Connor, Theodore Hoxie, Alexander Donley, William O'Boyle
Faculty Mentor: Ms. Clara Thiel

The Hemlock Woolly Adelgid (HWA) is a non-native and invasive species that is taking over the Eastern Hemlock tree population on the east coast of the United States. These insects are able to decimate trees at a fast rate which causes a loss of habitat for many native species, such as brook trout, blue jays, and chickadees. These sensitive species need these trees to thrive; the loss of these trees will have a significant impact on their populations. At Deer Valley Camp, we assessed which trees were infected and at which level they should be treated. Setting up square acres, we were able to assess which trees were producing cones, the percentage of cover they had, and their infestation level which allowed us to give them a score. Recording these scores helps us to give a report back to Deer Valley about which trees they need to treat first and with how much pesticides need to be used. We were able to do this experiment by using the forestry techniques we learned in our Forest Inventory Techniques class (BIOL 490).

Using Microsatellites to Establish Genetic Lineages in 12 Samples of a Strain of *Cannabis Sativa L* (Poster: Table 7)

Presenting Students: Sarah Clark, Lindsay Aldridge
Faculty Mentor: Dr. David Puthoff

The overall purpose of this research project was to use microsatellite sequences to establish genetic lineages in 12 samples of a strain of *Cannabis sativa L* by using various molecular biology techniques such as DNA extraction, DNA quantification, polymerase chain reaction (PCR), and gel electrophoresis. We also used 6 different microsatellite markers with their amplification conditions to determine the lengths of alleles in the DNA samples. Phylogenetic trees will be created using a Python-based program called PyElph, which allows for the analysis of gel result images, and the creation of phylogenetic trees. All 12 of the samples were random samples connected to the same strain of hemp. DNA Extraction is a method used to extract DNA from the nucleus or mitochondria of a sample. In this project, nucleic acid DNA was extracted. DNA Quantification is the process of utilizing a spectrophotometer to determine the average concentration of DNA present in a sample. Polymerase Chain Reaction (PCR) is a technique designed to create countless copies of a specific DNA region. These reactions rely on thermostable DNA polymerase and require DNA primers (microsatellite markers) designed specifically for the region of interest. In the process, the reaction is cycled through a series of temperatures which allow those copies of the target region to be produced. Gel electrophoresis is the process in which DNA fragments are separated according to their size. This helps the researcher determine which alleles are present in each sample, thus allowing us to create a phylogenetic tree. We are currently in the process of determining which alleles are present in each sample through gel electrophoresis. This process will be completed within a week and a phylogenetic tree will be created in the week(s) after. We have no specific results to include at this moment.

Using Small Herbaria and Floristic Surveys to Identify Conservation Needs for Rare, Threatened, and Endangered Plant Species in Western Maryland. (Poster: Table 13)

Presenting Student: Kayla Connor
Faculty Mentor: Ms. Clara Thiel

Small herbaria are of great importance because they contribute to knowledge regarding plant distributions and occurrences. Specimens housed within Frostburg State University's Herbarium can also highlight unknown or forgotten collections of rare or at-risk plant species. These collections may provide useful information in the prioritization of resurvey efforts of previously unknown populations of rare, threatened, or endangered species. Thus, our objective is to utilize herbarium specimens to identify previously undocumented occurrences of these species in western Maryland by resurvey efforts. These resurveys will help fill knowledge gaps surrounding the unknown presence of ecologically significant and rare flora in western Maryland. Western Maryland is a

significant geographical survey area due to being settled within the biodiverse mountains of Appalachia. Our findings will help inform us on conservation and restoration efforts to preserve rare flora populations as well as continue long term monitoring projects.

CHEMISTRY DEPARTMENT

The Analysis of Commercially Available Gluten Digestion Supplements (Poster: Table 3)

Presenting Student: Jacob Stocker
Faculty Mentor: Dr. Holly Currie

Gluten is commonly known as the protein that can be found within foods such as wheat, rye, and barley. There are several reasons why people avoid consuming gluten in their diet. One of the most well-known reasons is Celiac disease. To avoid these issues, people consume gluten digestion supplements. The Analysis of these gluten supplements is to be determined. Utilizing Liquid Chromatography and a Protease Assay Analysis, these supplements will be broken down and a more detailed look into their properties can be observed. The specific proteins seen through the analysis will yield a better understanding of how gluten supplements function to prevent people from contracting certain gluten related concerns such as celiac disease.

Evaluating Deep Eutectic Liquids as Solvents for Microwave-Assisted Aldol Reactions (Poster: Table 3)

Presenting Student: Ayden Roberts
Faculty Mentors: Dr. Benjamin Norris, Dr. Holly Currie

Synthetic chemistry is reliant on solvents that are harmful, expensive, and nonrenewable. For the field to be sustainable, a switch to greener solvents is needed. Choline chloride and urea, both found in large naturally occurring quantities, can be used to form deep eutectic solvents. These deep eutectic solvents have not been widely used in synthetic chemistry. This experiment showcases their uses in synthetic chemistry by exploring the proline-catalyzed aldol reaction of benzaldehyde and acetone under both microwave and conventional heating. We will present reaction yield and product purity that will be benchmarked against similar reactions in conventional solvents.

Total Synthesis of Lidocaine via an Alternative Pathway (Poster: Table 3)

Presenting Student: Maxwell Sykes
Faculty Mentor: Dr. Matthew Crawford

Organic chemistry, at its core, is concerned with *'How do we get from point A, to point B?'* on a molecular scale. The convolution of this aspect arises mainly from the varying specificity, yield, or efficiency of a given reaction scheme. Certain compounds are of particular pharmaceutical or industrial importance and the need for alternative and potentially, more-efficient synthetic

applications are always of paramount concern for the researching chemist. Not only could the alternative path prove to be more eco-conscious, but it could also result in higher yields/purities and potentially provide a mechanism with significant applications in the general field of chemistry, outside of just one synthesis. Here, within this experiment we attempt to synthesize the pharmaceutical analgesic, Lidocaine, from phenol. The alternative pathway includes several 'one-pot' synthetic steps which could prove effective in the reduction of overall yield losses.

COMMUNICATION DEPARTMENT

I'd Rather Listen to Your Woes than Listen to Your Eulogy: The Mental Health Crisis Plaguing Colleges (Oral Presentation: Room 108 from 11:00-11:30)

Presenting Student: Bradley Vincent
Faculty Mentors: Dr. Elesha Ruminski, Dr. Angela Luvara

From depression and anxiety to eating disorders and substance abuse, college campuses have a mental health crisis plaguing them. With over 60% of college students reporting a mental disorder in the 2020-2021 academic year, it is clear that this is a widespread issue. Mental Health problems have big impacts on students—such as lowering energy levels and concentration, and even causing some students to dropout ("College Students Speak", n.d). Many of us have experienced some sort of mental illness, yet even with this experience and the impact is has on us, we barely talk about it. According to a survey conducted and published by the National Alliance on Mental Illness, 50% of surveyed students do not disclose their mental illness, creating an environment where they cannot get needed help ("College Students Speak", n.d). This is something that needs to be talked about, taught, and destigmatized, because if we keep ignoring this crisis, then it will be too late.

"Walkable Cities: What, Where, and Why Should You Care?" (Oral Presentation: Room 108 from 11:30-12:00)

Presenting Student: Jessica Griffin
Faculty and Staff Mentors: Dr. Elesha Ruminski, Dr. Susan Mandell

Take a second to think about the area around Frostburg State University. We live in a pretty walkable community as there are houses and businesses within 15-minute walking distance of the school. We also have sidewalks lining our streets that are used by pedestrians of all ages. Living in a walkable community has obvious benefits like less traffic and improved physical health, but research has found more underlying benefits to living in a walkable city. When looking at the progress made in cities around the world, it's hard to understand why we haven't been advocating for walkable cities in the United States. Many cities are facing the same declining conditions with studies revealing a high demand in suburban housing vs. a decline in urban living. In Europe the situation is quite the opposite with large cities being high quality, sustainable, appreciated environments. Cities like Oslo, Berlin, and Madrid have proposed restricting cars in certain areas of their cities, and Copenhagen and Milan are known for being bike friendly (Jaegerhouse, 2022). In many of these cities, cars and pedestrians are able to coexist, but that does not seem to be the case in the United States. Pedestrian deaths hit a 40 year high in 2021, and reckless driving has increased in recent years during and after the pandemic. Between the first half of 2019 and 2022 pedestrian deaths rose 18% (HealthDay, 2023). With this surge in pedestrian deaths, it's important we understand what is causing this and how we can resolve this problem in our country.

COMPUTER SCIENCE AND INFORMATION TECHNOLOGIES DEPARTMENT

A Better Way for Pentest—Using Metasploit for Exploitation (Poster: Table 18)

Presenting Students: Christopher Geiger, Lusinodaio Makengo, Donald Brown, Geraldine Tchhakam, Ne'vaeh Nalty
Faculty Mentor: Dr. Wendy Xu

Our project is on the Metasploit framework and the hacking abilities that come along with the software. Metasploit is based out of Kali/Linux and can give the user many different hacking abilities to gain information from another user's system. Metasploit is one of the most user-friendly hacking software's that are available, but to do it ethically you need to get the user to know that you are going to be attacking before hacking into the system, otherwise just like with any hacking software it is illegal to access someone's system without their permission. There are ways you can use Metasploit as a hacker without the user's permission such as sending trojan links in emails or messages that can get the user to click and grant you access (without their knowledge). Once you are in the system you have any ability you can think of. You can kill processes, turn on the webcam, go through files on the computer and even make changes to the files that are on the computer you are accessing, plus many more things you can do with the computer that you are accessing. Metasploit is an open-sourced software that is constantly being updated and worked on so new features are constantly being added every day. This makes Metasploit one of the most effective software's that is available when it comes to hacking into someone's device.

AR Sports Drills (Poster: Table 17)

Presenting Student: Emilie Bonhivert
Faculty Mentor: Dr. Xunyu Pan

When elite athletes are away from their team and coaches it is harder to connect ideas of field plays and white boards are erased almost as quickly as the drill is drawn. New AR software allows users to play interactive games, try on virtual models of accessories, and enhance learning experiences. The AR project I am working on will incorporate these drawings into a 3D visual that applies dynamic movements. The software I am using includes Unity AR and Vuforia to achieve mobile device usage. A device will be able to take a picture of the board and render player positions and line movements. A coach or player will be able to place objects like players and balls on a drawn line on a coaching whiteboard. These boards have the field layout already printed and will allow the user to only draw lines to enact movement in a drill.

AR Zoo Companion App (Poster: Table 17)

Presenting Student: Jarryd Rosenberry
Faculty Mentor: Dr. Xunyu Pan

This project aims to create an AR Zoo Companion app using Unity and C# that enhances the overall zoo experience. The app allows visitors to get a closer look at animals that may not be currently available or in view. It also provides educational and more hands-on opportunities for children. The app encourages users to explore the zoo and look for specific animals by enticing them with exciting 3D models and videos of the animals. Additionally, the app provides more information than what might be available through just looking at the animal. Designed with children in mind, the app's user interface is intuitive, and upon opening, the app directly opens the camera, requiring only that the user points it at the printed photograph. One potential challenge is that the app is currently only available on Android devices, but future work could expand it to iOS. Another challenge is that the app is limited to a select number of images, but future work could expand the library of images that it can work with. In conclusion, the AR Zoo Companion app provides a unique and interactive experience for zoo visitors, enhancing their visit and providing educational opportunities. The app's focus on children, ease of use, and potential for future development make it a valuable addition to the zoo experience.

Employee Tracker (Poster: Table 17)

Presenting Student: Dawson Hormuth
Faculty Mentor: Dr. Michael Flinn

In any workplace it is always important for managers/leaders to monitor employee performance. Depending on the size of the organization, this can be a daunting task. Many applications that aid in employee tracking allow users to document staff behaviors and actions as journals. However, that is the extent of the application. Once journals are documented, they can be hard to retrieve and lack the overall ability to generate a useful report. The solution is to build an application that allows efficient journal logging, retrieval, and report generation. The Employee Tracker does just that. Using a combination of JavaScript, SQL, and various JavaScript libraries and frameworks, a full-stack web application was implemented. The Employee Tracker implements an efficient and effective means of employee performance reporting.

Use WebGoat for Penetration Testing Learning (Poster: Table 18)

Presenting Students: Ebubechukwu Amuzie, Jahnae Miller, Ariyone Reaves, Paul Lewis
Faculty Mentor: Dr. Wendy Xu

WebGoat is an open-source web application developed for testing and training purposes. It includes various vulnerabilities and challenges to help users learn about common web application security issues. One of its use cases is as a tool for attackers to test and exploit vulnerabilities on a Windows system. The attack process involves identifying vulnerabilities in the target system, selecting an appropriate attack method, and exploiting the vulnerability using WebGoat's various tools and features. By using WebGoat for an attack on Windows, users can gain a better understanding of web application security and learn how to protect against such attacks.

UX/UI Design (Poster: Table 18)

Presenting Students: Geraldine Tchakam, Kwame Nketia
Faculty Mentor: Ms. Rebecca Flinn

Our mission is to create a comforting and comprehensive website. The revision of our website is to increase productivity, and most importantly is to have users at ease. This rebranding is mostly done for new students and staff of Frostburg State University. Our website is based on the rebranding of Paws. Paws is a space for students, professors, and administration to look at important educational information. Paws FSU (Frostburg State University) is a big part of a student’s life, it allows students to look at their financial status, academic status and enables them to connect with their advisors.

ENGLISH AND FOREIGN LANGUAGES AND LITERATURE DEPARTMENT

Beyond the Text: Adapting Famous Literary Works (Oral Presentation: Room 111 from 1:00-1:30)

Presenting Students: Cara Allen, Malaika Habib, Tyler Redding
Faculty Mentor: Dr. Amy Branam Armiento

Cara Allen, an elementary education major at Frostburg State University, created a children's rendition of "Sonnet 116" by William Shakespeare. Allen's ambitious goal was to write a version accessible to children as well as something that adults would find intriguing. Her book is a side-by-side "translation" of the original three quatrains and rhyming couplet next to updated and age-appropriate prose. Allen used this approach to show how love is unchangeable and how Shakespeare's definitions of love can apply to a familial relationship. In addition, Allen created illustrations. Malaika Habib's project is titled "Letters from Delia: An Epistolary Adaptation of Zora Neale Hurston's 'Sweat.'" After reading the short story, she wanted to portray the thoughts that could have belonged to Delia, thereby adding more emotion that the author did not directly express in the short story. The story facilitated this approach to an extent; however, Habib projected some emotions and opinions inspired by the plot. Tyler Redding's piece is titled "The Rainbow," an allusion directly related to Kate Chopin's "The Storm." The motivation behind this project was to show another character's point of view, opposing that of the main character. The adaptation experiments with mirroring the dialect, tense, and formatting in the original text. Tyler's goal in constructing this story is to present two different viewpoints, thereby highlighting how they can be dramatically different from one another: one with sorrow and misfortune juxtaposed against one with devotion and luck.

Beyond the Text: Using the Lewis J. Ort's Special Collections to Contextualize Literary Works (Oral Presentation: Room 111 from 11:30-12:00)

Presenting Students: William O'Boyle, Reeve Kennedy
Faculty Mentor: Dr. Amy Branam Armiento

William O'Boyle will expand upon research conducted last year on the Lewis J. Ort Library's Special Collections' Pansye Atkinson Collection. In this presentation, he makes the move to understand how to research "unofficial" family collections. The items to be discussed include a coal oil glow lamp, which belonged to Frostburg Teacher's College alumna Eliza L. Morgan, and a painting of her Moscow, Maryland, home, which was commissioned by her son Professor Charles "Puff" Puffenbarger. These items and their histories tell the story of one woman's rise from rags to riches and serve as signs for how she was impacted by the battle for women's rights and the expansion of education in the United States as well as the impact of two world wars and the Great Depression on her family. Will discuss how these objects symbolize the value of literature, reading, and writing across generations. Reeve Kennedy's presentation will focus on *Done in the Open* (1903), a book by

Frederic Remington and Owen Wister, which is housed in the Lewis J. Ort Library's Special Collections. In the United States to this day, many people are uneducated or misinformed on the gruesome treatment of Native Americans. It is of utmost importance that this situation be rectified. One of the best ways to do so is to page through authentic sources from these times rather than reading about these events in a sanitized textbook. In order to connect the history to the literature of the time, they scrutinize this object and discuss the book's history with librarian Liza Zakharova. By sharing images and excerpts from this book that most people will never see, Reeve uses Remington's artwork and Wister's writing to elucidate excerpts from Zitkala Ša's, *Impressions of an Indian Childhood* (1900) and Ohiyesa's *The Deep Woods to Civilization* (1916). This comparative work creates a link between first-hand accounts of Native Americans to a work authored by white men in an effort to assess whether Remington and Wister offer an accurate narrative and portrayal.

Which Immunotherapy has the Most Efficient Results of Treating Cancer: Anti-PD-1 vs Anti-CTLA-4? (Poster: Table 9)

Presenting Students: Kaylee Pifer, Laura Golden
Faculty Mentor: Dr. Jill Chihak

While chemotherapy and radiology are the main ways of treating cancer, immunotherapy is also starting to make a name for itself. Two different receptors, programed death 1 (PD-1) and cytotoxic-T lymphocyte associated antigen 4 (CTLA-4), have become prevalent in the oncology world. The discovery of these receptors led to medicines made for these receptors, allowing signals to be blocked between T cells and cancer cells. Not many clinical trials have been conducted comparing the inhibition of one or the other receptor. Many sources such as peer-reviewed papers, news articles, scientific journals, etc. are compared through a systematic review to see which inhibited receptor has a better outcome for the patient. Research shows that while both types of inhibitory medicines work for some patients, they only work to a certain extent and for only certain types of cancers.

GEOGRAPHY DEPARTMENT

Field of Dreams: Patterns of the Periglacial Boulder Field (Poster: Table 9)

Presenting Students: Kasia Chmiel, Mick Lynch, Miranda Teats, Madison Toothman, Oliver Vasquez
Faculty Mentor: Dr. Phillip Allen

The term *Periglacial* refers to a range of cold, non-glacial geomorphological processes and landforms, that operate on time scales stretching from 100,000's of years to annual seasonal freezing. A common characteristic of mid-latitude mountains is the presence of patterned ground. Patterned ground describes terrain that exhibits regular or irregular surface patterning. These landforms commonly occur in the form of boulder deposits, sometimes referred to as *felsenmeer* or *blockfields*. The slopes around the FSU region exhibit vast felsenmeer deposits, yet it is not known if a discernable pattern exists. By employing clast form analysis, the orientation of boulders (long, intermediate, and short axis) was recorded. These data were then plotted, and analysis indicates the influence of topography at different scales on the felsenmeer deposit development. The dominant trend was a macroscale down slope orientation of NE-NNE. The second trend was a microscale situational slope orientation of circa of SE. In addition, the influence of bio-geomorphology was also recorded with more recent reorientation of boulders due to disturbance by tree fall. The significance of the provisional results suggests the processes of felsenmeer development and boulder orientation are more nuanced than previously described and the role of microtopography needs further consideration.

Mapping Elk Ridge Land Trust in Grantsville, Maryland (Oral Presentation: Room 111 from 10:30-11:00)

Presenting Students: Morgan Mathews, Sarah Smith, Miranda Teats, Madison Toothman
Faculty Mentor: Dr. William Wetherholt

The Gamma Phi chapter of the International Geographical Honors Society (GTU) at Frostburg State University was tasked with formulating an updated and accurate trail map for the new owners of the Elk Ridge Land Trust in Grantsville, MD. The organization's advisor, Dr. Wetherholt, initiated the project by bringing the needs of the land trust owners to GTU's executive board after being contacted in October 2022. Members of GTU met with owners via Zoom to brainstorm and establish mutual goals and outcomes. Once a plan of action was developed, members of GTU and Dr. Wetherholt visited the land trust during the Fall 2022 and Spring 2023 semesters to collect trail data using hand-held Garmin *etrex 10* GPS receivers. The owners of the land trust also provided a recent informal map of the property given to them by previous owners for guidance walking the trails. It was found that some trails seemed to be nonexistent altogether, and other trails remained on the landscape. Each visit to the property allowed GTU to gather more data to confirm non-existent and existing trails. Dr. Wetherholt used DNR GPS software (Minnesota DNR 2023) to extract tracks and waypoints in varied formats, and Google Earth to initially overlay GPS data onto satellite imagery of

the property. Data was also managed with ArcGIS Pro (Esri 2022) to generalize tracks, lay them on top of the county's parcel boundary of the property, symbolize one trail from the other, and compare their true position to a georeferenced image of the informal property map and its suggested trails. This collective effort has resulted in a polished, accurate trail map that was guided by landowner input throughout the process. In addition, this study has opened the possibility of future research and educational outreach between the university and the land trust.

MATHEMATICS DEPARTMENT

Power Values of Divisor Sums (Poster: Table 19)

Presenting Student: Adam Sullivan
Faculty Mentor: Dr. Mark Hughes

The purpose of this project is to show that there are infinitely many integers whose sums of their divisors are perfect squares. Throughout the project the sum of divisors function can be denoted as $\sigma(n)$. To further explore this idea, the prime factorization of $\sigma(n)$ must be determined. While some prime factorizations may be square when first calculated, many are not. The σ function has a multiplicative property that allows for $\sigma(m) \times \sigma(n)$ to be equal to $\sigma(mn)$ when m and n are relatively prime, an idea prominently featured in the field of number theory. The following example will show the previous ideas: $\sigma(5) = 1 + 5 = 6 = 2 \times 3$ and $\sigma(23) = 1 + 23 = 24 = 2^3 \times 3$. Through the multiplicative property, $\sigma(5 \times 23) = 2^4 \times 3^2 = (2^2 \times 3)^2$, indicating that $\sigma(115)$ is a square value. The exponents in a particular prime factorization can be viewed as a vector, and a collection of multiple vectors will be represented as a matrix. From techniques discussed in number theory and abstract algebra, exponents are then reduced modulo 2 which will indicate whether they are even or odd. Using ideas from linear algebra, namely the image and kernel of a matrix, the result can be proven.

To Drill a Square (Poster: Table 19)

Presenting Student: Roman Helmstetter
Faculty Mentor: Dr. Mark Hughes

This project involves the mathematics needed to design a drill which cuts out square holes. The construction is based on the Reuleaux triangle which is a region of constant width. After outlining some of the properties and applications of the Reuleaux triangle, it is shown how this figure allows for the design of a drill bit which comes very close to being able to drill a square exactly. A very interesting mathematical problem is to determine the path traced by the centroid of the Reuleaux triangle as the drill bit rotates. The complicated answer is explained using linear algebra, in particular, eigenvalues and the diagonalization of matrices. A second part of the project explains the mathematics required to adjust the drilling process so that a square can be cut out exactly. The explanation of how an exact square is obtained is demonstrated with linear transformations of an adjusted Reuleaux triangle as it is rotated. Again, this problem makes use of linear algebra in the form of rotation matrices and translation vectors to work out the details.

PHYSICS AND ENGINEERING DEPARTMENT

Acrylonitrile Butadiene Styrene (ABS) Plastic Enhancement Through Graphene and Silicone Dioxide Coatings (Poster: Table 10)

Presenting Students: Seth Granger, David Harrison, Joseph Uhler
Faculty Mentors: Dr. Dale Schultz, Dr. Zhen Liu

ABS (Acrylonitrile Butadiene Styrene) plastic is a thermoplastic known to have applications in engineering that utilizes its mechanical properties and cost effectiveness. A flaw of ABS that makes it insufficient in some environments is its degradation after exposure to light and weather. The question our team wants to answer is: Can graphene alone, or graphene in conjunction with silicon dioxide be sprayed and layered onto ABS in a replicable and cost-effective manner to extend or retain properties after light and weather exposure, thereby extending the applicable environments, industries, and applications? To answer this question ABS plastic samples with a range of ceramic layer combinations are exposed to both light and weathering. Mechanical, thermal, and electrical properties are tested post-exposure to identify any protective or enhancing effects. Liquid spray volume, the quantity of layers, and cost are also considered, since these factors have a role in whether or not this treatment will protect or enhance the ABS to a degree, it makes it suitable for more applications in industries like automotive parts, building exteriors, and consumer electronics.

Data Collection, Storage, and Management of an Integrated Automation System for Sustainable Agricultural Facilities (Poster: Table 15)

Presenting Students: Chrystal Stroud, Matthew Worgan, Mason Hordubay
Faculty Mentor: Dr. Oguz Soysal

With the rise in climate change, the need to be efficient with both water and power usage is more important than ever. Our class has been given the challenge to design a system that will efficiently be able to support a greenhouse. Our group, the Data Collection and Storage Group, focuses on resource management, load flow management and data collection and storage. For resource management, the goal is to equally distribute water and power throughout the system. A custom code has been created in C++ that will have the ability to monitor both power and water, ensuring that safety is a top priority. The custom C++ code that we are using will be inputted into an Arduino. A specialized Microcontroller can be used with a multitude of sensors such as the BME280 which can monitor both temperature and pressure. In addition, it can also be used to input hard data such as the power level of the battery banks. The Arduino, a microcontroller by default, can also be used for control of various other processes such as closing relays which will be featured in the load flow portion of our task. For data collection and storage, a data logger will be utilized to complete the task. We will be utilizing the Nomad 2, a data logger that is currently at the Frostburg campus. In addition to the custom code created for resource management, a code has also been created for

load flow management. Our ideas combined with the concepts from the other groups in our class will result in a fully functioning machine that could support a greenhouse system.

Electronic Converters and Battery Charger for Irrigation of Sustainable Agricultural Facilities (Poster: Table 15)

Presenting Students: Nathanial Evans, Daylynn Williams, Yodit Weldetsadik, Sean Detrick, Robert Bittinger
Faculty Mentor: Dr. Oguz Soysal

The Standalone Irrigation and Power System (SIPS) is an integrated automation system that has been developed to provide sustainable options for agricultural facilities such as greenhouses, nurseries, and others. The system's main goal is to use sustainable resources to supply power and water to various agricultural facilities. In order to achieve this goal, the SIPS system employs electronic converters, which have a wide range of applications in fields such as medical devices, electric vehicles, and power supplies. The converters serve the purpose of converting the power supplied by the grid into a form that can be used by the irrigation system. This way, the irrigation system can use a reliable AC/DC converter that will be used for the SIPS module, which will ultimately supply water and energy to agricultural facilities in need. The AC/DC converter uses a three-phase power source supplied from a wind turbine to supply a 120 W 12 V water and irrigation pump. These converters were chosen due to their exceptional reliability and efficiency. By utilizing this converter, the automation system designed for the SIPS will significantly increase the efficiency of the irrigation system. Overall, the integration of electronic converters into the SIPS system will have a significant impact on the agricultural industry by providing a sustainable and reliable source of water and energy to agricultural facilities. In addition to the AC/DC converter for the water and irrigation pump another AC/DC converter and a DC/DC converter will be used in the battery charge controller. The battery is a 12V Lithium-Ion battery and it will provide power for the rest of the SIPS subsystems. The converters are chosen for their versatility and ability to alter the wind turbines produced voltage and current and convert them into the needed power for the battery. The battery requires a constant input current and voltage to ensure the longevity of the battery's life. Ensuring the various components are supplied with the correct regulated power is critical for ensuring the SIPS will be a reliable and long-lasting piece of equipment for the applications in which is being designed to do. The design of the SIPS includes a maximum power requirement of 1820W, a Canadian PV module, battery bank with a capacity of 1200 Ah and 6 12V lithium-ion batteries. All of this is to help the system be sustainable and cost effective. The converter will need to step up or step down to obtain the desired output voltage therefore a buck boost converter that can handle the maximum current that will flow through would be a good choice. Materials such as transistors, diodes, indicators, and capacitors will be needed to build but as it will help several agricultural facilities it will be very useful.

Hempcrete as a Green Building Material (Poster: Table 10)

Presenting Students: Matt Foster, Braden Bohn, Daniel Records, Tyrell StJean, Andrew Smith
Faculty and Staff Mentors: Dr. Zhen Liu, Mr. Duane Miller

Hempcrete is a composite of hemp stalks with the fibers removed and a lime-based binder which are mixed with water and dried. This combination creates a highly insulative, fire-resistant, and sustainable material that regulates temperature and humidity within a building. It is often used to create a monolithic building envelope around traditional framing but can also be made into blocks and shipped. Hempcrete is mostly used for small buildings and can be scaled up for larger homes, but it may not be appropriate for commercial structures. Building with hempcrete sequesters carbon dioxide and reduces construction waste and energy costs relative to traditional construction. It also is immune from the impacts of geopolitical tension and pandemics such as COVID 19 which have affected the home-building industry in recent years, because it only requires two ingredients that are highly accessible.

Mailbox Hub (Poster: Table 5)

Presenting Students: Luther Brewer, Christopher Reed, Lynsey Freeland, Joseph Waicukauski, Blake Hatcher
Faculty Mentor: Dr. Jamil Abdo

The popularity of the mailbox began in 1863 after Congress passed the Free City Delivery Act, allowing citizens to receive mail at their home addresses. The technology of today, specifically transportation, has changed since then, unlike the mailbox. This project aims to redesign the modern mailbox so that it is easier to access for users operating an automobile during retrieval. The research group finds that modern vehicles come in various heights that may not be optimal for mailbox access during operation. The redesign will specifically target post-mounted mailboxes with the ability for users to install the system onto their existing mailbox posts. The project group finds that the system can bring benefits and convenience to users with vehicles that do not fit conventional height standards.

Mathematical Model of Ultrasonic Wave Scattering Due to Varying Metal Surface Roughness (Poster: Table 20 and Oral Presentation: Room 108 from 12:00-12:30)

Presenting Student: Terrence White
Faculty Mentor: Dr. Eric Moore

Ultrasonic waves have been used for a variety of purposes and now have been introduced in the field of non-destructive testing and evaluation (NDT&E). With the known behavior of mechanical waves reflecting off surfaces of different materials, such as cracks within a metal object, pipeline

inspection companies have been able to use ultrasonic technology to determine the structural integrity of pipes with real-time monitoring while keeping the pipes in use. Unfortunately, the corrosion created inside the pipelines creates a rough surface for the ultrasonic waves to reflect and the waves scatter throughout the pipe. As a result, it can be difficult to calculate accurate thickness measurements. This project models the scattering of ultrasonic waves with varying surface roughness along the inner wall of a 1'' thick metal plate. Using Snell's Law of Reflection, the angle of reflection of any UT wave can be derived. With this model, R&D companies focused on pipeline corrosion could begin development on categorizing the pattern of different types of corrosion (single pits, multiple pits, pin hole, etc.) by generating a correspondence between distributions of signal attenuation or calculated thicknesses. By determining the type of corrosion, the source will be known and therefore pipeline companies can treat the corrosion effectively to extend the lifetime of their pipelines. Future iterations of this model could include the transmitted ultrasonic waves following a cone shape rather than a direct beam and the implementation of interference patterns of the reflected waves.

Simulation of Ultrasonic Waves for Non-Destructive Evaluation in Pipelines (Poster: Table 20 and Oral Presentation: Room 108 from 12:30-1:00)

Presenting Student: Isaac Zais
Faculty Mentor: Dr. Eric Moore

There is a strong interest in the industry of oil and natural gas for non-destructive evaluation (NDE). Maintaining the integrity of pipelines is important for quality control and effective operation, and finding ways to analyze the conditions of a pipe without interrupting its operation can cut down on costs and labor. One method of NDE is the use of ultrasound waves. The idea is to send sound waves into the pipe and measure the reflected waves to determine the pipe's properties. To replicate the behavior of these waves, a program is created using the MATLAB programming language and is aided using a third-party toolbox. The toolbox, called the k-Wave Toolbox, is developed by Bradley Treeby and Ben Cox (University College London) and Jiri Jaros (Brno University of Technology), containing many useful functions for simulating ultrasonic testing (UT) waves for engineering purposes. These simulated waveforms are compared to real-life examples obtained in the lab, using their waveform shapes and their fast Fourier transform (FFT) plots. Further analysis is done using software developed by Berkley Springs Instruments (BSI), a local business that focuses on NDE with UT waves. Differences between the two waveforms are analyzed using laws of acoustics. Additionally, the results of this project act as a proposal for businesses like BSI to consider using simulated ultrasonic waves in their NDE methods. Creating replicable waveforms that closely resemble the real-life waveforms can reduce costs to run physical hardware in the lab because such waveforms can be fabricated by the program.

Solar Observational Location System (SOLS) (Poster: Table 10)

Presenting Students: Zach Arnold, Austin Brown, D'Artagnan Lazar, Sean McDaniel, Shea Przywieczerski
Faculty Mentor: Dr. Jamil Abdo

The United States Army spends approximately twenty-six million dollars per year to replace vehicle batteries to keep their vehicles operational. This expenditure comes because of the amount of time these vehicles spend idling. At idle, the engine of the vehicle may not produce a high enough RPM to charge the battery, especially with the amount of additional electrical loads found in a mission ready vehicle. The Solar Observational Location System, or SOLS, is designed to reduce the degradation of these batteries at idle by providing a trickle charge stemming from a small solar panel. SOLS is a device that consists of a solar panel mount, a virtual sphere rolling joint, and bracket that will be able to mount to a vehicle. The goal of SOLS is to have the ability to keep the mounted solar panel at a ninety-degree angle with the sun as it moves across the sky or as the vehicle changes direction. By doing this, SOLS would maximize the efficiency of the solar panel and produce enough power to continuously trickle charge the vehicle batteries.

PSYCHOLOGY DEPARTMENT

Scientific Skepticism and Reasoning in Relation to Psychological Knowledge and Dispositions (Poster: Table 14)

Presenting Students: John B. Liparini, Sophia L. Griffith, Hannah M. Culver
Contributing Student: Adam S. Brode
Faculty Mentor: Dr. D. Alan Bensley

Background

Are people who are more scientifically skeptical less dogmatic, cynical, and gullible and better able to reason scientifically and reject misconceptions? In a related study, Bensley et al., (2022) found that a new measure of scientific skepticism, the Scientific Skepticism Scale (SSS), was negatively correlated with endorsement of psychological misconceptions. The SSS was positively correlated with scores on the rational-analytic Scale of the Rational-Experiential Inventory of Pacini & Epstein (1999). It is not known, however, whether scores on the SSS are related to other dispositions, such as dogmatism and gullibility, or with a measure of scientific reasoning skills. Accordingly, the purpose of this study was to further test the SSS using measures of scientific reasoning skill, a new test of psychological misconceptions related to clinical psychology, and measures of other dispositions, such as dogmatism and gullibility.

We hypothesized that the scores on the SSS would be:

- positively correlated with scores on the Scientific Reasoning Test of Drummond and Fischhoff (2015).
- negatively correlated with scores on the Test of Clinical Knowledge and Misconceptions of Bensley (2022), when scored for misconceptions.
- negatively correlated with scores on the Cynicism Scale of Bensley et al. (2022), the Gullibility Scale of Teunisse et al. (2020), and the Dog Scale of Altemeyer (2002).

Method

- **Participants**

  Beginning students were tested at the start of the semester and seniors at the end in an IRB-approved assessment activity for which they received extra course credit. The sample included:
  - 132 beginning and senior psychology students at a small, rural comprehensive university.
  - Sex (of those reporting)
    - Male is 23.5%
    - Female is 74.2%
  - Ethnicity
    - White (53.4%)
    - African American (35.9%)
    - Other (10.9%)
  - Age
    - *M* = 21.1 (*SD* = 3.5) years

- **Measures**
  - Scientific Skepticism Scale (SSS) of Bensley et al., (2022)
  - The Cynicism Scale (CS) of Bensley et al., (2022)
  - The Dog Scale (DS) of Altemeyer (2002)
  - The Gullibility Scale (GS) of Teunisse et al. (2020)
  - Scientific Reasoning Scale (SRS) of Drummond and Fischhoff (2015)
  - The Test of Clinical Knowledge and Misconceptions (TOCKAM) of Bensley et. al. (2022)

Results and Discussion

Correlations among the measures show that Scientific Skepticism Scale scores were negatively correlated with clinical misconceptions on the TOCKAM, $r(64) = -.47$, $p < .001$ while Cynicism Scale scores were positively correlated with TOCKAM misconception scores $r(63) = .44$, $p < .001$, Moreover, SSS scores were positively correlated with scores on the Scientific Reasoning Scale, $r(87) = .18$, $p < .05$. As expected, SSS scores were negatively correlated with scores on the Dog Scale, $r(130) = -.33$ $p < .001$, but unexpectedly were positively correlated with scores on the Gullibility Scale, $r(94) = .20$, $p < .05$. The results partly supported our hypotheses, with SSS negatively correlated with measures of cynicism and dogmatism but not with gullibility. Also, higher SSS scores were associated with greater scientific reasoning skill and fewer misconceptions.

SOCIOLOGY DEPARTMENT

Gender in the Everyday (Oral Presentation: Room 113 from 10:30-11:00)

Presenting Student: Callie Miller
Faculty Mentor: Dr. Angela Luvara

Gender is a social construct. The social, cultural, and behavioral aspects that are associated with gender identities are based on norms that have changed over time and place. There have always been conversations about gender in academic and activist circles. In fact, we have activists and academics to thank for the existence of research and writing regarding the effects of the gender binary and other intersectional work. While this work is incredibly important, it falls short in one way. Oftentimes, this type of work leaves people wondering, "well, how does this affect me?" Because gender is looked at through a macro lens, sometimes the actual people impacted by the system are forgotten. What does gender look like for a real person in their everyday life? What are the effects of this social construct on the average human? In an attempt to answer these questions and understand gender from a micro level, I've documented a collection of photos to show you how gender is marked, portrayed, and expected in the real world. The truth is gender is everywhere. Every store you walk into is gendered. Every person you talk to has been impacted by gender expectations. Gender is especially present in the digital world of social media.

Racism on Social Media (Oral Presentation: Room 113 from 12:00-12:30)

Presenting Student: Haley Fuentes
Faculty Mentor: Dr. Angela Luvara

Racism has been a consistent issue in our country, a county that started by removing indigenous people through displacement and murdering and exploiting the labor and bodies of people of color. This structural racism has expanded through the course of U.S history. In recent years, the technological advancements have provided numerous new platforms for structural and interpersonal racism to present itself. With the ability to comment, like, and share at the click of a button, hate speech and racist micro aggressions can spread at rates previously unheard of. In St. Mary's County, Maryland, this presents itself in the comment sections of various social media pages of local media entities. In this research, I analyze the comment sections on posts made by these local media entities to develop an understanding of how racist ideologies manifest themselves on hyper local online spaces.

VISUAL ARTS DEPARTMENT

Journalistic Courtroom Sketches (Physical Display: Table 1)

Presenting Student: Gabrielle Oakes
Faculty Mentor: Mr. Jamison Odone

For the past year, I have been working on a unique project in Visual Journalism in my Advanced Illustration class. I have been a courtroom documentary artist in the Allegany Circuit Court in Cumberland, MD. Here I have been a hidden journalist, producing sketches inside the courtrooms. I draw a variety of people who are present in the courtroom including judges, attorneys, and criminals. These cases deal with a variety of scenarios from drug arrests to domestic violence to murder. Through my work, I am able to document what I see. I produce these images quickly without the use of photography. This project that I am working on is something that I plan on continuing when I graduate Frostburg State University.

WOMEN'S STUDIES PROGRAM

Analysis of the Gender and Sexuality Education in Appalachia (Oral Presentation: Room 113 from 11:30-12:00)

Presenting Student: Mae Reyno
Faculty Mentor: Dr. Angela Luvara

Appalachia is one of the biggest and most notable regions in the United States. However, the history of the powerful Appalachian Mountains has often been subject to severe stereotyping, economic and political exploitation, and systemic poverty. The same people who exploit the region for their own wellbeing, often go on to victim blame the people of the region rather than taking accountability for their actions and working to improve the region. In the analysis of the Appalachian region, this paper/presentation focuses on the gender and sexuality education (and lack thereof) and how the extraction economy of Appalachia played a role in that. First the paper/presentation goes through an extensive analysis of the existing literature on exploitation of the region historically, politically, economically, and sociologically and the effects of such exploitation on education in Appalachia. Combined with both, quantitative and qualitative survey research of people who experienced education in various parts of Appalachia, the paper/presentation concludes with issues that were found throughout the entirety of the research as well as reasons why these issues must be resolved and who is to be held accountable.

"Anything a Wife can do, Money can Buy": An Analysis of Gender in the Everyday Life (Oral Presentation: Room 113 from 12:30-1:00)

Presenting Student: Meghan Farrar
Faculty Mentor: Dr. Angela Luvara

This project is assessing the display of gender in everyday life. It is to show the abundance of patriarchal ideology that is seen every day, the way companies make unnecessary gendered products, how oversexualized women are, as well as emphasized femininity and hegemonic masculinity. This project was completed in Dr. Angie Luvara's Introduction to Women's Studies course. The task was to find examples of gender that is seen in person, as well as when it is seen online. A portfolio was compiled of screenshots from people on the internet, screenshots of personal texts, and photos that were taken in person. They were then separated into the categories that were listen above (e.g., patriarchal ideology). The main piece of information that was learned through this project is that gender plays a big role in everyday life, a lot of times, a very unnecessary, offensive, and ridiculous role. The next step that needs to be taken is bringing this issue of gender into light on a higher level. More people need to learn about it and more people need to realize that it is a real issue, and not just something that these so called 'feminazis' are worried about. It is an issue that should concern people of all genders, sexual orientations, race, age, etc. The patriarchy is

an ongoing and ever-growing issue that needs to be noticed and taken care of, which is the reason for this project.

Hip-Hop: The Contemporary Vehicle for Social Change (Poster: Table 14 and Oral Presentation: Room 113 from 1:00-1:30)

Presenting Student: Stefan Sani Siewe
Faculty Mentor: Dr. Angela Luvara

The voice of change often comes from the lips of the voiceless. Hip-hop has been that voice since its inception. The medium is the new contemporary platform for activism, Mos Def is a new Audre Lorde, Public Enemy has more in common with James Baldwin than most would believe. The findings are seen here by examining everything from song lyrics, music videos to even down to the makeup and motivations between these groups themselves and the societal context from which these groups were born. Our goal is to show that these songs are more than just entertainment, it's the lifeblood and stories of those who are the descendants of men and women whose blood, sweat and tears were given to push forward and now through song, the bonds, and bumps on the road to a better society are highlighted and spread to the masses in a more appealing and constructive way.

OHH… To Be in a Men's Head (Oral Presentation: Room 113 from 11:00-11:30)

Presenting Student: Aissatou Diallo
Faculty Mentor: Dr. Angela Luvara

My research project is about Men and how they don't embrace their emotions. The stigma of men's emotions is conversation that needs to be talked about. Growing up in a house full of females, you see all types of emotions because it's normalized for us to embrace it. For men, It's not. Not once have I seen my father show any type of emotions besides anger, and that is normalized. What is normalized in a man is showing anger, frustration, but as soon as they show feelings like sadness or love, they either have to toughen up or stop so call being a "simping" (meaning of loving on your significant other). Here's the thing, we really normalized all of these things, now men are scared to embrace their feelings. In my women studies, we are studying the topic of southern hip hop and all the aspects of what society see in African American from music to lifestyle. Now connecting my topic on the stigma of men's emotion, I have picked an artist named Rod wave. He's a 23-year-old R&B artist from St. Petersburg, Florida. The type of music that he creates is so-called sad and heartbreaking. One of my favorite artists. I claim that his music just connects with me in a deeper level than a sad, emotional way, but people always say that he makes sad music, and he needs to stop. The other side of things people especially men now feel allowed and a little more open with talking about their feels and are comfortable listening to music about it. I generally believe that this society need to change the way they think about emotions towards men. The reason why I want to

talk about this is for men to understand that its ok to talk about it their feelings and not be embarrassed by it.

Storytelling in Southern Hip Hop: How the Experiences of Black Women are Often Misrepresented (Poster: Table 14)

Presenting Student: Amber Greenbaum
Faculty Mentor: Dr. Angela Luvara

With deep-rooted Southern origins and a strong influence from Black artists, hip hop has become a popular and expressive genre of music. While Black artists of many genders have contributed to the development of hip hop, this genre of music is overwhelmingly dominated by men. Black women face an intersection of discrimination, known as misogynoir. Because of this, they are frequently left out of the creative process surrounding hip hop, despite being mentioned in most songs within the genre. Though music is a powerful form of storytelling and communication, Black women are commonly portrayed inaccurately. Through my research, I have developed two repertoires of Male Southern hip hop artists: those who are inclusive of women in their creative process and use their platform to share their stories, and those who do not. By sharing my research, I will hold male hip hop artists accountable for their often negative portrayals of Black women.

FSU Undergraduate Research Symposium Committee

Karen Keller, Biology (Chair)
Phillip Allen, Geography
Jill Chihak, English and Foreign Languages and Literature
Matthew Crawford, Chemistry
Erica Kennedy, Psychology
Marc Michael, Mathematics
Duane Miller, Physics and Engineering
Eric Moore, Physics and Engineering
Benjamin Norris, Chemistry
William Seddon, Biology
Rebekah Taylor, Biology
Clara Thiel, Biology
Gregory Wood, History

Traki Taylor, Provost
(Opening Remarks)

SPECIAL THANKS

To Mr. Wesley M. Gordon and Mrs. Katherine D. Gordon for their generous donation to the FSU Undergraduate Research Symposium. Their thoughtful contribution made the new signs, backdrops, and registration materials possible. We truly appreciate your support of our students and their experiential activities.

To the Honor Society of Phi Kappa Phi for their generous donation which allowed us to provide refreshments for the event.

To the FSU Foundation for providing the main support funding for the Symposium. In addition, many projects featured in the Symposium were funded by other Foundation grants, Faculty Development grants, PELEF grants, and the Student Government Association.

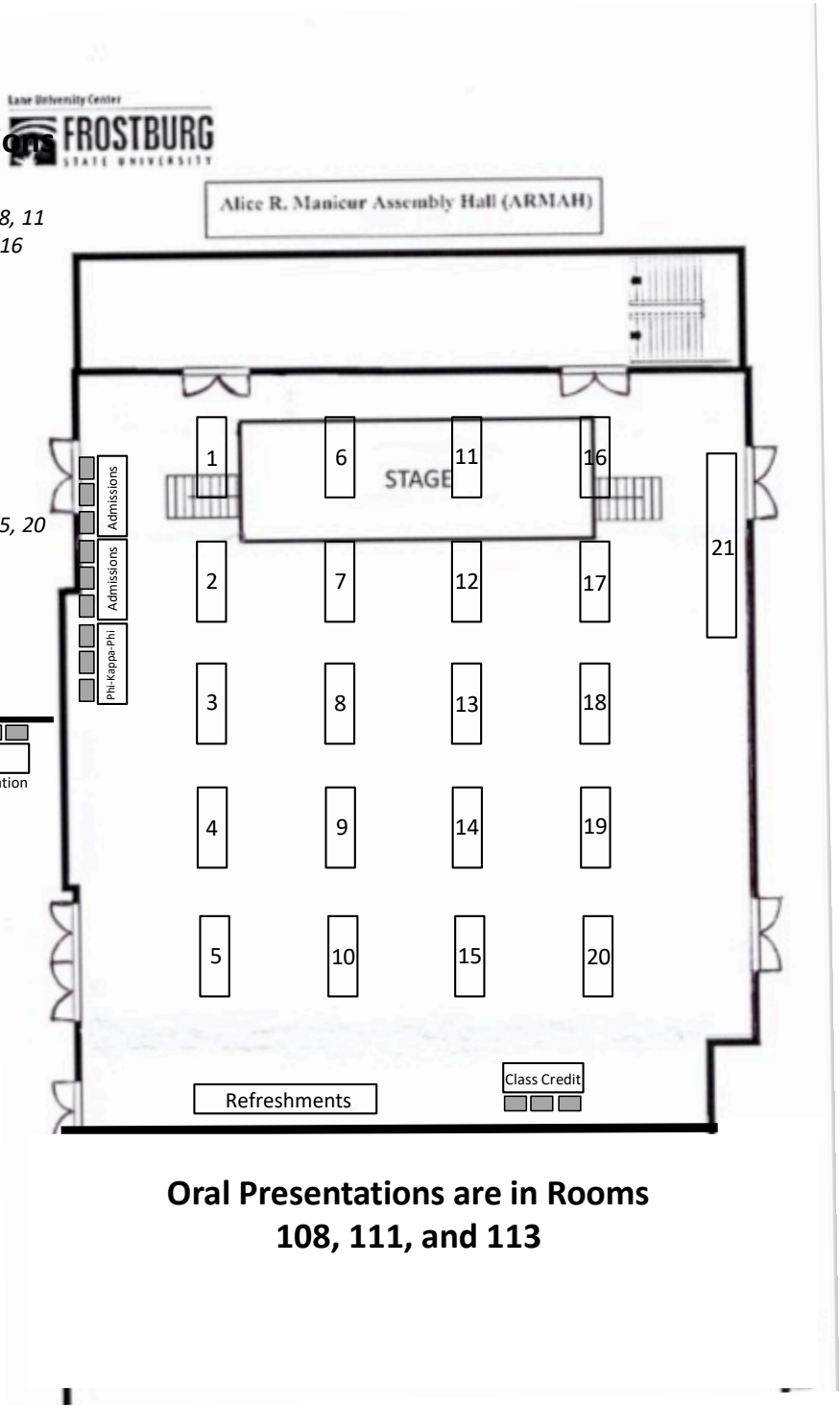
To the staff of the Print Shop, the Lane Center, the Physical Plant, the FSU Foundation, and Chartwells for all their assistance in the preparation of the Symposium.

Most importantly, to the Students and their Faculty and Staff Mentors for making the Symposium possible!

Frostburg State University
Undergraduate Research Symposium 2023

Poster Presentations

Department	Tables
Biology	*2, 6, 7, 8, 11 12, 13, 16*
Chemistry	*3*
CSIT	*17, 18*
English & Foreign Languages & Literature	*9*
Geography	*9*
Honors Program	*21*
Management	*4*
Mathematics	*19*
Physics & Engineering	*5, 10, 15, 20*
Psychology	*14*
Recreation & Parks Management	*9*
Visual Arts	*1*
Women's Studies	*14*



Oral Presentations are in Rooms 108, 111, and 113

FROSTBURG STATE UNIVERSITY

LANE CENTER ROOM 108	
Time	**Oral Presentation and Presenters**
10:30-11:00	Desensitization: The Psychological Impact of Police Brutality in the Media on African Americans ***Angel Young***
11:00-11:30	I'd Rather Listen to Your Woes Than Listen To Your Eulogy: The Mental Health Crisis Plaguing Colleges ***Bradley Vincent***
11:30-12:00	"Walkable Cities: What, Where, and Why Should You Care?" ***Jessica Griffin***
12:00-12:30	Mathematical Model of Ultrasonic Wave Scattering Due to Varying Metal Surface Roughness ***Terrence White***
12:30-1:00	Simulation of Ultrasonic Waves for Non-Destructive Evaluation in Pipelines ***Isaac Zais***

LANE CENTER ROOM 111	
Time	**Oral Presentation and Presenters**
10:30-11:00	Mapping Elk Ridge Land Trust in Grantsville, Maryland ***Morgan Mathews, Sarah Smith, Miranda Teats, Madison Toothman***
11:00-11:30	"Beyond the Net: Exploring eDNA Detection Methods for Threatened Pollinators in Appalachia." ***Cameron Garland***
11:30-12:00	Beyond the Text: Using the Lewis J. Ort's Special Collections to Contextualize Literary Works ***William O'Boyle, Reeve Kennedy***
12:00-12:30	Cloning ospA of *Borrelia burgdorferi* for Transformed Plant Expression ***Quinton Browne***
12:30-1:00	From Paper to Trees: Creative Writing and the Natural World ***William O'Boyle***
1:00-1:30	Beyond the Text: Adapting Famous Literary Works ***Cara Allen, Malaika Habib, Tyler Redding***

LANE CENTER ROOM 113	
Time	**Oral Presentation and Presenters**
10:30-11:00	Gender in the Everyday ***Callie Miller***
11:00-11:30	OHH… To Be In a Men's Head ***Aissatou Diallo***
11:30-12:00	Analysis of the Gender and Sexuality Education in Appalachia ***Mae Reyno***
12:00-12:30	Racism on Social Media ***Haley Fuentes***
12:30-1:00	"Anything a Wife can do, Money can Buy": An Analysis of Gender in the Everyday Life ***Meghan Farrar***
1:00-1:30	Hip-Hop: The Contemporary Vehicle for Social Change ***Stefan Sani Siewe***