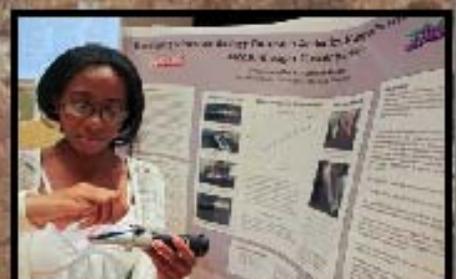
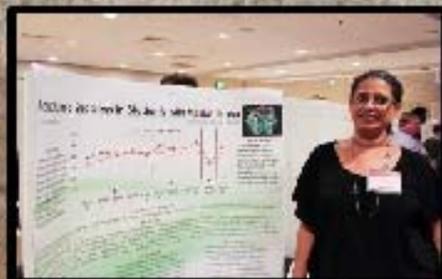
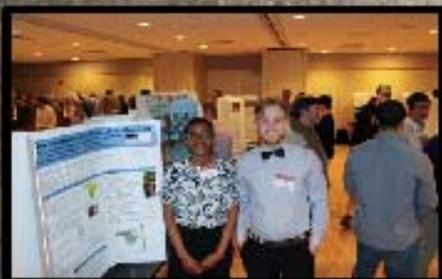


5th Annual CLAS Undergraduate Research Symposium



Lane Center

May 5th, 2017
11:00 a.m.-2:00 p.m.

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THE ABSTRACTS

This Symposium includes 137 presentations featuring the work of 221 students, mentored by 62 Faculty and Staff across 13 departments, 3 programs, and the Multimedia Learning Center (MLC). The projects presented at this Symposium took place in 2016 and 2017 and include coursework and independent study activities. Abstracts are organized alphabetically by department, program, or the MLC, and by project title. The Presentation number in parentheses following the title refers to the table locations of the Poster and/or Physical Displays in the ARMAH. Oral presentations are scheduled in Lane Center 108, 109, 110, 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, Physical Display, Oral Presentation, Table #)

Name(s) of presenting student(s)

Name(s) of contributing student(s) (if applicable)

Name(s) of faculty/staff mentor(s)

AFRICAN AMERICAN STUDIES

“DNA is not Destiny:” An Epigenetic Analysis on Transgenerational Trauma in African Americans Post American Slavery (Poster, Table 13)

Presenting Student: Alicia Matthews

Mentors: Dr. Amy Armiento, Dr. Frank Ammer

A population of African descent that currently resides in North America is commonly referred to as African Americans. “African Americans” can broadly describe the population from slave descended Africans (or American Slave Descendants) to immigrated Africans. American Slave Descendants (ASD) are the primary focus of this study. Many health disparities, such as cardiovascular disease, diabetes, and high blood pressure, plague the African American community. It is found that racial disparities can influence health disparities. Factors, such as psychological stress, physiological stress, and biological stress, can play a role in the health disparities experienced in African American communities. African Americans of slave descent may have acquired psychological trauma and genetic trauma during the slave era. This psychological trauma is referred to as Post-Traumatic Slave Syndrome (PTSS). The genetic trauma may have occurred in the form of epigenetic processes. Epigenesis refers to the interaction of the genome with its environment. The expression of the DNA can be modified based on environmental conditions a given population experiences. In this study, the trauma of the slave era on ASD will be explored as well as how it plays a role in the health disparities exhibited in that population today.

Remembering Carver (Poster, Table 13)

Presenting Student: Shavonne Hamilton

Mentor: Dr. Amy Armiento

This poster showcases the Remembering Carver Facebook page. The webpage shares photos, current events, and past news stories about the African American community in the Cumberland area. This website and presentation are important because they recognize the often overlooked contributions of African Americans in the region.

DEPARTMENT OF BIOLOGY

A Microscopic World (Poster, Table 8)

Presenting Student: Kelly Skoczynski

Mentor: Dr. Rebekah Taylor

Microscopy is the use of microscopes to observe different forms of life and other objects that the human eyes are unable to see. Using different variations of microscopy, like brightfield, darkfield, phase contrast, scanning electron, and fluorescence, the microscopic world was observed and captured. Individual pollen grains, extremely small aquatic organisms, frozen mouse tissue, fruits, carpet fibers, feathers, and plants are just some of the things that have been captured at high magnifications. This gives an ability to observe a microscopic object, living or nonliving, in ways that couldn't be done otherwise.

A Survey of Techniques in Microscopy (Poster, Table 7)

Presenting Student: Dakota Fazenbaker

Mentor: Dr. Rebekah Taylor

Microscopy is the study of objects that cannot be seen with the naked eye. In a way, it changes the scale of our reality. There are several types of microscopy, each with its own advantages and limitations. Using the right technique is vital to answering questions about the specimen you are looking at. The use of microscopes increases our understanding of the world around us. This allows scientists to make new connections and realizations. The field often plays a major role in scientific advancement. For example, discoveries in medicine would not be possible without understanding basic cell structure and function through microscopy. This poster shows an array of images taken using several different microscopy techniques. Each technique helps us to understand something specific about the subjects.

Advanced Techniques in Microscopy (Poster, Table 8)

Presenting Student: Picard Johnson

Mentor: Dr. Rebekah Taylor

From Anton van Leewenhoek's microscopic discoveries to today's advances with fluorescence and electron microscopy; biologists have strived to observe smaller and smaller specimens while retaining resolution. Scientists have created many microscopes and microscopic techniques to see from the outer surface of a sample to the organelles within cells. The purpose of this project was to test the different microscopic techniques available in lab using a variety of microscopes. The techniques were compared and contrasted in terms of method, beneficial and non-beneficial aspects, and for what types of samples and conditions are ideal for each technique. This poster displays the images that were collected by using different techniques.

Analysis of Chipmunk Tissue Using Immunofluorescent Staining Techniques (Poster, Table 7)

Presenting Student: Haylee Wilson

Mentors: Dr. Karen Keller, Dr. Rebekah Taylor

The Eastern chipmunk (*Tamias striatus*), which is the only species of chipmunk found in Maryland, is a major vector in the development and transmission of Lyme disease. Lyme disease is caused by the bacterium, *Borrelia burgdorferi*, and has significantly increased in prevalence over the last two decades. The blacklegged tick (*Ixodes scapularis*) nymphs, most common in the mid-Atlantic, are the main culprit for human infection of Lyme disease. The purpose of this project was to analyze *Borrelia burgdorferi* infected Eastern chipmunk tissue found at Rocky Gap State Park. Spleen and intestine tissues were frozen in OCT medium and cut to 10 µm sections in a cryostat. The tissue sections were then stained with DAPI, a fluorescent stain that binds tightly to AT rich regions. Unfortunately, no *Borrelia burgdorferi*, was found in either tissue sample. This is interesting because the chipmunk tested positive for the bacterium, and the spleen is a primary lymphoid organ.

Choosing the Best Technique for Microscopy (Poster, Table 8)

Presenting Student: Logan Cheshire

Mentor: Dr. Rebekah Taylor

In the field of microscopy, scientists are able to use microscopes to observe species that cannot be seen with the naked eye. They use these observations to draw different conclusions on the species that they are observing. There are several different techniques within the field of microscopy and each of these techniques offers their own strengths and weaknesses when viewing different samples. There are certain situations which would indicate to use one of these techniques over the others. The images that are shown on this poster indicate just a few of these techniques that can be utilized in the field of microscopy and why those techniques were better suited than the others for that sample.

Comparing the Diets of North American River Otters from Wyoming and Pennsylvania through Scat Analysis from Wyoming and Pennsylvania (Poster, Table 11)

Presenting Students: Carly Boyd, Jackson Johnstone

Mentors: Ms. Kelly Pearce, Dr. Thomas Serfass

Historically, river otters (*Lontra canadensis*) were present in aquatic systems throughout much of North America. Through reintroduction projects and natural range expansions, river otter populations have recovered in many areas, including Pennsylvania. We compared and contrasted the different diets of two different populations of North American River Otters

through otter scat analysis – a population in Pennsylvania that suffered declines and another in Grand Teton National Park, Wyoming that has retained healthy population levels. The diet for river otters was based on 44 river otter scats (droppings) collected in northeastern Pennsylvania during 1982 and 55 river otter scats collected from Grand Teton National Park during 2015. Fish were the predominant food item identified in scats for both Pennsylvania and Grand Teton National Park. The majority of fish in scats from Pennsylvania were represented among 3 families; Centrarchidae (sunfish and bass), Cyprinidae (carp and minnows), and Percidae (perch). Scat samples from Grand Teton National Park contained remains of fish from the families Castostomidae (suckers), Cyprinidae, and Salmonidae (salmon and trout). Other less frequently occurring prey remains identified during scat analysis included aquatic insects, birds, mammals, reptiles, and amphibians.

Comparison of Detection Patterns of Allegheny Woodrats (*Neotoma magister*) at Existing Colonies Using Live Traps and Remote Cameras (Poster, Table 11)

Presenting Student: Kamren Jefferson

Contributing Student: Joshua Tambora

Mentors: Ms. Kelly Pearce, Ms. Alice Hotopp, Dr. Thomas Serfass, Dr. Sunshine Brosi

Allegheny woodrats (*Neotoma magister*), are experiencing population declines throughout their northeastern range and are listed as endangered in Maryland. As a response to reported declines in Maryland and other states, woodrats have been the focus of ongoing population monitoring in Maryland since 1990. Traditional, live-trapping has been the prominent sampling technique, but use of remote camera-trapping has become a technique being used more frequently to monitor wildlife populations. The aim of this study is to compare the efficiency of live traps and remote cameras at detecting Allegheny woodrats in western Maryland. The efficiency of the two methods will be evaluated using the latency to detection (LTD), percentage of devices with detections, and the trap-night success rate of each method. The presence or absence of Allegheny woodrats at each of the sites sampled will also be determined. Live traps and remote cameras were deployed at 4 sites, including Savage River State Forest's High Rock Area in Garrett County, Dan's Mountain Wildlife Management Area and 2 sites within the Fort Hill Nature Conservancy Preserve in Allegany County. At each site, 5 to 35 ($\bar{x} = 15$) Tomahawk live traps baited with oats and peanut butter were placed (10-20 m apart) near known, or likely, woodrat middens or latrines, each for 2 trap-nights. Within an overlapping area at each site, 2 to 5 ($\bar{x} = 4$) remote cameras were placed on trees approximately 2 m from a sardine bait and left in the field for a period of 10-60 trap nights. Live traps had a total of 5 detections over the course of 120 trap-nights and 8.3% of the live traps had an individual detection. The success rate of the live traps was 0.042 detections per trap-night. An individual detection on a remote camera was considered unique if it occurred at least 60 minutes from the next detection. Remote cameras had a total of 96 individual detections over the course of 415 trap-nights and 53.3% of the remote cameras had an individual detection. The success rate for the remote cameras was 0.231 detections per trap-night and, for better comparison to the live-traps, a success rate of 0.1 detections per trap-night for the

first two trap-nights. Preliminary results indicate that camera traps are an efficient method for detecting the occurrence of Allegheny woodrats, and can serve to compliment live trapping for monitoring. Remote cameras confirmed the presence of Allegheny woodrats at High Rock, Dan's Rock, and Fort Hill North, but no individuals were detected at the Fort Hill Quarry site. The results of this study will be used to support a larger project that is identifying and targeting intervention strategies for Allegheny woodrat recovery in Maryland.

Distinguishing Black Cohosh from Look-Alikes (Oral Presentation)

Presenting Student: Laura Price

Contributing Students: Karen Johnson Heeter, Lauren Hull

Mentor: Dr. Sunshine Brosi

Black cohosh (*Actaea racemosa* L., Ranunculaceae), is an herbaceous, medicinal plant found within the understory of rich, moist woods throughout North America (Foster, 1999; Strausbaugh et al. 1978). As an endemic species, it contributes to the richly diverse ethnobotanical history of Appalachia, used for a broad range of ailments. Today, the rhizomes are primarily harvested for their commercial value as dietary supplements, which are typically used for menopausal complaints, such as hot flashes (Chamberlain et al., 2013; Verbitski et al., 2008; Shou et al., 2011). Annual harvests of black cohosh can equate to as much as 500,000 pounds in dry weight per year, 97% of which is being sourced from wild habitat (Greenfield & Davis, 2003; Davis & Persons, 2014; American Herbal Products Association, 2000, 2003). Black cohosh is critically imperiled in Mississippi, Massachusetts, and Illinois, where it is also State listed as endangered (NatureServe, 2017; Massachusetts List of Endangered, Threatened and Special Concern Species, 2015; Checklist of Illinois Endangered and Threatened Animals and Plants, 2015). Several species of North American *Actaea* are easily mistaken for black cohosh. These include mountain bugbane (*Actaea podocarpa* D.C.), Appalachian bugbane (*Actaea rubifolia* (Kearney) Kartesz), doll's eye (*Actaea pachypoda* Elliott), and red baneberry (*Actaea rubra* (Aiton) Willd) (Upton, 2002). Many of these species are also facing population declines habitat loss and unintentional harvest, having vulnerable, imperiled, or critically imperiled population statuses throughout the Appalachian region. Creating outreach material that makes the morphological characteristics of these species easily distinguishable will help herb harvesters in the field and may alleviate population pressures for black cohosh look-alikes. Using several floras from the Appalachian region, the distinguishing characteristics of these species were evaluated and compiled into an easily discernable table. There are several vegetative characteristics that can be used to differentiate look-alikes from black cohosh. Black cohosh has the distinction of non-overlapping leaflets, unlike mountain bugbane. The terminal leaflet sinus of mountain bugbane is also greater than $\frac{1}{2}$ the length of the terminal leaflet, unlike black cohosh or doll's eye. Black cohosh also has a smooth basal stalk, without the groove found in mountain bugbane. Doll's eye leaflets do not overlap one another and terminal leaf sinus lacking or is less than $\frac{1}{2}$ the length of the entire terminal leaflet. Appalachian bugbane leaflets do not overlap, but have 5-9 prominent veins arising from base, unlike black cohosh. The basal stalk of red baneberry is branched (typically 2-3), unlike

black cohosh, which has an unbranched basal stalk. The ability to distinguish these species from black cohosh may alleviate population pressures and aid in the conservation of look-alike species.

Evaluating Humane Trapping Standards of North American River Otters for Research and Recreational Fur Trapping (Poster, Table 11)

Presenting Student: Kevin Hesse

Mentor: Dr. Thomas Serfass

Trapping wildlife for research and fur is a controversial issue. Legal, regulated trapping of some wildlife species for fur occurs throughout much of the United States. Over the last 20 years there has been efforts to evaluate the efficacy and humaneness of traps used to capture wildlife, including the North America river otter (*Lontra canadensis*). We examined literature pertaining to traps and techniques used to capture river otters for research and fur, and evaluated injuries sustained by river otters captured in foothold traps as part of a river otter-reintroduction project in Indiana. We applied a standardized, international scoring system to evaluate injuries to these otters and used outcomes to determine if the traps used for the Indiana river otter-reintroduction project met current humane standards. Trap-related injuries caused to otters exceeded established levels for humanness. However, veterinary care provided in Indiana resulted enabled otters to recover from injuries prior to their reintroduction. Results from our literature review and assessment of injuries to otters demonstrate a paucity of information for use in determining the humaneness of traps used for river otters.

Forest Bird Distribution at the Great Swamp National Wildlife Refuge (Poster, Table 9)

Presenting Student: Edward McDonald

Mentors: Dr. Dorothy Wells (USFWS), Dr. Frank Ammer

Located in Morris County, NJ, the Great Swamp National Wildlife Refuge (GSNWR) encompasses 7,768 acres with 3,660 acres dedicated to Wilderness Area. Forest area within the Refuge is equal to 5,316 acres with 288 classified as upland forest and the remainder as bottomland forest. The Refuge's bottomland and upland forests are recognized as providing significant habitat for migrating, wintering and breeding songbirds and raptors. Single observer point counts were conducted twice at 34 randomly selected GPS locations from May to July 2016. The GSNWR lists four focal species for forest habitat based on conservation status including the Barred Owl, the Scarlet Tanager, the Eastern Wood-Pee-wee and the Wood Thrush. In total, 60 species of birds were detected and among the most abundant species were the Wood Thrush and Eastern Wood-Pee-wee. The Red-shouldered Hawk and Barred Owl from the New Jersey State threatened and endangered species list were also detected. The data from this project will supply the Refuge with current information on bird species using forest

habitat on the Refuge. In addition, data will allow the Refuge to determine if the habitat is supporting focal species or if management should be adjusted.

Increasing the Sustainability of a Threatened Tree Species, Butternut (*Juglans cinerea* L.), for Use in Traditional Dyes for Cherokee Basketry (Poster and Oral Presentation, Table 10)

Presenting Students: Madison Lawrence, Olivia Goldstein, Andrew Wall

Mentor: Dr. Sunshine Brosi

The original lands occupied by the Cherokee included over 35 million hectares and is now reduced to 0.06% of the original size and includes the 22,600 hectare Qualla Boundary in Western North Carolina which is surrounded by the Great Smoky Mountains National Park bringing millions of tourists who purchase crafts. Basketry is a key cultural resource practice and is a symbol of Cherokee culture, subsistence, and resilience. Rivercane (*Arundinaria gigantea* and i-hi in Tsalagi) is a key ecological community which increases riparian stabilization, reduces sedimentation, and is essential wildlife habitat for a number of endemic species. As a cultural keystone species rivercane is used for baskets, fish traps, pipe stems, flutes, to build houses & mats, for weapons such as blowguns & blowgun darts, and the shoots and seeds were eaten as food. Butternut (*Juglans cinerea* and kahi in Tsalagi) is used to create a dye for baskets. Over 350 seedlings were planted in a field and interplanted into canebrakes to encourage apical growth & reduce branching of the rivercane. Rivercane sites were compared to the open field sites in terms of impact of growth and survival of butternut seedlings over a ten-year period. Butternuts planted in rivercane sites had reduced height & diameter compared to an open field 8-years post planting ($p=0.016$). However the rivercane insulated the seedlings against mortality and show increased 37% mortality verses 49% in the open field ($p = 0.037$). This project is part of the larger research element of managing culturally important species in the context of environmental change.

Nativescaping Frostburg: Creating Sustainable Landscapes on Campus (Poster and Oral Presentation, Table 10)

Presenting Student: Amanda Beeman

Mentor: Dr. Sunshine Brosi

Frostburg State University's campus is a valuable asset to the school and community. A tranquil setting in the Appalachian Mountains, Frostburg's campus boasts a diversity of landscapes from wooded to wetland and is home to many native flora and fauna. As part of a campus wide initiative towards sustainability, it is important to create, improve, and maintain wild areas and native plant gardens as this will increase our campus's value economically, environmentally, and socially. Using native plants that are adaptable to this region's climactic conditions ensures that landscapes will be able to respond to local environmental changes, continue to contribute

to healthy plant and animal communities, reduce maintenance expenditures, and increase overall biodiversity on campus. The restoration of five memorial flower beds and a large open area of Frostburg's arboretum involves the planting of over a dozen species of native flowering and fruiting shrubs and trees and more than 15 species of native flowers and grasses. Increasing the presence of native plants will attract native wildlife, reduce habitat available to invasive species, increase biodiversity, and improve overall condition of the school's arboretum. Gardens provide a source of plant material for projects. Seeds for many of the native plants were obtained from the rain garden at Simpson Hall which features over 20 species of native plants that focus on attracting pollinators. In total, over 150 native plants will be planted throughout the arboretum, rain garden, and campus this spring. Native landscaping projects and restorations also provide educational opportunities for students, faculty, staff, and the community. Frostburg State is joining PlantsMap, part of an interactive mobile learning project where users scan a QR code on individual plant identification tags which then links them to a site that will provide specific information pertaining to that plant. This program uses interactive maps and geolocations of selected plants, mapping and creating a digital catalog of collections of plants all over campus. Native gardens and landscapes also function as sources of hands on learning and are useful in botany, entomology, wildlife, and ecology courses as well as providing aesthetically appealing outdoor spaces for recreation. Creating sustainable landscapes improves and preserves Frostburg State's campus while creating value for wildlife, for students, for the University, and for the community.

Phenotypic Expression of Anthocyanin in *Brassica rapa* var. Fast Plants (non-purple) is Dependent on the Biosynthetic Gene Dihydroflavonol 4-Reductase (DFR) (Poster, Table 9)

Presenting Student: Laura Price

Mentor: Dr. David Puthoff

Anthocyanins have been well established as antioxidant compounds, which serve as potentially protective factors against cancer and cardiovascular disease^{2,3}. Developing a complex understanding of anthocyanin biosynthesis could be applied to developing foods that meet increasing nutritional demands for such health-promoting compounds⁴. Biosynthetic pathways of anthocyanins, along with the isolation of corresponding genes, have been well characterized⁵ in species such as *A. thaliana*^{6,7}. *Brassica rapa*, also a member of Brassicaceae, comprises a variety of vegetables, of which there are several red and purple varieties⁸. The red/purple pigments in *B. rapa* have been established as anthocyanins⁸, but the genetic mechanism associated with the phenotype remains unclear⁴. Understanding the structural and regulatory genes involved in anthocyanin biosynthesis of *B. rapa* is not only important for establishing the mechanism by which it takes place, but also for the future breeding of *B. rapa* varieties with anthocyanins. The biosynthetic mechanism in *B. rapa* is suspected to be involved with RNA transcription/translation on the DFR gene⁹. Using *A. thaliana* as a genetic model, DFR gene fragments of purple and non-purple varieties of *B. rapa* Fast Plants were compared.

Recombinant plasmids containing DFR were screened using restriction enzyme analysis to confirm integrity. The most appropriate recombinant plasmid will be used for genetic transformation into non-purple (anthocyaninless) *B. rapa* Fast Plant mutants.

Prevalence of *Borrelia burgdorferi* at Rocky Gap State Park (Poster, Table 9)

Presenting Student: Hannah Elliott

Mentor: Dr. Rebekah Taylor

In recent years there has been a noticeable increase in publicity surrounding the topic of Lyme disease in humans and its lasting effects. Many people know the importance of checking themselves for ticks after an outdoor excursion, but are not truly aware of the chances of encountering a Lyme-positive tick. Rocky Gap State Park in Flintstone, Maryland is a popular destination for tourists and local adventure-seekers in the summer. This project sought to determine the prevalence of Lyme-positive ticks and rodents in the park. From June 2016 through October 2016, blood samples from indigenous rodents and *Ixodes scapularis* ticks were collected from 21 sites in Rocky Gap State Park. These blood samples and specimens were processed and analyzed via nested PCR reaction in order to determine the presence of *Borrelia burgdorferi*, the bacterium which causes Lyme infection. This information was then used to determine high-risk areas throughout the park, which, through wise land management decisions and public health campaigns, will ultimately serve to protect the visitors and staff of Rocky Gap State Park.

Specimen Analysis Using Advanced Microscopy Techniques (Poster, Table 9)

Presenting Student: Hannah Elliott

Mentor: Dr. Rebekah Taylor

Biology is extremely varied subject of study. However, throughout all of the sub-disciplines of Biology, microscopes remain a cornerstone. Beginning at an early age students are taught to use light microscopes in order to gain a further knowledge of what the world truly looks like at a basal level. Since the basic light microscope is so heavily used in the classroom, students can become jaded and unexcited when using them. Using various modifications in lighting, magnification and technique is one method to solve this. By applying more advanced techniques in light, fluorescence and electron microscopy, new information is able to be gleaned from samples while creating visually appealing images that allow viewers to see the world in a new way.

The Reevaluation of the Appalachian Cottontail Geographical Dispersal via mtDNA using Pellet Samples (Poster, Table 10)

Presenting Student: Alicia Matthews

Mentor: Dr. Frank Ammer

The Appalachian Cottontail (*Sylvilagus obscurus*) is dispersed across patchy mountainous ranges and is suspected to be in decline in MD due to habitat fragmentation caused by development, degradation, conversion. The Appalachian Cottontail and the Eastern Cottontail are similar in appearance and are difficult to differentiate using morphological characteristics. Fecal pellets are a non-invasive method that can be used to discriminate the Appalachian Cottontail from the Eastern Cottontail without disturbance or stress on the population. Analysis of the mtDNA genome using fecal samples allows for the reevaluation of the Appalachian Cottontails status, relative abundance, and habitat associations in western Maryland. Species-specific primers are used to amplify the cytochrome B gene (Cyt B) region of the two species. In order to determine the unique fragment for each labeled reverse primers were used. Habitat assessment and pellet surveys were also conducted at historic sites in western Maryland. The DNA fragments are currently being analyzed for species identification. Data obtained from this study will facilitate the conservation, management and recovery of the species in this region.

Types of Microscopy and Their Techniques (Poster, Table 8)

Presenting Student: Taylor Dudiak

Mentor: Dr. Rebekah Taylor

Microscopy includes many different types and techniques to view samples at a microscopic level. Three main types of microscopy include light microscopy, fluorescent microscopy, and electron microscopy. Three techniques within light microscopy include brightfield, darkfield, and phase contrast. Brightfield allows one to view a sample at a microscopic level on a light background using a visible light source. Darkfield microscopy allows one to view the sample on a dark background and allows one to view a transparent sample with great contrast. Phase contrast allows the viewing of the internal structures of a transparent sample. This technique is great to use on living samples. Fluorescent microscopy increases the resolution and contrast from light microscopy. From fluorescent microscopy, one can learn where molecules are in a cell and which cells express certain molecules. This type of microscopy is semi-quantitative, meaning one can view the levels of expression. Electron microscopy uses an electron beam as the illumination to view a sample, rather than a light bulb. Electron microscopy allows one to view a sample at a far greater resolution and magnification than light microscopy and fluorescent microscopy. Depending upon the knowledge one wants to learn from using microscopy, each type described allows different aspects of a sample to be viewed. The images viewed in each microscopy type provide far greater detail than the human eye is capable of seeing.

Using Fluorescence Microscopy to Image Tissues (Poster, Table 10)

Presenting Student: Avery Ranney

Mentor: Dr. Rebekah Taylor

Advanced Microscopy is a class where students study techniques to image living organisms under a microscope. This project is focused on a technique called fluorescent microscopy. Fluorescent microscopy uses molecules called fluorophores which glow when excited by a specific wavelength of light. The two colors that were emitted were green and blue. Actin green was used to attach fluorescent antibodies to actin. Then a DAPI blue stain was used to attach a fluorophore to the nucleus. Tongue, muscle, and ovary tissue of a mouse were sectioned using a cryostat, and then those tissues were put through a series of chemical reactions to fix the fluorophores onto the actin and the nuclear membranes of the cell. These tissues were compared to determine the structures and therefore the functions of each tissue.

DEPARTMENT OF CHEMISTRY

Analysis of Bovine LDH through 2-D Electrophoresis (Poster, Table 4)

Presenting Student: Cara Crawford

Mentor: Dr. Peggy Biser

Multiple samples of Bovine LDH will be analyzed through 2D electrophoresis and then compared to literature values of isoelectric points. Multiple samples will be ran with different stains to ensure the best possible outcome. The goal of this project is to refine the procedure of preparing the protein sample and analyzing it. 2-D electrophoresis is a form of proteomics which is the field of studying proteins and determining their function. Within the field of proteomics, isoelectric points are important in understanding how the protein is affected by certain toxins and diseases, whether it is present and its abundance, and what developmental stage the cell is in. This is important within the health care field because the disease or medical condition can be more thoroughly understood at the cell level. This form of protein analysis is also important because it will allow researchers to develop treatments and drugs to target specific proteins that are involved with that disease.

Characterization of the Structure of Vinyl Cations (Poster, Table 3)

Presenting Student: Christopher Lodder

Mentor: Dr. Benjamin Norris

Vinyl cation $C_2H_3^+$ can be described as either a classical cation or a non-classical cation with a bridging hydrogen. Previous research by several groups indicates that the bridged structure is favored based on a number of computational models. This work extends the investigation of the structure of vinyl cations to include substituent effects on one or both carbon atoms. Additionally, this work uses a new approach to estimating the energy difference by repeating the calculation with expanding basis sets in order to extrapolate to the theoretical infinite basis set. This experiment will, through use of WebMO and a GAMESS server, look to verify the two structures' formation energies using the second order Møller Plesset perturbation theory and post Hartree-Fock basis sets up to cc-pVTZ. These basis sets allow for extrapolation to the infinite basis set which will allow for a conclusion about which structure of vinyl cations is more stable. Preliminary results show a dependence of structural preference on the basis set used. Further experiments are necessary with more computational resources allocated to the GAMESS server.

Colorimetric Polarity Sensors (Poster, Table 3)

Presenting Student: JaNea Hailey

Mentors: Dr. Benjamin Norris, Mr. Blair Knouse

The purpose of this experiment is to use Reichardt's dye, a simple solvatochromic molecule that responds to changes in polarity by changing its absorption and emission wavelengths. Solvatochromic molecules are useful for colorimetric sensors for solvent polarity. Absolute polarity is hard to determine because polarity is an abstract concept. However, varying compositions, vary polarity. Solvatochromism is the ability to change color due to solvent polarity. It is expected that Reichardt's dye will have a large solvatochromic effect based on different solvents. With increasing solvent polarity, there will be a blue shift to respond to the negative solvatochromism. Positive solvatochromism should have a red shift with decreasing polarity. The absorbance maximum and retention time of Reichardt's dye will be determined by using a HPLC that has a biphenyl column for different solvent mixture compositions. The change in behavior will be analyzed to see how polarity changes with different solvent compositions. The solvent mixture used will be water/methanol. The combinations will start with one of the solvents being 100 percent pure and then change to varying solvent compositions. 10% of the other solvent will continuously be added in each round until it gets to 100% of the other solvent in the composition. The retention times and absorbance max will be graphed and later compared after all of the data is collected.

Detection of the Diabetes Medication, Sitagliptin, in Breast Milk (Poster, Table 4)

Presenting Students: Picard Johnson, Kelly Skoczynski

Mentor: Dr. Holly Currie

Sitagliptin is a medication used to treat type 2 diabetes. This medication, like all medications, has the potential to cause adverse side effects. Sitagliptin is prescribed to nursing mothers even though there is no research to determine if it can cross into the mother's milk. A method to determine the concentration of sitagliptin in milk using gas chromatography mass spectroscopy (GC-MS) was developed. This method will be used to analyze breast milk samples collected from a mother taking sitagliptin.

Development of an Undergraduate Peptide Synthesis Lab for Organic and Biochemistry Courses (Poster and Oral Presentation, Table 2)

Presenting Students: Brian Day, James Larrimore

Mentor: Dr. Matthew Crawford

The purpose of this project was to develop a new peptide synthesis lab that would be feasible to complete in either organic or biochemistry labs. Three separate experiments were

completed to decide which approach is appropriate for an undergraduate lab setting. Two approaches involved solid phase peptide synthesis (SPPS) and the other involved solution phase peptide synthesis. Solid phase synthesis (SPS) is primarily used in modern industrial and academic synthesis of drugs because these kinds of methods allow rapid synthesis of low molecular weight drugs. The purpose of the first SPPS based experiment was to synthesize a peptide with various N- terminal labeling groups. A biologically active peptide was created using the Fmoc strategy and a marker was attached in the last step in place of the amino acid. The markers are designed to target bioconjugates. The samples were analyzed by a mass spectrometer. The experiment was completed using a manual method, which was inexpensive, did not require complicated instruments, and were easy to perform. This process can be changed by adding more, using other amino acids, or using other markers. The second SPPS focused on the same method but used unnatural amino acids to determine robustness in the solid phase synthesis approach. In addition to these solid phase peptide synthesis protocols, a set of procedures from the literature was adopted to attempt a solution-phase dipeptide synthesis. The procedures were chosen for their apparent reproducibility with the intention to expand the approach to longer polypeptide sequences. All three of these approaches continue to be evaluated to determine the best synthetic route for an undergraduate lab in either organic or biochemistry.

Extraction and Identification of Vitamin K2 from Black Cohosh (Poster, Table 4)

Presenting Student: Aminah Jones
Mentor: Dr. Peggy Biser

Actaea racemosa, Black Cohosh, is used widely in the world as a dietary supplement for the alleviation of menopausal symptoms. In this research, it will be determined if vitamin K2 is present in Black Cohosh and responsible for diminishing bone loss. K2, menaquinone, is a vitamin that is involved in maintenance and regulation of calcium in the body. The research group confirmed the presence of this quinone in Black Cohosh extracts with alcoholic KOH chemical tests and H₂SO₄. Two standards of menadione and vitamin K2 were tested and run through GC/MS for further confirmation.

Purification of Gold Nanoparticles through Size Exclusion Chromatography (Poster, Table 4)

Presenting Student: Nicholas Mazzeo
Mentor: Dr. Robert Larivee

A need for gold nanoparticles (NP) has surfaced within the 21st Century in the medical field. Gold NPs are currently being used for photodynamic therapy, drug delivery systems, and even cancer treatment. But the problem arises, how does one get pure gold NPs? The challenge remains in developing strategies for the preparation of NPs of high purity. High purity indicates that there is little to no impurities or starting materials. The goal for this research project is to

find a quick and inexpensive way to separate the gold NPs from other impurities, and to collect purified gold NPs ready for medical use. The method being used is size exclusion chromatography (SEC), which takes the size and molecular weight of all the molecules in the mixture and separates them accordingly. In this research project, 3 impurity samples will be made. The first one will be made from a mixture of NaCl and water. The second impurity sample will be made from yellow dye and water. The third sample will be made from water, cholesterol, and soy bean lecithin. The impurities will be mixed with gold nanoparticles and then will run through the column packed with Bio-Gel Agarose gel resin. During SEC, small molecules enter the pores from the column media and their flow is slowed down. On the other hand, the larger molecules pass through the column around the media and are eluted. The media in the column includes the resin. Resin is porous beads that allow the small particles to enter the pores and slow down the flow rate. With the specific resin being used, the flow rate for this research will be 25 mL per hour. In order to test if the gold nanoparticles separated from the impurities, a few tests will be performed. For the first test, the NaCl impurity sample will be tested with an electrical conductivity meter. If the nanoparticles separated properly, the conductivity meter should be close to zero. If NaCl is in the sample, the conductivity meter will have a high reading. The second and third sample will both be tested by the UV Spectrometer. An absorbance reading will determine if the gold nanoparticles are separated from the impurities.

Solvatochromism: Rainbow Chemistry (Poster, Table 3)

Presenting Students: Maya Taylor, Robert Mfuh

Mentor: Dr. Benjamin Norris

Solvatochromism is a phenomenon that occurs when a solute is dissolved into a solvent. If the polarity of both the solute and the solvent vary largely, it can cause shifts in the position, intensity, and shape of the solution absorption band. There are two variations of shifts that can occur in solution: bathochromic (red) and hypsochromic (blue) shifts. The red shift corresponds to a positive shift in the absorption band, while the blue shift would be negative. These shifts can then be used to determine the polarity of the solvent. Using Brooker's Merocyanine solvatochromic properties in different solvents, it is possible to observe shifts in absorption band in correlation to the retention time of solvents in high pressure liquid chromatography. The change in retention time can be qualitatively related to the polarity of the solvent Brookers is immersed in. Solvents polarity is very important as it can dictate how a reaction occurs. Choosing an improper solvent can lead to an undesired product or the reaction not occurring altogether. This also changes the dynamics as to how polarity can be measured. Currently, over 30 different polarity scales are used worldwide which can lead to misunderstandings and misinterpretations of polarity data. Having a polarity scale that can be kept consistent and universal would be ground breaking in many fields of study.

Synthesis and Characterization of Chemiluminescent Esters (Poster, Table 3)

Presenting Student: Catherine Owens

Mentor: Dr. Benjamin Norris

Chemiluminescence is a chemical reaction that results in light being produced. A really good example of chemiluminescence is glow sticks. Glow sticks contain two different chemicals plus a colored dye. When a person breaks or snaps and then shakes a glow stick, this causes the two chemicals and the colored dye to mix, which then produces light.

Toxic Exposures in Plastic Water Bottles (Poster, Table 2)

Presenting Student: Shanna Marcelino

Mentor: Dr. Holly Currie, Mr. Blair Knouse

Bisphenol A (BPA) can lead to many serious health effects, like hormone imbalance, infertility, hyperactivity, and more. BPA can be found in products that contain polycarbonate plastics and epoxy resins. Main products that contain those are plastic food containers, water bottles, and canned food. The chemical can seep through to food and beverages that are contained in the products and can also become worse if heat comes into the factor. There are situations where consumers will leave their water bottles in a hot car or microwave their food in a plastic container without realizing the dangers that it could cause. Over the years, the production of BPA has gone down and fewer products contain the hazardous chemical. Most reusable water bottles and food containers are now labeled as BPA-free, but can those still be trusted? Another chemical, bisphenol S (BPS), is used as a substitute for BPA but has the parallel effects of BPA. This experiment will analyze BPA and BPS in plastic water bottles in order to determine the toxic exposures it contains to consumers. Water samples from four different brands of water bottles and a reusable water bottle that is labeled as BPA-free will be analyzed using the HPLC. Is drinking water from plastic water bottles safe? Would drinking from a BPA-free water bottle be any better? These questions will be taken into account when conducting the experiment.

DEPARTMENT OF COMMUNICATION

A Case Study in Small Group Communication: Creating a PSA on the Local Opioid Addiction Crisis (Oral Presentation)

Presenting Students: Kambawamukor Harris, Stephen Owings, Renee Poffenberger

Contributing Students: Zachary Mason, Brandon Roberson

Mentors: Dr. Elesha Ruminski, Ms. Christine Willingham

On March 1, 2017, Maryland Governor, Larry Hogan, signed an Executive Order declaring a State of Emergency in response to the heroin, opioid and fentanyl crisis that is occurring all throughout Maryland. The state is rushing to control this epidemic. In an effort to manage the crisis, Maryland has taken a new heroin and opioid prevention, treatment, and enforcement initiative, established the Maryland Heroin and Opioid Task Force and Coordinating Council, and began recording more detailed and timely data on the health crisis. The opioid addiction is not just a national and state problem, but also a crisis for the local Western Maryland area too. The amount of overdoses has risen steadily since 2013 as a result of the prevalent opioid addiction in the region. This presentation will not only discuss the local opioid addiction in Western Maryland, but will also focus on how Frostburg State University students took initiative to raise public awareness of the issue. Working as a group on an assignment for CMST 215: Small Group Communication, five students created a public service announcement (PSA) on the local opioid addiction. In their collaborative effort, the students used small group processes learned in the class to facilitate positive and effective communication skills, as well as overcome group breakdowns. This case study will examine how group endeavors are only as successful as the group communication itself. Thus, the presenters will analyze the small group communication processes and their result within the group of students in creating the PSA.

A Millennial Engagement: Bernie Sanders and Political Campaign Communications in the Digital Age (Poster and Oral Presentation, Table 16)

Presenting Students: Nicole Leighty, Eddy Adams, James Kirk

Mentors: Dr. Brian Hough, Dr. Stephen Simpson

The 2016 presidential election proved to be historic in many ways, challenging countless long-held political assumptions about both candidate and voter behavior. One manifestation of this trend was the use of emerging social media platforms on the campaign trail. Candidates from both major political parties, in addition to independent and third-party candidates, expanded the use of social media to a more significant component of their political communication strategy. Building upon the pioneering digital media strategy of Barack Obama's 2008 and 2012 campaigns, presidential candidates in the most recent election sought to utilize social media to reach Millennial voters and an electorate that has become increasingly reliant on online media for news and communication. While most research on this topic has focused on the Twitter usage

of President Donald Trump, this research will examine a less publicized example of social media's influence on the 2016 election. In the Democratic Party primary campaign, 74 year old and relatively unknown Vermont Senator Bernie Sanders was able to emerge as a strong challenger to frontrunner Hillary Clinton. This paper will explore how Sanders was able to utilize social media to build broad and responsive support among young Democratic voters. The Sanders' campaign's ability to use emerging media platforms to evolve from political footnote to legitimate presidential candidate can shed tremendous light on the future of political campaign communications.

Am I Safe or Do I Have Space for These Jordan's? Analysis of the Worth of Air Jordan's and the Violence the Brand Has Caused (Oral Presentation)

Presenting Student: Brandon Roberson

Mentors: Dr. Elesha Ruminski, Mr. Shawn Jones

Michael Jordan is one of the greatest legends to play the game of basketball. This research will cover the ins and outs of a normal boy who grew up in North Carolina who would dominate the basketball courts to reach the goal of getting drafted into the National Basketball Association (NBA). Once getting drafted he managed to grasp his audience's attention by setting unthinkable goals as a black male, because he soon became the first modern African-American superstar and later captivated the younger generation by starring in the film *Space Jam*. A professional basketball mogul who has become a role model for many young African American boys and as Nike's top selling prospect who will go down as one of the most influential athletes in Black History, Jordan and his brand are also the reason some people are losing their lives. Based off Marc Bain's research, an estimated 1,200 people die over sneakers every year (Quartz, 2015). A recent documentary on sneaker culture, *Sneakerheadz*, suggests one factor in the violence is the marketing hype machine that transforms sneaker releases into consumer feeding frenzies (Quartz, 2015). Although there is a negative, there is also a positive that comes out of these shoes: Collecting these shoes as personal trophies has given opportunities for people to start their own businesses trading, selling, and buying Jordan's. This presentation will analyze the phenomenon of Jordan's shoes within the sneaker culture context.

Bain, Marc, "1,200 People Die Over Sneakers Every Year," *Quartz Media LLC*, Senseless, <https://qz.com/554784/1200-people-are-killed-each-year-over-sneakers/>. 20 Nov. 2015.

Challenging the Glass Ceiling: Women in Sports and Public Relations (Poster and Oral Presentation, Table 16)

Presenting Students: Brandon Reitz, Deborah Aiyegbusi

Mentors: Dr. Elesha Ruminski, Dr. Amy Armiento

Women across the United States struggle with the barrier of advancing in various professions. This is known as the "glass ceiling." This presentation will focus on women in the field of public

relations and women in sports media. The field of public relations is mostly dominated by women at the entry level expect for the top because public relation specialists require listening to their clients, working well in teams, and advocating for their clients. A lot of these skills are commonly recognized as gender-based and common in women. However, women do not hold the executive positions in the field of public relations. Alternatively, women in sports media struggle with both financial inequality and mainstream broadcasting positions. Coverage of women sports is at an increasingly low rate within the United States. Each of these fields will be used to prove why the glass ceiling for women is present and why it needs to be challenged.

Creating a Sustainable Plate: How Frostburg Grows Makes It Easy (Oral Presentation)

Presenting Student: Rosemary Wehberg

Mentors: Dr. Elesha Ruminski, Ms. Christa Kucharczyk, Dr. Dan Fiscus

This presentation will show why buying nutritional locally grown produce is a smarter alternative than buying produce elsewhere. Frostburg Grows is a community based sustainable agriculture and local food project working to improve the food system in Western Maryland. Programs like Frostburg Grows provide fresh produce and also create more job opportunities around Maryland. A community like Allegany County can benefit from more local farms in numerous ways. Allegany County has some of the highest percentage of people residing in areas where they have little to no access to supermarkets or healthy food options. These areas are known as food deserts and it is a huge problem that will be addressed in this presentation. According to a Maryland Food System Profile II, about 56% of the population in Allegany County is living in a USDA food deserts. Food deserts are creating more issues everyday around Allegany County because they are causing a chain of reactions regarding health issues. The lacks of access to healthy food options are causing outbreaks in diabetes, heart health, and obesity around the county. According to John Hopkins Center for a Livable Future Food System Map reported that Allegany County ranks third for heart disease mortality rate. This basically means 243 per 100,000 people have heart disease in Allegany County. Not only are there many health issues in Allegany County, but there is also a huge need for food assistance and jobs. By increasing the amount of local farms, it will ultimately create more job opportunities and eventually lower the poverty rate. This research will show the issues Allegany County is facing and ways we as a community can work to changing those cycles and unhealthy eating habits. The goal for this presentation is to inform and argue to increase endorsements for local farms in Maryland to lower some of the many health and poverty problems Maryland is being challenged with. Endorsing and supporting local farms such as Frostburg Grows would ultimately have a very positive influence in Maryland. Local farms will provide fresh, organic produce instead of unhealthy alternatives. Allegany County could lower health problems and create a healthy sustainable environment by supporting more local farms such as Frostburg Grows. Investing in local farms can be considered an investment in our futures.

Don't BAN Thin, Love the Skin You're In: How B.A.N (Beautiful and Natural) Models Can Help the Modeling Industry (Oral Presentation)

Presenting Students: Taishi Cornish, Shantia Hamler

Mentor: Dr. Elesha Ruminski, Mr. David Stern

Is banning underweight models the right thing to do? According to a French Fashion model named Isabelle Caro, "It's important that the models are healthy, but it's a little simplistic to think there won't be any more anorexics if we get rid of very thin models" (Stampler, 2015 pg. 1). Caro agrees that models needed to be healthier but she doesn't agree with the discrimination against "too thin models." Today, television illustrates and depicts ideal lifestyles, images, and happiness. Many children and adults today use multimedia forms and iconic figurines from various mediums as their source to find their true role models. The ideal image of a "woman" has been portrayed to be a sexy, skinny, clear skinned, and a "healthy eating" woman. However, this ideal image is unachievable for most women and is likely to lead to women feeling depressed and ashamed about their body image. Everyone is different and society needs to accept that, which is why a policy change for the modeling industry is needed. The name of this policy is called B.A.N Models, which stands for "Beautiful and Natural Models." The first rule is that every model should have a nutritionist. The models must do a check-in every month in order for the nutritionist to ensure their bodies are still healthy and there have not been any drastic changes. Secondly, every model should be willing to do random drug testing so that we know that the model was not forcing themselves into something just so they can fit the "thin is in" image. Thirdly, modeling agencies are forced to change the face of modeling in general. They now accept plus size models, skinny models, disabled models, long and short hair models. Lastly, to help avoid low self-esteem issues, feelings of socially unacceptableness and only targeting a specific audience, modeling agencies will be forced to close down until they target their audience to all types of people. All models should be a reflection of the "everyday person," and no one should feel left out or forced to change their appearance due to what society has caused us to believe. This policy was implemented in order to get men, women, and children to love themselves for who they are and accept what they look like. Overall, being aware of these problems and knowing that something will be done to change the issue will allow society to be happier from within.

"France Just Banned Ultra-Thin Models." Time, 3 Apr. 2015. Web. 12 Dec. 2016.

Fracking is Banned in Maryland: The Big Picture (Oral Presentation)

Presenting Students: Bethany Maglidt, Erin Kroder

Mentors: Dr. Elesha Ruminski, Dr. Kara Rogers Thomas

Hydraulic Fracking, which is an invasive process used to extract natural gas from the earth's shale, has been a controversial topic in Maryland over the past few years. Recently, Governor Larry Hogan announced his persuaded support to ban fracking in Maryland, which was big news considering he was once opposed. This research presentation will review and discover the

efforts made by Frostburg locals and students that led to the success of a Maryland Fracking Ban, identify key factors to implement change, and share the findings of any motives and passions students have on campus that may preview what movement might be next.

Funding After-School Programs: A Stepping-Stone for Opening More Opportunities for Generations to Come (Oral Presentation)

Presenting Students: Harden Crosson III, Chazz Bradner, David Diggs

Mentors: Dr. Elesha Ruminski, Mrs. Robin Wynder

In the 1990's school was essential and perfect attendance was expected; if anyone saw a student not in school during school hours, parents would be notified their child absent in class, and families throughout the neighborhood would also step in. As time evolved, more kids on the street could be seen during school hours, which can lead to negative and unfortunate events due to certain crowds and friends that are bad influence on them. Funding after-school programs with extra-curricular activities is needed to address this issue. Our youth can have a great outcome from these funded programs to build more involvement in their education and community. Funding after-school programs may show an increase in school attendance and a decrease in youth crime rate, and should lead to future successes.

How Do We Stop the Pain? Preventing Impaired Operators in the Transportation Industry (Oral Presentation)

Presenting Student: John Shaffer

Mentors: Dr. Amanda Vandiver, Dr. Elesha Ruminski, Mr. Timothy Magrath

The words "Safety is of first importance" resonate throughout all the operating and safety rule books of North American railroads of the last two centuries. Almost four decades of on-duty use of drugs and alcohol have gained public awareness, and on-duty drug and alcohol use has negatively affected safety in transportation. The transportation industry and organized labor have tried to eliminate alcohol and drugs from the workplace by punitive methods and peer pressure. The federal government has tried to mandate the removal of alcohol and drugs from the transportation industry through alcohol and drug testing. Neither industry nor government has succeeded in eradicating alcohol and drugs from this place of work. The airline industry has most recently experienced the notoriety of published incidents of alcohol use at work by an airline pilot. How many pilots fly impaired daily without raising reasonable suspicion? One daily impaired operator of transportation equipment is unacceptable. Families and friends are depending on the transportation industry to return their loved one's home safely; the American public has a right to a safe transportation system. Is it possible to reach 100 % compliance with industry rules and government laws prohibiting the usage of alcohol and drugs in the transportation industry? This presentation will focus on the usage of alcohol and drugs in the transportation industry and solutions to the problem. History, government, and new technology will be the focus of this presentation. The combination of new technology with

existing testing and peer groups will provide the matrix for 100 % compliance with drug and alcohol regulations and laws. It is possible to reach 100% compliance with rules and laws by applying modern technology with existing tools.

Marijuana Legalization: An Inside Look into the Thoughts of Frostburg State University vs The Nation (Oral Presentation)

Presenting Student: Clyde Burke-Coursey

Mentors: Dr. Elesha Ruminski, Ms. Melinda Farrington

Marijuana legalization is hot topic in the United States. With more states, like California, beginning to legalize marijuana, both medically and recreational, the public has been positive but others disagree. Per the Washington Post, 52% of Americans believe that weed should be legal. Public opinions range from marijuana should have recreational use and be taxed like alcohol and cigarettes while other people believe that marijuana should be completely illegal. An anonymous survey conducted on the campus of Frostburg State University will review demographically based opinions on marijuana legalization. This presentation will discuss the trend of marijuana legalization in the United States and how the results of the survey of the student and faculty of our local campus compare to the nation.

Romantic Relationships and “Situationships”: College Students Relationship Construction on Social Media and in the Public Sphere (Oral Presentation)

Presenting Student: Kaylah Calvert

Mentor: Dr. Marcus Hill

College students are entering into what some mainstream bloggers are calling “situationships.” A situationship is a romantic relationship that mirrors a traditional romantic relationship, and has all of the benefits of a romantic relationship. However, there is no commitment of monogamy between the two parties involved. Previous studies have shown that college students engaged in monogamous romantic relationships have a greater degree of mental and physical well-being than their single counterparts. However, previous studies have not considered racial and gender differences, as well as the role of social media. This research seeks to explore potential racial and gendered differences in college students’ participation in romantic relationships, motivations for entering romantic relationships, as well as the role of social media being a medium to display these relationships. Moreover, this research seeks to uncover new ways in which college students are redefining the parameters of traditional romantic relationships, e.g., situationships, if situationships are occurring among college students, and if they are having an adverse effect on college students’ overall well-being.

TEDxFrostburgStateU: Reality or Fiction? (Oral Presentation)

Presenting Student: Patrick Broussoul

Mentors: Dr. Elesha Ruminski, Ms. Christine Willingham

Imagine a day filled with bright lights, amazing performances, community involvement, and powerful minds coming together to share one of a kind and thought provoking ideas. With the help of the TED foundation, this event can be achievable. This project was conducted to see the feasibility of hosting a TEDx event at Frostburg State University. TEDx events are locally organized and speakers are invited from all over the world to share their research in a TED-like talk. An event of this caliber requires time, planning, and partnership from the community and the University. From organizing a team responsible for the event to having our first speaker walk on stage, there are many aspects necessary for the event to come to Frostburg. The important question is, can we as an institution achieve the goal?

The Future of Female Infantry Officers in Marine Corps Battalions (Oral Presentation)

Presenting Student: Jacob Schmid

Mentors: Dr. Elesha Ruminski, Mr. Justin Anderson

Gender equality in the workplace is an important aspect of any company, and this is no different in the Marine Corps. In recent years tests have been implemented to see if females could pass the physical requirements needed to be officers in Infantry Platoons. To this day a single woman has yet to graduate from *Marine Corps Infantry Officer Course* (IOC). However, this may be contributed to if they did graduate they would not get the opportunity to lead an Infantry platoon in combat; instead they would go to jobs that have been opened to females in the past. Could knowing the fact that all their work would have been for nothing attributed to this zero pass percentage? There is also the troubling concern that all the equipment used in IOC is designed to fit on a male body. Could this also be the reason for the attrition rate? Females have been serving in combat roles throughout the entire history of the United States. Why have they never been able to claim a job title that distinguishes this?

Why D1 Athletes Should Not be Paid (Oral Presentation)

Presenting Student: Patrick Bell

Mentors: Dr. Elesha Ruminski, Dr. John Lombardi

This presentation will examine whether D1 athletes should be paid. The debate of whether they should be or not is known at universities like Duke, North Carolina, and Kentucky, which have sports programs that can generate millions of dollars every year. While coaches, trainers, and other staff members earn significant salaries, some think players deserve a cut. But these athletes are being compensated more than people know. These athletes have benefits that

come along with being a D1 athlete that regular students do not have. These athletes are receiving money for school, a great amount of media exposure, and direct tutoring programs. This presentation will examine what DI level players are, what they receive as benefits, and what is fair compared to other division level athletes.

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGIES

Apache NiFi (Poster, Table 1)

Presenting Student: Sarah Polkabila

Mentor: Dr. George Rinard

NiFi is a program created and designed by the National Security Agency (NSA), which was originally called NiagaraFiles. In November 2014, this program was submitted to The Apache Software Foundation (ASF) as part of NSA's Technology Transfer Program, allowing anyone to access, modify, and use this program for any purpose. Overall, NiFi is a framework built to automate the flow between systems. Dataflow is the automated and management of highly scalable and flexible flow of information between various systems. The program provides a Graphical User Interface (GUI) through which users can design the dataflow they want to implement. NiFi allows users to tailor the dataflow anytime for their specific needs and the goal environment wanted. This program allows for users to send, receive, route, transform, and sort data, as needed, in an automated and configurable way. NiFi provides hundreds of premade modules allowing for maximum configuration and reusability. In addition to being able to create personal dataflows through the use of premade modules, developers or any user to have the option to create their own modules. This research project demonstrates how to create these personal modules to overall benefit production of dataflows within the NiFi software.

Augmented Reality with Physics Based Interaction Using Edge Detection (Poster, Table 28)

Presenting Students: Jacob Dwyer, Joseph Shipway, Jared Turner

Mentor: Dr. Xunyu Pan

Our project incorporates the concept of augmented reality using components such as edge detection to create an interactive environment for a computer generated entity, e.g. a circle or ball. The project is programmed using JavaScript, HTML5 Canvas for rendering, and WebRTC for webcam input. In this project, a generated entity is superimposed over real world images, and the entity reacts to the real world images giving the entity the appearance that it is in the real world. The entity acts with different motions of physics including bouncing and falling.

There are essentially two programs in our project. The first program takes a single image as input which the user can choose, and the second program takes input from a webcam and runs the same types of filters used in the first program. Using the webcam allows the computer graphics to react in real time to a dynamic environment and not just a static one.

The environment starts with a blank canvas in which the user can determine whether they would like to use the real time module or the single image module to add their image to the canvas. From here, the user is able to see the ball interact with their image or webcam by it bouncing and falling in the environment. The ball is able to appear to interact with the environment because of a series of filters, collision detection, and a basic physics engine. There

are two Sobel edge detection filters, one for the horizontal lines and one for the vertical lines, and they use the output of a grayscale filter. The basic physics engine uses collision detection to detect when the entity collides with an edge. Knowing the horizontal and vertical components of the edge allows the physics engine to compute the angle of the edge, and thus properly resolve the collision to give the entity the proper appearance of bouncing. Gravity is also incorporated in the physics engine, making the ball appear to be real as it falls and bounces in the real world images from the webcam in real time.

Automated Room Schedule Generation for Frostburg State University Administrative Assistants (Poster, Table 2)

Presenting Student: Cody Grimes

Mentor: Dr. Michael Flinn

This research project utilizes several high-level programming languages to automate the task of generating a room schedule. Room schedules are generated, and posted, by the administrative assistant for student and faculty convenience. This task is time-intensive requiring three to four hours per semester for all academic departments, every *semester*. Through the use of this software, there is no longer a need to manually perform comparisons between the results of schedule queries in PAWS in order to locate duplicates and ensure the resulting schedule is both complete and correct. After inputting data for each day of the week, the program will automatically analyze and process the data, then output a neat, formatted PDF file that is ready to be posted. With this tool, schedule generation is just a few short clicks away!

Development of Simulation Software (Poster, Table 1)

Presenting Students: Rebecca Flinn, Jermykl Spencer, Alexandria Alvarez

Contributing Students: Catherine Austria, Samantha Bennet, Alexandria Alvarez, Kyle Marshall

Mentor: Dr. Michael Flinn

The department of Computer Science and Information Technologies (CSIT) was awarded a grant through Maryland Industrial Partnership in cooperation with Hi-G-Tek. The grant enabled several CSIT students to work with a live client to create a simulator for Hi-G-Tek's global tracking system. The requirements of the software include consideration for multiple stress vectors. The final simulator will enable Hi-G-Tek to stress-test the global tracking system before new clients are on-boarded. The grant team was given a set of requirements that need to be satisfied for both the global tracking system and the system user. The FSU Grant team's mission is to code a simulator to leverage numerous variables (e.g. number of tracking devices, time off-line, number of sensors, etc.) and use various algorithms, pre-loaded data sets, and targeted circumstances. The simulator will then feed the test case into the Hi-G-Tek pre-production system to simulate a physical world situation. This research presentation discusses the complexities encountered while creating the simulation software and the solutions

implemented. The intellectual property of the system belongs exclusively to Hi-G-Tek; however, there are many public facts that can be freely discussed.

Every Color has a Note (Physical Display and Oral Presentation, Table 27)

Presenting Students: Andranay Peyton, Courtney Sinkler, Jermykl Spencer, Tyler Vaughn
Mentor: Dr. Xunyu Pan

In this project, our group wants to convert light into sound using the programming language C#. This will be our first time using this language so it might be a little difficult. Therefore, we will all do our part for research accordingly so we can understand C# better. In C# we want to have the light read certain frequencies and react when it is in between a certain range in that frequency. We will start by writing a code that we allow us to input a pitch and that pitch will correspond with a color. Once we can enter any range of pitch and the color reacts the way we want it to, we will take that part of the code out and start to figure out a way to add music. We believe the best way to make sure the code is reads the music right is to use switch cases. Below is a diagram of color and notes that we want our code to implement. For this project, we want to try to make it into an app on Android. We will also be making mini projects that will lead to our bigger project which will be the color/sound.

FSU Lost and Found (Physical Display, Table 25)

Presenting Students: Willy Njundong, Jared Keen, Claud Bou-Abboud, Robert Thomas
Contributing Student: Jon Yantz
Mentor: Dr. Michael Flinn

The “FSU Lost and Found” web app has a very simple purpose: to turn the already established “lost and found” process on campus into an app. It is safe to say every single student on campus either has easy access to the internet using a smartphone or a computer, and from a quick poll of random students on and off campus, it turns out that most students never visit any of the “lost and found” locations on campus. Particularly when the item in question is of low monetary value, students who find dropped items are typically not as inclined to getting the item to its owner, with the idea in mind that the owner will not put in very much effort in getting their item back or it is simply none of their concern nor worth their effort. My peers and I resolved to address this by creating an online interface and mobile experience of said web app, where students and staff can create listings for items they have lost or items of value found. Having a repository of missing items within easy and quick reach would prompt more students or staff to check for their items, and be on the lookout for valuables that may have been lost in an area they frequent. Conversation threads will also be included with listings so students and staff can get more specifics from the person listing a missing or found item. Users can post anonymously (with the loss of certain capabilities, which are yet to be finalized), and for this reason there will be an administrator interface for moderating the contents of the item repository and listings and threads created by users and issuing alerts for certain items.

Students and staff can also choose to be alerted when an item they posted as missing is found, or some other item matching its description is found. In future, an experimental feature will be utilizing an image recognition API (Application Programming Interface, or in non-technical language, a tool which allows a piece of software—our web app—to interact with another piece of software; an image recognition platform) to sort and compare items. This would help reduce the need of an individual to go through several listings in search for their item. This web app will be accessible online using a browser, is built mobile friendly. Additionally, there will be an app version for iOS and Android, if one chooses that over the web app from a mobile browser. It is our hope that the process of losing and finding items on campus becomes easier and more inviting, and encourages students and staff to help each other in restoring items back to their owners.

Multimedia Chat with Attribute-Based Encryption (Poster, Table 28)

Presenting Students: Andrew Brust, Cameron Shaffer

Mentor: Dr. Xunyu Pan

Today, Online Social Network (OSN) has emerged as the pervasive form of media connecting people from all over the world. Among the core functionalities associated with OSN, Instant Messaging (IM) plays a critical role in real-time communication between those virtual online communities. IM can include any type of multimedia from simple text to image and video. As the growth in IM usage continues, it has become the primary means of communication within business, education, and everyday life. People are in constant communication with each other and sharing these image and video files with one another. Meanwhile, privacy management and data protection are issues that remain paramount to the future development of IM technology. In this work, we focus on the data protection and privacy management of group chat where multiple users simultaneously connect to a central server for real-time communications. This includes text, image and video file sharing among these multiple users. We describe a novel multimedia IM system supporting system defined security control, based on a selected grouping of attributes, over real-time communication in a multiuser environment. The attribute-based encryption (ABE) is employed by the system to provide access control over transmitted user messages. Extensive experiments demonstrate that the new ABE key management mechanism provides a flexible and effective solution to data protection and privacy management for real-time online communication in multiuser environments.

Raspberry Pi Super Computing and the Infinite Monkey Theorem (Poster and Physical Display, Table 26)

Presenting Students: Atticus Speis, Brian Bluebaugh

Mentor: Mr. Steven Kennedy

Combining less powerful computers allows you to create a type of supercomputing system called a Beowulf cluster which can be useful for parallel programming research. Our group used a collection of the popular Raspberry Pi computers to create such a cluster. We began by assembling all of the pieces we needed. The first step to this was connecting all of the Raspberry Pis together using standoffs in two, 1 by 8 rows, then connect them using networking components. After this process was completed we designed a program to utilize the cluster's multiprocessing capabilities. We used the cluster to simulate the infinite monkeys theorem. If a number of monkeys are given infinite time, they should almost surely type any given text. To test the theory, we assigned each Pi in the cluster the role of a single monkey. Each monkey then randomly generates its text. This text gets compared to our input text. Using this method, we are able to show how short phrases can quickly be discovered, although longer works such as the works of Shakespeare could still take effectively infinite amounts of time.

Women in Computer Science (Poster, Table 1)

Presenting Student: Alexandria Alvarez

Mentor: Dr. Michael Flinn

The projected growth of careers in the Computer Science field is approximately 15-20% between 2012 and 2022 due to the constant improvements within the field making technology more accessible and prominent in everyone's daily life. However, most Computer Science, Computer Information Systems, Information Technology, and Secure Computing & Information Assurance (cyber security) careers are filled by men. In the classroom, the ratio of females to males in computing science courses is approximately 4: 25. Research shows that the gender gap between males and females within the computing science field has continued to increase. There is an obvious disconnect between the computing science field and females' perception of being able to succeed, happily, in the field. This research poster illustrates the establishment of Frostburg State University's Women in Computer Science (WiCS) club as a method to encourage more females to get involved in the Computing Sciences while abolishing misconceptions about the majors.

Women in Computing: To Be or Not to Be (Poster, Table 1)

Presenting Student: Valerie Ehimhen

Mentor: Mrs. Oluwadamilola Gbenro

Why would John get the STEM job rather than Jennifer? In our world today, it is very obvious that there has been a decline of females in STEM related jobs and majors in college. There are many more males in the computing field than females. In programming (Coding) specifically, males are dominating. Why is that? Are women advised to stay away from this field when picking a major in college? Is coding taught in a way that only entices males? I personally have struggled with programming in Computer Science and I am also aware of many females who are scared to come into this field or drop it along the way because it got too difficult. This however does not speak to one's intelligence. Why is it that many females do not like programming? Are women wired differently? Do women think differently? Is it societal? Is it cultural? Are there just too many male professors in this field? Why do most women deter programming? Through this study, I will gain understanding of the differences in the way males and females intellectually comprehend programming (coding). Through collaborations with various computer science and women studies professors at Frostburg State University, I plan to find the root behind the disproportional numbers of females in the coding field. I may also find a better way for programming to be taught, that would perhaps catch the interest and success of more women.

DEPARTMENT OF ENGLISH AND FOREIGN LANGUAGES

Hand Hygiene: How Much Do You Know? (Poster, Table 15)

Presenting Students: Janae Wilkins, Justin Hansen, Jenelle Baker, Ariel Roland

Mentor: Dr. Molly Hartzog

It has been constantly asked if “Students know about and practice good hand hygiene?” in the biology field by many scholars. These articles express how poor hand hygiene may affect a students’ overall health and performance but do not express ways to educate them on proper hand hygiene and the importance of practicing it throughout their days. My paper addresses the issue of lack of knowledge of hand hygiene and how often students do it. In my project, I will be looking at how knowledgeable students on a college campus are about hand hygiene in general, how often they practice it, and if they promote hand hygiene to others to determine whether their practices contribute to many illnesses that are spread across campus. I argue that students do not know much about proper hand hygiene and do not practice it well enough. MRSA or Methicillin-resistant Staphylococcus aureus is a staph infection that is easily transmitted through skin to skin contact or contact with an infected object. It can be mistaken as a bug bite or pimple but if not treated could possibly abscess and become infected resulting in amputations or incision and drainage. There are many cases of bacteria being passed by touch but there are no definitive solutions to stop the passing of these microbes. The best solution to reduce the amount of germs spread on campus is proper hand hygiene. Properly washing and sanitizing your hands is the number one most effective way to prevent the passing of germs. Good hand hygiene on a college campus is necessary for the well-being of our students and staff. In conclusion, this project will use the data given from the students to determine how much they know about hand hygiene and to promote it to other students so that they can continue to improve their overall health.

Overpopulation in Shelter Pets (Poster, Table 15)

Presenting Students: Shelbi Sullivan, Kelly Healy, Markador Dahn, Ayanna Price

Mentor: Dr. Molly Hartzog

The population in today’s animal shelters in the US has become one that is getting hard to ignore. With so many people breeding animals instead of adopting, the shelters are doing everything they can to keep up with the growing number of animals brought into their facilities. Within the US, there are only about 13,600 animal shelters with approximately 7.6 million companion animals entering these shelters every year. Only about 2.7 million of those animals are adopted, leaving the rest to wait to find their forever home, or to be euthanized because the shelters cannot house them any longer. My team and I want to find out the main reason for overpopulation in these shelters, whether it be strays that are found and brought in, companion animals that the owners can no longer afford to take care of, or landlord issues

within an owner's home forcing them to give up their pet. We want to research these causes and find out what it is that we can do to help these animals in need as well as the shelters that are working so hard to make sure these animals have roofs over their heads and food in their bellies. It is found that best approach in controlling the issue of overpopulated pet shelters has been early age spay and neuter. Even though this method might be the answer to the long-term aspect of this problem, it does not however take into account the short-term goals which is what this project will be addressing. My team and I will be examining a local shelter to find out what the main cases are that they encounter, what they are doing to maintain all the animals, and which type, dog or cat, is the most brought in to the shelter. By seeing what we can do to help our local shelters, we can help to ease the number of animals that are actually in these shelters. Our project will allow us to get an inside look into the everyday work that goes into the animal shelters to help us to find ways to better the number of animals in the shelters and to get more information about adopting instead of buying, out to the public. We anticipate that the lack of resources, volunteers, and space are just a few reasons that the shelters are having trouble keeping up with the growing number of animals brought in. This research is to provide information on the overpopulation and to provide alternative ideas to help cope with this overpopulation in shelters.

Student Accessibility to On-Campus Mental Health & Wellness Facilities (Poster, Table 15)

Presenting Students: Megan Bentley, Grace Thompson, Allison Smell, Kaitlyn Barnhart
Mentor: Dr. Molly Hartzog

With the rise in mental health and wellness issues among college students, it is imperative to understand why students are not using on-campus health facilities provided to them. Examination of the American College Health Association (ACHA II) has provided data on the number of students suffering from mental health and wellness issues, but little has been done to reach out to those students. This research will show students their similarities among their classmates in terms of mental health, and help generate knowledge among students. This study will also answer the question as to why students are not using facilities. The data found from this project will fill the gap left from previous findings by addressing the issues pertaining to the lack of mental health awareness as well as promote the use of on campus mental health and wellness facilities. Previous research has led to the hypothesis that students are not using on campus mental health and wellness facilities because of their lack of knowledge on them. Mental health can impact a student's ability to perform academically. To promote mental health awareness on campus, it is vital to first understand why students are not using facilities. Then, encourage them to in order to decrease the amount of students suffering from depression, stress, anxiety, and other mental health and wellness issues.

The Effect of Amounts of Sleep on Academic Performance (Poster, Table 15)

Presenting Students: Hailey Smell, Phillip Hogan, Vanessa Mukendi, Myia Huggins

Mentor: Dr. Molly Hartzog

The question of what type of effect the amount of sleep has on an individual's academic performance has been widely debated in the fields of education and medicine, with scholars from the Journal of College Student Retention and the Journal of School Health arguing whether there is a significant effect or not. Questions often asked are whether or not less sleep may cause poor grades or whether more sleep may cause better grades. Often times in students it is commonly known that the number of hours of sleep received from a student can have an effect on their grades. Although they have addressed the issue, they have not done so with enough time or research to come to a proper conclusion. This paper addresses the issue in depth of the effect of sleep on grades with special attention to college students with regard to the ones here at Frostburg State University. This project will specifically focus on FSU students and how their sleeping patterns may lead to good grades or bad grades. In this project, we will look at an individual's amount of sleep and then a rating of their academic performance during each given week. We will discuss sleep and grades without any other factors of their lives involved in order to reveal the misunderstanding of what can affect an individual's academic performance. This project focuses on 40 anonymous participants by using a surveying method. The goal is to gain knowledge of how many hours of sleep on average do the participants receive weekly and also what were the average grades they had received during each given week by using the survey methods previously stated. We argue that sleep has a direct correlation between an individual's grades and when an individual does not get enough of it, their grades will ultimately suffer. We believe that students receiving the standard 8 hours of sleep will show greater grade averages than those who have lower amounts of sleep. From these 40 participants, the audience will be able to get an overall idea of how sleep can affect grades throughout campus. In conclusion, this research survey sheds new light on the vague research previously conducted on the issue of the amount of sleep and its effect on one's grades.

DEPARTMENT OF GEOGRAPHY

A Land Cover Classification of a Southern Scotland Hyperion Scene (Poster, Table 30)

Presenting Student: Paul Churchyard

Mentor: Dr. Matthew Ramspott

The purpose of this project is to conduct a land cover classification based on a satellite scene collected from southern Scotland from the EO-1 Hyperion Hyperspectral imaging sensor. The scene was first radiometrically and atmospherically corrected so as to improve the fidelity of the pixel spectra and convert the raw data values to surface reflectance. In order to find endmember spectra and subsequently classify the scene, multiple processes were executed. The processes used in order of execution were Minimum Noise Fraction Transformation, Data Dimensionality determination, Pixel Purity Index, and finally the n-Dimensional Visualizer. After the endmembers were identified, the Spectral Angle Mapper was used to classify the scene based on the calculated spectral endmembers. In order to make a comprehensible land cover map of the scene after the initial classification, the spectra for each of the derived classes were compared to each other. Classes that had similar spectra were combined to produce the final scene classification. Finally, a preliminary assessment will be conducted on the ease of use of Hyperion data in classifying land cover by comparing some of the image-derived endmember spectra to a library of reference spectra. The results of this work suggest that the use of endmember classification on corrected hyperspectral imagery is feasible for basic land cover analysis. A library spectrum for coniferous canopy cover did correlate with some of the derived endmember spectra; however, the limitations of the library spectrum database did not allow for a useful comparison of the other endmembers to reference spectra. The validity of the results will be assessed through a rough visual interpretation of land cover types observed in the scene. Additional validation of the classification can be made possible by comparison of results to a vegetation map that will be requested from a park/natural area that is located within the scene.

A Temporal Study of Reclaimed Coal Mines in the United States: Highlighting Regional Differences (Poster, Table 30)

Presenting Students: Kaitlyn Roush, Michala Garrison, Austin Owens, Samantha Bennett

Mentor: Dr. Matthew Ramspott

Mine reclamation allows lands that were once disturbed by mining processes to be restored to a natural state or used for another purpose. This may mean rebuilding an ecosystem or making the land suitable for another industry or municipal use. The Surface Mining Control and Reclamation Act of 1977 provides funding to reclaim abandoned mines throughout the United States. Since the Act, reclamation has become a normal part of mining practices and many mines across the country have been successfully reclaimed. The goal of this study is to reveal

differences in the mining and reclamation practices of various locations within the US. To carry out this study, we will use data from the Landsat archive and Google Earth for the sites of several reclaimed coal mines, highlighting regional differences between the Appalachian region and the Western United States. We aim to find images that span years or even decades to follow the progression of the land through the complete mining and reclamation processes in order to reveal how the land was changed, for better or worse, throughout them. By doing this, we should be able to provide information on how mining and reclamation practices vary between the two regions, and the long term results of the reclamation efforts in both sites.

Aqueous Chemistry of the Built Environment: A Comparative Analysis of Freshwater from Urban and Rural Areas (Poster, Table 19)

Presenting Student: Morgan Alban

Mentor: Dr. Jonathan Flood

A body of water is often a fine distillate of the chemical environment surrounding it. In natural settings, the water chemistry of streams and springs mainly mirror the geologic substrates, the biotic communities present, and human land-use impacts and chemical inputs. Non-engineered waters in urban landscapes also reflect their chemical surroundings, but source from a more complex amalgam of geo- and synthetic chemistries. This research project compares the inorganic chemical character of non-engineered water bodies in urban settings with those in rural areas. My aim is to decipher the array of elements and their relative concentrations in water sourced from an *urban aquifer* as compared to more traditional, more natural aquifers. This project targets how an urban mosaic of materials influences water quality. What is the weathering and depositional destiny for the complex assemblage of soluble chemistries comprising the urban form? How does the hydrosphere interact with physiochemical realities of built environment? For my control setting, I selected springs in rural areas with an enduring history of human use. I selected these places in order to detect the initial inorganic chemical signals caused by human impacts on the hydrosphere, specifically groundwater. I use EPA Method 220.7 to determine trace elements with an ICP-AES. The results illustrate two ends of the spectrum of human impacts on water quality, one more enduring and benign, the other more complex and potentially harmful.

Combating Toxic Runoff: Effects of Riparian Buffers on the Water Supply System for Frostburg, MD (Poster, Table 19)

Presenting Student: Jacob Timney

Mentor: Dr. Jonathan Flood

Water supply systems are of great importance to local communities and wildlife. The health of these water bodies is crucial for the success of the population in the region. However, there is concern that agricultural runoff can alter the water chemistry in the water supplies. This experiment focuses on the water supply for the city of Frostburg known as Piney Reservoir.

Several streams converge on this man-made body of water and each stream channel is near an agricultural landscape. There is some local concern about potential toxic runoff entering the water supply as a result of agricultural practices. There is evidence suggesting that riparian buffers can decrease and/or prevent toxic runoff if it exists in an area. The goals of this experiment are to: determine if toxic chemicals are entering sampled streams, describe what chemicals are present and their potential impacts, and test the local riparian buffers on the prevention of agricultural runoff. Expected findings are variable. One stream will probably contain different levels of certain chemicals than the other sampled streams. Riparian buffers will have some level of toxic runoff prevention. Even though Frostburg has a proper water treatment facility, it is important to identify any hidden dangers in the water supply system in order to preserve the health of the local citizens.

Down in the Valley: Subsidence of Historic Coal Mines in the Georges Creek Basin, MD (Oral Presentation)

Presenting Student: Olivia Lewis

Mentor: Dr. Matthew Ramspott

Frostburg State University is located within the Georges Creek Watershed, which is known for its rich historic legacy of coal mining. The true extent of historic deep-mining operations in Georges Creek can be traced by identifying and mapping sites of land subsidence. I used Light Detection and Ranging (LiDAR) areal imagery to perform a detailed observational analysis of the valley's bare surface. Unlike other remote sensing platforms, LiDAR imagery penetrates canopy-cover to generate landform maps at sub-meter detail. LiDAR's piercing sensor allowed me to detect subtle dents and cavities pocking the land surface. I identified multiple clusters of dents, cavities, and other surface depressions distributed across the region, often arranged in linear groups. Through ground-truth observations, I established a strong correlation between clusters of land subsidence and 19th & 20th Century mine entrances, eroding piles of mine spoil, and most importantly collapsing coal seams. Closed historic mining operations leave behind empty voids that are subjected to gravitational collapse that propagate to the surface. Subsurface collapse features include troughs, landslides, sinkholes, losing-streams, and other features under the subsidence umbrella. When these features develop and create strain on the land surface it can cause significant damage to building structures, roadways, and other utilities. This project demonstrates how advanced remote sensing techniques and detailed imagery can be used to delineate post-mining effects in Central Appalachia. Application of these remote sensing procedures can be used as a damage prevention tool for homeowners, landowners, land-developers, and municipalities.

Engineering Strategies for Mitigating AMD Discharge into the North Branch of the Potomac from the Kempton Mine Complex, Western Maryland (Poster, Table 19)

Presenting Students: Jason Howard, Christopher Kelly II, Kathryn Bickerstaff, Mikayla Spencer, Lake Sherrard, Sam Groat, Kristen Geroski

Mentor: Dr. Jonathon Flood

Subsurface engineering skill and ingenuity unlocked a vast supply of fossil energy in the 19th and 20th Century in Western Maryland, Pennsylvania, and West Virginia. The development of coal as an energy source led to land, water, and community development in the historically sparsely populated central Appalachian region; the majority of extant towns, villages, and cities are rooted in the once thriving coal economy. Early development of coal seams in central Appalachia wrought massive changes to the local landscape and culture, and also spurred revolutionary changes in the broader American economy, industry, and society. The subsurface engineering within coal seams that unlocked one of the nations most critical and transformative resources but also spawned a host of environmental problems, many of which continue to damage ecosystems today. One major environmental consequence of mining efforts of yesteryear is the generation of Acid Mine Drainage. This document explores the issue of acid mine drainage (AMD) at the Kempton Mine Complex (KMC) in southwest Maryland and proposes a set of engineering options to mitigate environmental damages caused by subsurface engineering of the past. In this report we explore a myriad of options ranging from a hydroelectric dam to bioremediation wetlands to sealing of streams that supply the KMC with oxygenated water. We begin with an introduction to the AMD problem, the physical setting of the Kempton area (i.e., general hydrology, geology, etc.), and the mining and land-use history of the area. We then move on to the strategies previously employed to manage and mitigate the detrimental effects of AMD in the Kempton Area and the Upper Potomac Watershed. Finally we describe: a) Bioremediation Options; b) Passive Engineering Strategies; c) Major Hydraulic Engineering (i.e., Dam); d) Chemical Treatment and Related Strategies; and e) Composites of Part or all of the above.

Organizing the FSU Student Body to Promote Science in the Local Community and Abroad (Poster, Table 19)

Presenting Student: Mikayla Spencer

Mentor: Dr. Jonathan Flood

Throughout my four years here I try to top the previous year and make it bigger and better so I decided to do something completely new: an on campus march called Bobcats for Science. This project is geared towards political (science) awareness in the community. This idea came from the Dean of Sciences: Dr. Hoffman. He gave me the challenge of organizing a peaceful protest which stemmed from recent current events. On April 22nd (Earth Day) there was a March for Science in D.C., similar to the Women's March after Inauguration Day. I thought if I could

manage to pull students from all majors together it could be a blueprint for future students to create on large scale inclusive event. I want to inspire people to go outside their comfort zones (majors) to be a part of something greater because that is what strong communities do. Hopefully, this motivates students to overcome social barriers that we as students put up ourselves. My main goal is to reach as many people as possible so when I am gone there are others to carry the torch and they can learn from my mistakes so their impact can be even greater than mine, optimistically this march stimulated that.

Oyster Rehabilitation and Water Detoxification of the Chesapeake Bay (Poster, Table 20)

Presenting Student: Alex Kirchhof

Mentor: Dr. Jonathan Flood

Crassostrea virginica, Oysters, provide exceptional benefits to the health of the Chesapeake Bay. These organisms are filter feeders, and the reefs which they make up provide habitats and food sources for local organisms. Aside from providing a food source for local fauna, *Crassostrea virginica* also provides the Chesapeake Bay with a natural water filter. A filter, that if managed effectively, can lead to the possible detoxification, and overall improvement of water quality in the Bay. There are several ways to go about this, from building specialized bayside filtration tanks, to adapting existing oyster farms to also serve as filters. To establish a baseline, water samples have been tested through ICP-AES analysis to identify common compounds in nearshore Bay waters. Water samples are expected to contain high amounts of nitrogen and phosphorus, as indicative of anthropogenic influence. The analysis will also look for possible dangerous compounds that may be present in bay waters. A study oyster filter tank is also analyzed for effectiveness, and common issues, such as source water quality and filtration mediums. Alongside this, the research aims to promote and improve the public's opinions on the benefits of oysters and their function in restoring Bay health, and oyster farming. Oysters assist in maintaining a delicate estuarine environment, acting as food sources, water clarifiers, eutrophication protection, a historically important industry, and habitats.

Potential Impacts of Natural Disasters on Voting Patterns (Poster, Table 32)

Presenting Student: Mikayla Spencer

Mentor: Dr. Francis Precht

Many factors affect how a person votes such as gender and ethnicity. A study was undertaken to explore how populations within census tracts changed voting patterns between the 2012 and 2016 presidential elections relative to a natural disaster. Hurricane Matthew was a particularly strong and destructive storm and was the first hurricane to reach category 5 strength since 2007, killing more than 1,000 in Haiti and 27 in North Carolina. The storm swept from the Caribbean along the eastern coast of the United States from September 28 through October 28, 2016, only a matter of several days before the November 8th presidential election.

A Geographic Information System (GIS) was used to compare changes in voting trends in the hardest hit states (Florida, Georgia, South Carolina, and North Carolina) between the 2012 and 2016 elections within a 100-mile buffer centered on Hurricane Matthew's track. The greatest percent gain in Republican votes from 2012 to 2016 occurred in coastal areas within the 100-mile buffer area in Florida and South Carolina, with some gains in Georgia. The greatest percent loss in Republican votes also occurred in South Carolina but in many more restricted areas within the impact zone. Democratic gains were scattered along the coast of Florida, with a few areas each in Georgia and South Carolina. The greatest percent loss in Democratic votes appears to be outside areas most impacted by the hurricane in southcentral and western Florida and in central Georgia.

Relationship Complexities between Past and Present Coal Mining Activities and Local Communities and Ecosystems: A Case Study of Kempton, MD (Poster, Table 20)

Presenting Student: Kristen Geroski

Mentor: Dr. Jonathan Flood

This project explores the complex relationship between the small community of Kempton (MD) and resource extraction industries past and present. The research is conducted by a local member of the community who documents the founding, florescence, and decline of Kempton and juxtaposes past developmental trajectory with the current economic, social, and environmental state of the community. The presence of coal beneath Kempton is simultaneously the *raison d'être* for the community, the fuel for its initial growth, the cause of its historic decline, and remains an influential factor in community and environmental dynamics. This research highlights several transcending themes in the relationship between local communities and coal extraction industries. This study of the human-environment relationship at Kempton documents the double-edged character of communities and environments driven by fossil fuel resource extraction.

Remediating Acid Mine Drainage Originating from the Hoffman Drainage Tunnel, MD (Poster, Table 20)

Presenting Student: Kathryn Bickerstaff

Mentor: Dr. Jonathan Flood

The Hoffman Drainage Tunnel is a structure that has been continuously draining water from subterranean coal mines since its completion in 1906. The water that is draining is contaminated with many constituents that are harmful to the health of the streams it flows into, the land and environment surrounding these streams, and for humans and human activities. While water has been continuously flowing for over a century, the characteristics of this water including flow rate, pH, and chemistry has varied. This poster strives to examine these changes and to discuss possible reasons for these fluctuations including changes in land

use, activities in surrounding mines, and natural changes in the geology the water is exposed to. Once these conditions are identified, a potential remediation technique will be proposed to mitigate the situation.

Silent Streams: Assessing Hydrologic and Ecosystem Functioning in the Georges Creek Watershed, MD (Poster, Table 20)

Presenting Students: Austin Owens, Benjamin Roebuck, Joseph Fallon, Dakota Hamilton, Kathryn Bickerstaff, Lake Sherrard, Forest Brach
Mentor: Dr. Jonathan Flood

This collaborative project assessed the impact of mine water hydrology and chemistry on local stream morphology and ecosystem health. We began with a reassessment of water quality, channel hydrology, and benthic communities in a stream section restored 12-years ago. Neff Run, located less than 3 miles south of the FSU Campus, flows forth from headwaters dominated by extant surface mines and Frostburg's landfill. The strategic placement of engineered fluvial devices such as cross-veins and limestone treatment beds serve to slow velocity, augment stream bedload, and improve water quality. The effectiveness of engineered fluvial structures on stream health at Neff Run is exemplified by the system's neutral pH, low dissolved load, bank and bed morphology, vegetation, and macro-invertebrate communities. After documenting a restored stream system in advanced stages of recovery, we analyze one of the more heavily impacted stream sections in the Upper Georges Creek Watershed, Winebrenner Run. Our analysis shows deterioration in water quality and a drop in ecosystem diversity with proximity to a recently reclaimed surface mine bordering the south bank of Winebrenner Run. Oxygenated water coursing through and out of the remaining coal layers in the hill have weathered and mobilized harmful concentrations of soluble metal and metalloid ions and increased the overall acidity of the stream. We document the impacts of the Acid Mine Drainage (AMD) into Winebrenner Run through macro-invertebrate survey, water chemistry analysis, and fluvial characterization. Finally, we propose a stream restoration plan for Winebrenner Run based on our findings from recently restored and nearby Neff Run.

Spatial Distribution of Heavy Metals in Arboretum Soils (Poster and Oral Presentation, Table 32)

Presenting Student: Dakota Hamilton
Mentors: Dr. Jonathan Flood, Dr. Phillip Allen, Dr. Richard Russo

The Frostburg State University arboretum is a fourteen-acre section of land located on the edge of the campus, and is a community resource for education, research, and observation. The areas of and adjacent to the arboretum have a land use history of coal mining, which has historically affected the geomorphology and chemical characteristics of the arboretum, and competes with current anthropogenic inputs from nearby extractive surface mining, roads, and extensive application of de-icing agents. At the time of this research, soil chemistry of the area

had not been comprehensively explored and analyzed. In order to quantify the extent and spatial distribution patterns of heavy metal contamination in the arboretum, 190 soil samples were collected for laboratory analysis. Heavy metal concentrations were compared to Maryland Department of the Environment (MDE) soil cleanup standards in order to determine the degree of contamination of the study area. Choropleth maps of physical and chemical soil characteristics were generated using GIS in order to perform spatial and statistical analyses in an effort to develop a predictive model of heavy metal distribution.

The Turbidity of Littoral and Lacustrine Systems on Andros and New Providence Islands in the Bahamas (Poster, Table 31)

Presenting Student: Joseph Fallon

Mentor: Dr. Matthew Ramspott

This study aims to observe the turbidity of littoral and lacustrine systems on Andros and New Providence Islands in the Bahamas. Using Landsat satellite imagery archived on the Earth Explorer online data portal, multi-temporal composites will be produced from selected Landsat images with less than 10% cloud coverage from each decade since the 1970s. The multi-temporal composites produced will provide a means for observing short term, temporary changes as well as assessing long term changes in sediment levels/activity over the last 40 years in inland water bodies and coastal waters on Andros and New Providence islands, both located between 35 and 50 miles off the south eastern coast of Florida. To supplement the observation and analysis of the historical record through satellite imagery, field observations from selected locations on New Providence Island (March 2017, Fallon, J.), which include visual assessments of water/sediment quality and Electrical Conductivity measurements to determine dissolved solids, will be used to represent the current status of sediment on the island. The multi-temporal Landsat-derived information, combined with field observations, will be used to hypothesize the cause for any observed changes in sediment levels. Generally, a correlation between tourism and sediment activity is expected. Andros Island is being used as a control, since it is conveniently included in Landsat scenes containing New Providence Island and is not nearly as developed in tourism as New Providence Island. Thus a difference in sediment activity over the last four decades between the two islands is expected.

Using Multi-Temporal Satellite Imagery to Study Wildfire Impact (Poster, Table 31)

Presenting Students: Forest Brach, Matthew Dehn

Mentor: Dr. Matthew Ramspott

The hot climate of California, coupled with its summer-dry characteristic, makes much of the state prone to wildfires. There have been many historic wildfires in California; some have cost many lives and billions of dollars in damages to property and infrastructure, while others have been purposefully set in controlled environments to mitigate potential damage. Regardless of

how these fires were set, they still leave behind scars that linger on the landscape. Using Landsat data, these fire scars can be monitored at multiple time scales in the years after the fire ravages the land to see how long it is taking local plant life to regrow. By making use of the Landsat-based Normalized Burn Ratio index in a differential calculation that considers data collected before and after the fire, a quantitative estimate of wildfire burn severity and burn recovery can be evaluated. This information, coordinated with information obtained about climate and drought conditions both before the fire and during the post-fire recovery, will aid in assessing and characterizing the conditions surrounding wildfire risk, severity, and recovery.

DEPARTMENT OF HISTORY

Frostburg State and the 1960s: A Roundtable Discussion (Oral Presentation— Roundtable)

Presenting Students: Alexis Brandon, Trace Livengood, Kaitlyn Roush

Mentor: Dr. Greg Wood

This roundtable session will explore campus culture and local student politics at Frostburg State College during the upheavals of the 1960s. Students from the spring 2017 “Frostburg State’s Archives and the 1960s” honors seminar will discuss and explore the impact of the African American civil rights movement, the women’s movement, and the anti-war movement on the Frostburg campus, as well as how students struggled to shape these wider developments. As students worked on their archival research in this course, they discovered that Frostburg students of the 1960s were deeply engaged with the tumult of the era.

HONOR'S PROGRAM

Results of Regulation in Circadian Clocks within Humanized MC3R Knock In Obese Mouse Models (Poster, Table 14)

Presenting Student: Ngozi Alia

Mentor: Dr. Greg Wood

Introduction: Obesity is a growing epidemic in the United States and worldwide. Circadian clocks maintain internal cycles of behavior, physiology, and metabolism. Disruption of clock related genes can cause an imbalance to metabolism. Children who are homozygous for a pair of missense mutations in melanocortin 3 receptor, MC3R coding sequence have an increased prevalence of obesity. Methods: Mouse genotyping, quantitative PCR, (qPCR), Gel electrophoresis. Results: Mice were euthanized and tissues were collected at 6-hour intervals beginning at the lights-on time (Zeitgeber Time, or ZT 0). Relative expression levels were measured and double plotted for a) clock, b) bmal1, c) cry1, d) sirt1 e) nampt, f) bnip3 using qPcr with β -actin and 18s as housekeeping gene controls. N=3-5/genotype/time point

Conclusion: Compared to $MC3R^{hWT/hWT}$ mice, $MC3R^{hDM/hDM}$ mice, studied under a 12h/12h light/dark cycle have mostly normal core clock gene expression rhythms in the liver, with some differences in metabolic genes that link nutritional state with circadian rhythms.

DEPARTMENT OF MATHEMATICS

CECS: Dynamical Model and Analysis (Poster, Table 16)

Presenting Student: Jacob Williams

Mentor: Dr. Justin Dunmyre

The primary goal was to develop an accurate mathematical model for a medical condition that I have, called compartment syndrome and its two variations, chronic exertional compartment syndrome and acute compartment syndrome. The model is initially based on a logistic growth equation, and all modifications and additions to that model are novel. Once creating the model, it is implemented in MATLAB, creating a program that could be used by a doctor to analyze a patient with compartment syndrome, and to predict what effect a surgical procedure could have for the patient. The final program along with the model behind it provides much more insight into the individual case for a compartment syndrome patient than what is typically available.

Optimal Stopping Problems (Poster, Table 16)

Presenting Student: James West

Mentor: Dr. Justin Dunmyre

We face many decisions in our day-to-day lives. Obviously we want to make the choice that gives us the best result, so when making major decisions, we tend to spend time collecting information on the matter. But how do you know if you have spent too much or too little time collecting information? If you wait too long or do not have enough patience, you could miss out on an incredible opportunity. The field of optimal stopping looks into solving this problem. Given the parameters of a decision, it can be mathematically determined how much time you should be spending considering your options and when you should stop and make the decision to act. Knowing the optimal time to stop can help employers find the best new hire, get you the best bang for your buck when selling your house, and it even has applications to the testing of new drug treatments.

MULTIMEDIA LEARNING CENTER

Evolving Cellular Automata: Code for a Living Algorithm (Poster, Table 33)

Presenting Student: Caleb Godwin

Mentor: Dr. Jason Speights

The goal of this research is to study convergent and divergent evolution using a cellular automaton. A cellular automaton is a representation of the evolution of a grid of cells over time due to some mathematical ruleset. Each cell in the grid has a finite number of states, typically on and off, but can contain more data as needed. Every cycle, the grid is updated to form the next generation of cells, which is wholly dependent on the previous generation. This means that the system is deterministic, and that the same initial conditions will always produce the same output. Depending on the ruleset, complex pattern can emerge and change over time, as seen in the classic cellular automaton "Conway's Game of Life." In our version, we initialize the grid with random values and modify the mathematical ruleset to search for any unknown phenomena that emerges.

DEPARTMENT OF PHILOSOPHY

Communicative Civil Disobedience (Oral Presentation)

Presenting Student: Michael Bartholomew

Mentor: Dr. Michael Mathias

John Rawls's philosophical analysis of civil disobedience has been very influential. Rawls defines civil disobedience as "a public, nonviolent, conscientious yet political act contrary to law usually done with the aim of bringing about a change in the law or policies of the government." Rawls indicates that this conception of civil disobedience applies in the context of a 'near just democracy' where the politicians are representatives of the people. Acts of civil disobedience in such a society are morally justified only if they are directed against a truly unjust law. Despite the significant influence of Rawls's thinking about civil disobedience, his analysis is inadequate for thinking about contemporary acts of civil disobedience, like those associated with the Black Lives Matter movement, the North Dakota Access Pipeline protests, and the actions of the "Black Bloc." These cases of civil disobedience raise problematic questions for Rawls's analysis: How "public" must civil disobedience be? What exactly constitutes "violence"? The nature of civil disobedience, I argue, can be better understood using a utilitarian framework, instead of Rawls's deontological framework. Once this alternative framework is clear, the moral criteria for civil disobedience will be clearer as well. I argue that the communicative aspect of civil disobedience is fundamental to its nature, and it can be morally justified only if it is likely to be effective in performing its essential communicative function.

Defending the Epicurean View of Emotions (Oral Presentation)

Presenting Student: Andrew Beachy

Mentor: Dr. Shoshana Brassfield

Should we avoid falling in love? Is it wise to be angry? Can the feeling of fear ever be good for us? Emotions are an integral part of our everyday lives, and yet we sometimes take them for granted. Have you ever been in a situation where you didn't know whether to feel sad, happy, or just confused? Questions surrounding the appropriate use of our emotional faculties have been and continue to be asked by philosophers. What part do emotions play in our efforts to lead happy and fulfilling lives? This question was a central concern for the Stoic and Epicurean schools of philosophy, both of which flourished in ancient Greece and continue to be studied to this day for their unique insights on how to live a good life. These two rival schools of thought often conflicted with each other regarding questions about emotion. The Stoics were well-known for shunning emotions for the sake of clear-headedness, while the Epicureans embraced those emotions which brought us pleasure and avoided those emotions that brought us pain. Love, anger, and fear – these three emotions are treated extensively by both the Epicureans

and the Stoics. Stoic objections to the Epicurean conceptions of these three emotions will be addressed from an Epicurean standpoint, and the key differences between Epicurean and Stoic conceptions of emotion will be explored.

DEPARTMENT OF PHYSICS AND ENGINEERING

Acoustic Array for Localization of Sound Sources (Poster, Table 38)

Presenting Students: Matthew Schinault, Andrew Politte

Mentor: Dr. Marjorie Rawhouser

Acoustic Microphone Array's (AMA) provide a unique platform for the study of signal processing. When combined with affordable software packages, microphone arrays can be used to implement discrete processing techniques such as beamforming, data filtering, and stochastic signal analysis methods. Current AMA systems are costly and can be outside the affordable price range form many institutions. As an alternative, we have investigated designs for a low cost modular interface that can be realized by students with intermediate knowledge of electronic circuits. The AMA system in development will consist of four microphone elements utilizing instrumentation amplifiers and a custom power supply. MATLAB will be utilized for the development of a Graphical User Interface (GUI) and the implementation signal processing algorithms. Signal processing techniques such as time delay of arrival estimation, spatial filtering and noise cancelling algorithms will be implemented to achieve sound source localization. Given limited budget requirements, this prototype array will show that it is possible to create an acceptable result of sound source detection, classification and localization.

Additive Manufacturing Lab: ENES100 Introduction to Engineering Design (Poster, Table 23)

Presenting Students: Gabrielle Sandy, Katelyn Hamilton

Mentor: Mr. Duane Miller

The goal of this project was to create an item that would be given out to prospective Frostburg State University Physics and Engineering students, while getting practice using the 3D printers and CAD software. The skills learned while working in the additive manufacturing lab will help prepare us for future ENES and ENME courses that require 3D printing. The goal of this project was to create an item that would be given out to prospective Frostburg State University Physics and Engineering students, while getting practice using the 3D printers and CAD software. Taking the project created in our 100 level ENES course, improvements were made to enhance the original idea. Coaster-The original idea was a simple coaster with a cut out paw print in the middle and "Frostburg State University" around the edges. Learning new skills while working in the additive manufacturing lab I was able to add more writing on the coaster and create a two color print by stopping the machine (MakerBot Replicator Mini), changing the filament, and resuming the print. Headphone Wrap-Taking the project created in our 100 level ENES course, a paw print headphone wrap was improved and printed with two colors on the MakerBot Replicator Mini. Using the skills learned from making the paw print headphone wrap a bookmark give-away item was created. This item was printed on two of the three printers we

own, and had the best outcome when printed on the MakerBot Replicator Z18. We were able to give away these bookmarks to young kids at an outreach for the Physics and Engineering department.

Additive Manufacturing Lab- ENME 272 Introduction to Computer-Aided Design (Poster, Table 23)

Presenting Students: Aili Wade, Jacob Williams

Mentor: Mr. Duane Miller

The objective of this project was to apply our basic understanding of 3D printing and tolerances in order to minimize error in prints and increase repeatability of prints. The knowledge gained from this project would be applied to the various courses at Frostburg State University that implement 3D printing as a part of the curriculum. When using additive manufacturing, the quality of the created object depends on the specific device used. The additive manufacturing laboratory at Frostburg State University utilizes three different 3D printers. These include the Catalyst Dimensions Printer, the MakerBot Z18 Printer, and the MakerBot Replicator Mini Printer. All three of these printers are considered fused deposition modeling (FDM) machines. This means that they each have a spool of a solid, plastic filament, which is then heated past its melting point and extruded through a nozzle to create a layer of the object being printed. Once the filament has been extruded, it then solidifies again after a brief period of time. When printing on the Catalyst Dimensions Printer, the dimensions of the printed object are virtually identical to those in the CAD program, with statistically negligible error. However, the MakerBot Z18 was used for this project. Although the MakerBot Z18 creates objects with dimensions that are very close to those specified in the CAD program, there is a small amount of error. When printing a single object that will not be fixed to anything else, the error is negligible. However, when printing parts to fit on, in or around something else, the error can cause problems. Depending on the intended use of the parts, this error can easily compromise the functionality of the parts. From the information we learned about the error in tolerance, we were able to begin to develop a method to approach parts with minimal tolerance error. Approaches included creating various tolerance blocks, creating detailed charts of the settings and conditions of each print, and using FEA to predict potential warping of the parts.

Analysis and Comparison of Double-Sideband Full AM Modulation and Double-Sideband Suppressed Carrier Modulation (Poster, Table 22)

Presenting Student: Ray Cooper

Mentor: Dr. Greg Latta

In this study, we compare the application and use of two common amplitude modulation techniques in order to explore the implications of using one over the other and why these circumstances can change. We also aim to quantify information and signal loss when using one over the other, and how this can impact communications. In order to accomplish this, various

circuits were made and applied to generate carrier and audio signals, modulate the signals, and transmit the resulting signal. In turn, the various input and output signals are analyzed using instruments that allow us to observe and measure signal characteristics. This information will be used to determine why one method may be used over the other, and to find situations in which one method may work while the other will not under certain parameters.

CAD Boeing 747-400 Model Redesign and 3-D Printing (Oral Presentation)

Presenting Students: Garrett Wiles, Brian Leech, Nicholas Baicar

Mentor: Dr. Julie Wang

This student project consisted of rescaled and redesigning for a CAD model of a Boeing 747-400. The description and additional details of an actual scale Boeing 747-400 can be found on www.boeing.com. The original model was given to a Computer Aided Design 200 level class as a student assignment. After showing interest in the design adjustments made to the model, the instructor recommended that a further remodeling of the 747 assembly be constructed. Rescaling the airplane to a small model created challenges in the aspects of accurate redesign, assembling with proper tolerance, and manufacturing constraints. The seven major parts including vertical and horizontal stabilizers, engine with rotating blades, wingspans, landing gears front and rear, and fuselage are modified based on appearance and proportionalities. The entire process of design for assembly and manufacture by CAD software has contributed the success of the project. Ultimately, the redesign of the Boeing 747-400 was 3D printed and provided a more accurate representation of the aircraft's appearance.

Color-Based Object Detection and Tracking for the Use of Computer Guidance (Poster, Table 23)

Presenting Student: Vincent Franke

Contributing Students: Dan Rathmann, Adam Woodley

Mentors: Dr. Marjorie Rawhouser, Mr. Ray Bosse

Many modern autonomous vehicles and robots tend to use various sensors to improve the accuracy and precision of their movements. The disadvantage to this method of improvement is that cost increases with each additional sensor system added to the technology. By using computer vision, we are able to decrease cost, and increase the accuracy of our automated quadcopter drone project. We use color-based object detection and tracking, which is a method of using a computer's camera to identify objects in real-time in the camera's pictures or videos. By using this method, we are able to improve the accuracy of various automated vehicles and robots. For our project, we explore the possibility of using this detection and tracking technique to guide an autonomous quadcopter to a specific landing target, with very accuracy and low cost compared to other methods such as GPS guidance or large sensor networks. The quadcopter is equipped with a Raspberry Pi and Navio2 flight controller shield, which is the main central onboard computer of the quadcopter. By utilizing a Zigbee radio and

Arduino board, we are able to transmit the GPS coordinates of the landing pad to the quadcopter. The quadcopter can receive the GPS coordinates, ascend to a standard hover height, and move to the target by GPS guidance. Once near the target's coordinates, the computer vision tracking software initializes, and begins to search for the uniquely colored (neon colored) target. The software, programmed in python, takes in a live video feed via the web camera, and analyses the feed frame-by-frame. It takes the frames, and converts the pixels from an RGB (Red Green Blue) color model to an HSV (Hue Saturation Value) model. By applying an HSV threshold, we are able to turn the desired color to white, and everything else to black. We then find the moment of mass, and track the center by using its relative pixel location. The software then sends commands to the Navio2 to center the quadcopter over the target, and slowly descend on to it. The system the systems goal is to increase the landing accuracy from the standard 3 to 10 meter GPS accuracy, to about a 6 inch landing accuracy.

Constructing & Testing a Michelson Interferometer Using Collimated Light (Poster and Physical Display, Table 37)

Presenting Student: Robert Lemaire

Mentor: Dr. Greg Latta

The goal of this project is to construct a working Michelson interferometer. One of the crucial components of this interferometer is the light source. We decided to use collimated light as its source because it would produce large and clear fringes for testing the interferometer. We used a refractor telescope to collimate the light. The beam that it produced was too large to use with the stock optical equipment, so in the final construction of the Michelson interferometer, we used a stock beam expander to collimate the light. When testing the interferometer, we found that we had a too significant of an error; so to reduce the error, we mounted the translation stage small angle from the path of the beam to allow the travel of the stage to be greater per turn of the micrometer.

Creating Models for the Biology Classroom Using 3D Printing Technology (Poster, Table 23)

Presenting Students: Aili Wade, Jacob Williams

Mentors: Dr. Mahdi Norouzi, Dr. Rebekah Taylor, Mr. Duane Miller

The study of Biology involves the understanding of complex molecular, cellular, and organismal structures. The interaction of molecules like DNA and proteins are key to understanding how living things work. It is often difficult for students to understand how these microscopic pieces fit together. The use of physical models as teaching tools puts a large three-dimensional model of a microscopic component into the hands of students to examine and explore. This hands-on experience is essential for learning and simply cannot be done with 2-dimensional drawings and slides. In this project, the 3-D printer in the Physics and Engineering department was used for producing 3-D models of various structures relevant to Biology. This significantly reduced the

cost of purchasing models from a commercial supplier and presented an opportunity for FSU Physics and Engineering students to become familiar with 3-D printing technology. The models are used in several Biology classes to improve learning and understanding of biological concepts.

Erosion-Corrosion Prevention (Poster, Table 22)

Presenting Students: Alanzo Chambers, Kanja Kabbany, Joseph Wilson, Andrew Klotz, Charles Cummings

Mentors: Dr. Zhen Liu, Mr. Duane Miller

During this project, erosion-corrosion was investigated to find the best method to prevent its effects in water piping systems. The results from our research show that environment and electrochemical reaction in combination with the mechanical flow of fluids, or corrosion-erosion, causes the rate of corrosion to accelerate and have the greatest effects on water piping systems. The cheapest most efficient method to address this issue seems to be the In-Place Pipe Coating method. By using Fluid Film Rust and Corrosion Preventive Penetrant and Lubricant, this creates a boundary layer within the pipe. We evaluated the efficiency of the suggested solution against industry standards using a ¾ in piping model which included a test system and control system. The result of our experiment adds to the body of work being investigated to solve the issue of erosion corrosion in in-home water systems.

Farmbot (Poster, Table 18)

Presenting Student: Zachary Hood

Contributing Student: Steve Pettie

Mentor: Dr. Marjorie Rawhouser

The Farmbot's aim is to decrease input costs therefore increasing profit margins. The Farmbot is an autonomous robot that helps farmers tackle tasks they may not have time to perform. The Farmbot is a proof of concept. It will be a smaller and less capable bot than a final industry ready bot. A fully capable Farmbot could house multiple sensors that would measure mineral levels in the soil, take pictures of trouble areas and take plant samples. The Farmbot would also have to run continuously either on battery or gas for many acres. Our prototype Farmbot is less capable. The chassis is a boxed RC car set that has been assembled and altered with electronics. The RC car houses a motor for the rear two wheels and a servo motor for steering the front two wheels. The added electronics are a Navio 2, Raspberry Pi, Arduino, actuating motor and soil moisture sensor. The bot will be powered by a battery that can run for 40 minutes. The added electronics will be used to make the bot move to desired GPS locations and move the sensor into position to take moisture readings. The moisture sensor is driven into the ground using the actuating motor. An area of about one acre will be traversed using GPS software to take and

record ten moisture readings. The information will be processed by the onboard electronics and displayed using Google maps. Google maps can read in csv file and display text given the GPS coordinates. The information will be used by the farmer to water his field more efficiently.

Heat Sink Design and Thermal Analysis Project (Oral Presentation)

Presenting Students: Zane Beal, Jon Walton, Kevin Heinz, Jacob Lichtenburg

Mentor: Dr. Julie Wang

For the class ENME 332: Transfer Processes, our team was instructed to research and design a heat sink which could dissipate energy and reduce the heat experienced by a computer chip efficiently. The team took three designs, Cylindrical Pins, Semiradial Fins, and Rectangular Fins and subjects each design to a Finite Element Analysis processes through the use of PTC Creo Parametric, a common industry-wide Computer Aided Design program. Each design was also assigned three separate materials, Steel Alloy, Aluminum 2014, and Copper, for the purpose of comparing the varies designs with the various materials and determining which combination of design and material was the most efficient. From the Finite Element Analysis and hand calculations, it was determined that the Semiradial fin design made out of aluminum was the most effective at dissipating energy and directing heat away from the computer chip found at the bottom of the heat sink. All calculations were conducted through the use of MatLab and were double-checked by careful hand calculations in order to ensure that the results are accurate in their representation of the final conclusions presented by the team.

Ink Jet Printed Carbon Nanotube Resistive Joule Heater (Poster, Table 22)

Presenting Students: Jacob Lichtenberg, Tucker Witt, Garrett Kessell, Stacey Acheampong, Jonathan Walton, Javeau Robinson

Mentors: Dr. Zhen Liu, Mr. Duane Miller

In the field of engineering, one of the most important aspects to deal with is energy efficiency. People are constantly considering new ways to make their applications more energy efficient. By utilizing carbon nanotubes, it is possible to create a highly efficient heating device, a resistive joule heater, to replace previous models of thin film heaters. Expensive to manufacture, carbon nanotube thin film heaters have shown to have rapid heat up and cool down rates and generate large amounts of heat with relatively low voltages. This makes them ideal to use for any heat applications. Ink jet printing can be used as a method of rapid circuit fabrication which would create low cost and customizable carbon nanotube resistive joule heaters. A standard home ink jet printer and commercially available ink are used to create a custom circuit that is tested for electrical and thermal properties. Making only one print of the carbon nanotube circuit will not be enough. Multiple prints will be made to overlap the ink. This will allow the carbon nanotube circuit to be more conductive. Analysis of the results and comparison to industry, standard resistive joule heaters are completed to determine the functionality of the generated heater.

Long Term Evolution Applicability in Space (Poster, Table 18)

Presenting Students: Timothy Asbury, Ivis Benavides

Contributing Student: Steven Van Epps

Mentor: Dr. Marjorie Rawhouser

The transfer of information has become a major keystone in how society operates in the modern age. Standards ensure that any device used can communicate and access information on the same network. A recent, efficient, and commonly used standard for cell phones is the Long Term Evolution (LTE) standard. The LTE standard is a combination of previous third generation cell phone technologies (3G) into an improved fourth generation communication standard (4G). The purpose of the standard is to improve data rates by increasing the channel bandwidth. The goal of the IST group's project was to determine if the LTE standard could be applicable to space communication scenarios. The problem is that objects are roughly moving 17 times faster in orbit than on Earth. These speeds are faster than previously tested for the LTE standard. This may cause too much disturbance to the data to get an effective data rate. To determine if the standard is applicable, the IST group simulated the LTE standard using MatLab, and created Doppler shift distortions to the generated signal to measure the bit error rates created. Afterward the team created potential modifications to the standard to improve these bit error rates. This paper presents the findings of the simulated space scenarios, as well as the results of the potential improvements to the LTE standard.

Modeling the Kinematics of Flocculent Spiral Galaxy NGC7793 Utilizing High Resolution Pattern Speed Measurements (Poster, Table 17)

Presenting Student: Allen Benton III

Mentor: Dr. Jason Speights

Previous authors find kinematic evidence of elliptical flows in the central region of NGC 7793 that are indicative of a bar. This galaxy, however, shows no obvious signs of a bar in the photometric data. In this poster we test the previous evidence by applying a method for measuring the angular frequency of the bar pattern, or pattern speed. Our results are consistent with a bar having a pattern speed of $.74 \pm .29 \text{ km s}^{-1} \text{ arcsec}^{-1}$. Using our measurement of the pattern speed, the kinematics of the galaxy are further constrained. We find that the bar is driving material inwards at a maximum rate of 14 km/s.

NASA CubeSat Power System Design (Poster, Table 17)

Presenting Students: Matthew Rager, Jack Beverly

Mentor: Dr. Marjorie Rawhouser

Miniature satellites, like the CubeSat, have gained popularity recently due to their ability to facilitate space experimentation at a reasonable cost. An important element of every CubeSat is

the system that stores and distributes power for the other components in the satellite. The focus of this Capstone project is to develop a strong understanding of the components and methodologies used in the design of an electronic power supply, and to then apply this knowledge to the development of a system for NASA that would be used in a typical 3U CubeSat design. This power supply will consist of primarily discrete electrical components, such as capacitors and transistors, with minimal use of integrated chips. This contrasts with more typical power supply systems, which rely heavily on computerized circuitry to manage power storage and power distribution. Another primary concern for the overall design of the power supply is efficiency, with an overall goal of 75%. A switch-mode converter circuit will be used to achieve this goal, which uses pulse-width modulation and comparator circuitry to manage DC-DC conversions. The result is regulated rails needed to power the equipment in the CubeSat operating at different voltage levels than the power source. To provide the power for this distribution section, the design relies on a combination of solar and battery power. The solar panel will both power the circuit and charge the batteries when there is an acceptable amount of solar power to do so. Otherwise, a power management circuit will assess the solar panel's current output and switch to the battery pack to power the satellite when appropriate. Lithium-Ion composition batteries are lightweight and rechargeable, which were chosen to help maximize efficiency. These cells also have a high-energy density, making them effective for a miniature satellite in terms of footprint. The complete circuit will need to ensure that the entire CubeSat always receives power at the correct regulated voltage, and that both the batteries and solar panel have their available power managed properly.

Next Generation Teflon Based Green Optical Enhancement Technology (Poster, Table 22)

Presenting Students: Kevin Heinz, Nicklaus Meneghini, Christopher Baker, Amanda Monahan, Jonathan Mukuna, Jeffrey Mello

Mentors: Dr. Zhen Liu, Dr. Rebekah Taylor, Mr. Duane Miller, Mr. Blair Knouse

As a team of innovative engineers, it is our passion to discover, design, and create new methods to make routine day-to-day functions more efficient or enjoyable for the general public. Our goal is to utilize the multi-purpose product, PTFE (Poly-tetra-fluoro-ethylene), better known as Teflon, to create a product that can be used to optically enhance the lighting for both residential and commercial applications. This is important in reducing energy consumption, becoming more economically efficient, and boosting the overall morale experienced from a daily exposure to natural sunlight. Teflon is a particularly thought-provoking material because it is classified as a plastic and has many multifunctional characteristics as well as a certain ability to be recycled, molded, and withstand extreme temperatures and other weather conditions. The project testing includes a test of optics, toxicity, and hydrophobicity. These tests will verify the safety, longevity, and effectiveness of Teflon to fulfill the need of creating an optically enhanced applicator that is cost effective, environmentally friendly, safe, and yet, simple. To extend our research we have looked into to the application of Teflon as a Next Generation material for future construction and building development to infinity and beyond!

Physics . . . IN SPACE: A Kinematic Study of NGC 2403 (Poster, Table 17)

Presenting Student: Rebecca Reimer

Mentor: Dr. Jason Speights

In this project, I seek to demonstrate a method for measuring radial inflows and outflows in the weakly barred, flocculent spiral galaxy NGC 2403. This is important for understanding the kinematic processes that occur in galaxies as they evolve, such as where the fuel for star formation comes from. A single galaxy was studied in-depth with the hope of learning more about how galaxies in general move and thus learn more about the environment of space. To accomplish this goal, I used a velocity model along with several additional models and photometric data from the Jansky Very Large Array and the Spitzer Space Telescope. The additional models were used to break the degeneracy of the velocity model. From these models, the orientation of the bar and the pattern speed were found.

Quad Copter Automation Using GPS and Color-Based Tracking Techniques (Poster, Table 24)

Presenting Students: Danial Rathmann, Adam Woodley

Contributing Student: Vincent Franke

Mentors: Dr. Marjorie Rawhouser, Mr. Ray Bosse

Multicopters and drones are a popular modern technology for various applications, from military use to personal use. With potential to improve this design for better use in specific applications, the challenge presents itself on how to achieve the desired advancement, while staying within constraints such as: cost, FAA regulations, accuracy requirements, etc. One of the common challenges addressed by various applications is the accuracy of GPS guidance, which is commonly associated with drones, and provides inadequate 3 to 10 meter accuracy due to atmospheric and environmental effects. The most straightforward approach to improve drone GPS accuracy involves high cost GPS hardware, or unreliable "error compensation" programming which is nearly impossible to get perfect due to the high amount of factors contributing to the error. Our Capstone project proposes an alternative to GPS flight assistance for landing, which may use complex programming, but would be much more reliable, and at far less cost for hardware. We propose integration of image processing into motor control to create a method for quad copter control that relies more on software than hardware. Our method for using image processing for flight landing assistance proposes a simple 3-way communication between the controller/monitor, a landing pad at the destination, and the quad copter itself, which will rely on a simple webcam and onboard computers to control its flight. The main goal of our project is for an automated flight consisting of: the quad copter communicating with the landing pad to calculate a path of travel, the drone ascending and traveling to the general area of the landing pad using GPS guided flight, and finally searching for the target and using image processing to slowly guide it onto the landing target with approximately a 1 foot accuracy. Landing pad to quad copter and GPS communication is mainly

going to be done using a ZigBee radio attached to an Arduino. Other processing, monitor communication, and controls, are implemented with a Raspberry PI equipped with a Navio2 flight controller. Our Current prototype is fully functional as a remote control quad copter, demonstrating high stability and controllability. Our image-processing program has proven to be able to effectively track a target of specific color(s). Our GPS communication and path calculation has also proven effective. We are now in the process of integrating them together to allow for automated flight.

Recyclability of Carbon Fiber Reinforced Polymers for the Automobile Parts (Poster, Table 36)

Presenting Students: James Bickling, Mike Randolph, Renee Piatt

Mentor: Mr. Scott Hemphill

Due to various economic and governmental factors the use of Carbon Fiber Reinforced Polymers (CFRP) has increased dramatically over the last few years. Although automobiles are one of the most recyclable products on the market today, there is no current methodology to reclaim the CFRP components; nor is there a market for the recycled material. This project investigated the current state of automobile recycling and proposes a practical method to reclaim the CFRP that fits within the current recycling infrastructure. Additionally, a usable product is proposed for the reclaimed and processed CFRP. Full scale processing of CFRP components and small scale recycling methodologies provided actual material that was reprocessed and then tested using ASTM and ISO-17025 laboratory criteria to validate the proposed solution.

Spic N Span Bottle Cleaner (Poster and Physical Display, Table 35)

Presenting Students: Joshua Tichinel, Kyle Maust, Dillon Russell, Kyle Chin

Mentors: Dr. Mahdi Norouzi, Mr. Duane Miller

Athletes and active individuals all encounter the tedious and time consuming problem of cleaning their dirty beverage containers. The team has developed a product that enables users to quickly and easily clean and sanitize reusable beverage containers. The final product will be similar in size to a Keurig Coffee Maker, and will be easily transported for storage. The first prototype will only allow for the ability to clean one container and its respective lid at one time. The user will refill a removable water tank and then begin the cleaning cycles with the press of a simple button. The button will control the pump and heating element to initiate the process of distributing heated water to the four nozzles. These nozzles will provide the appropriate spray angle and pressure necessary for properly cleaning the containers, while the heated water temperature will allow for the containers to be sanitized. The waste water will drain through a hose which is placed in the nearby sink or disposal area. The entire process will only take approximately one minute to complete all cycles and the container will be ready to use again. The prototype will focus on only cleaning one widely used type of beverage container,

but the final product would allow for the use of many types of containers. These future containers include coffee thermoses, reusable water bottles, and protein shake mixer bottles. By incorporating many types of beverages containers, the market size of the product will be greatly increased.

SPURS—Electronic Converter Design for a Solar Powered Uninterruptible Recovery Supply (Poster, Table 21)

Presenting Students: Gage Becker, Jerome Burgo, Adrian Jackson, Steve Sloane

Mentor: Dr. Oguz Soysal

Our team designed, built, and tested the electronic converters for the SPURS project described in the abstract of the “Solar PV” team. As the name entails, this project aims to creating and maintaining an “off the grid” power source that is mobile and cost-efficient that can be used as a power source in the event of an emergency. This product contains a battery bank charged by a solar array that will be able to provide 120-V, 60 Hz a power output. The focus of our team is designing, prototyping, and testing of the converter unit. A DC to DC converter, usually named “charge controller, is needed to charge the battery bank. The charge controller is connected between the solar array and the battery bank, allowing us to take the DC voltage obtained from the panels and flow it into the batteries to charge them. A DC to AC full bridge inverter was designed and implemented to convert the DC voltage from the batteries to the commonly used AC voltage for the load. Currently, the main source of a non-grid power supply large enough to power half a home is a common generator. These generators are loud, heavy, and require the burn of fossil fuels to provide power. We are proposing a safe, quiet, and clean solution to this problem by providing a mobile power source that can be charged naturally by the sun. Not only will it be able to placed in more locations than the generator, it will not make any noise when being used, and no additional fuel will be needed to obtain the power from the supply.

SPURS—Monitoring System for a Solar Powered Uninterruptible Recovery Supply (Poster, Table 34)

Presenting Students: Strobelle Deutou, Rany Justin

Mentor: Dr. Oguz Soysal

Our team designed, built, and tested the electronic instrumentation to collect operational data and a real-time status monitoring system for the SPURS project described in the abstract of the “Solar PV” team. In this design, the aim was to use skills and knowledge acquired during the pursuit of a Bachelor of Science Degree in Electrical Engineering. This design requires signal processing and signal analysis skills to be able to create a control system for monitoring signals received from a solar array and battery bank. The signal analysis and processing will be translated by the open source “Arduino®” software using the “Arduino Mega2560™” board. With that in mind, the design is also aimed at enhancing the customer experience. In the enhancement of the customer experience, easy to read and understand display modules were

used. This system will allow the customer to have an overview of the performance and status of the system. This design analysis is aimed at developing signal processing system, which can perform the following operations in real time:

- Acquisition of voltage and current data from different points of the system
- Determine the instantaneous generated and consumed power
- Determine the generated, stored, and consumed energy
- Monitor the system operation
- Store collected data for further analysis

After completing the initial tests, data collection, and design calculations; we built a prototype of the instrumentation hardware and software. Four design teams collaboratively assembled the comprehensive prototype and tested its overall performance.

SPURS—PV Array Design for a Solar Powered Uninterruptible Recovery Supply (Poster, Table 21)

Presenting Students: Dylan Abe, Xavier Alvarez, Brandon Bomia, Raymond Cooper
Mentor: Dr. Oguz Soysal

In spring 2017, the electrical engineering capstone project class (ENEE 408) designed an uninterruptible electric supply to power essential devices and appliances at locations where electric power is normally not available or when the electric grid power becomes unavailable for a long time because of a natural or man-made disaster. The standalone mobile unit named “SPURS” (Solar Powered Uninterruptible Recovery Supply) is powered by a photovoltaic (PV) array and contains sufficient energy storage to supply critical equipment continuously over night and during insufficient solar radiation. The unit is equipped with electronic converters and instrumentation for real-time monitoring of the system energy. The whole project is assigned to four teams to design different parts and construct a prototype with 500W installed PV power capacity. The scaled-down model can be upgraded to a higher power output. At the mass production phase, the full-scale system will be installed on a commercial trailer for ground transportation. The intended market for the product includes residential customers, farmers, small business owners, local governments, military use, parks, camping food storage and processing facilities. Our team was responsible for designing the structure to hold the PV array, wiring in compliance with the National Electric Code (NEC), protection from weather and surroundings, and ensuring the reliability and safety of the unit. The unit is designed to be suitable for ground transportation, space efficient, weather proof, and easy to assemble on site. The modular unit is intended to be expandable and manufactured using commercially available components. The PV array is designed to be foldable for easier transportation and erected on site to the optimal orientation for maximum power generation. Commercially available racking components are used for the structure holding the PV array. Wiring and protection of the final product will comply with the National Electric Code (NEC) and UL specifications. We used the “Solmetric SunEye” solar testing equipment and its dedicated software to evaluate different locations on FSU campus and determine optimal placements of the solar modules. This was done to find out how much power could realistically be expected from the solar array in

different locations throughout the year due to terrain, buildings and sun patterns. After all the testing, data collection, and design calculations we built the structure. Four design teams cooperated to assemble and test the whole prototype.

SPURS—Storage System Design for a Solar Powered Uninterruptible Recovery Supply (Poster, Table 34)

Presenting Students: Joshua Oyoo, Norman M Karamaga, Ronald Browning, Peter Wang
Mentor: Dr. Oguz Soysal

Our team designed, built, and tested the electric storage system for SPURS project described in the abstract of the “Solar PV” team. The battery bank is capable to store the amount of energy required for continuous operation of critical electric loads. The storage capacity is selected to be able to last longer than “night” time, and extended periods of insufficient solar radiation. The battery bank is charged using a commercial solar charge controller with “Maximum Power Point Tracking (MPPT)” capability and provides a suitable amount of power to the DC-AC converter designed by another team. Our team tested various charging and discharging conditions as well as the cycle efficiency of different types of batteries to determine which batteries are more appropriate for the needs of the complete system. The scope of the full-size supply system revolves around the 5kW. The maximum voltage the battery bank could be is 48V, with the minimum being 12V. The maximum current is estimated to be between 104 and 416A. The design requirement for the battery bank is to store sufficient energy to supply critical load overnight and for at least three consecutive overcast days with poor solar radiation. The system will be powered by a series and parallel combination of 12-V batteries. The complete SPURS system will be set on a 6x12 feet trailer with a payload of about 2000 pounds. The weight and the dimensions of the full-size battery bank are optimized considering the specifications of the commercial trailer. The finished product will use deep-cycle batteries suitable for solar generation systems. The scaled-down prototype will be built using smaller batteries currently available in the department. The final product will comply with the National Electric Code (NEC) , ANSI, and UL standards. Safety and reliability are additional constraints. After completing the initial tests, data collection, and design calculations; we built a scaled-down battery bank to evaluate the operation. Four design teams collaboratively assembled the comprehensive prototype and tested its overall performance.

The Effects of Curvature on Acoustic Impedance (Poster and Oral Presentation, Table 18)

Presenting Student: Jack Bluebaugh
Mentor: Dr. George Plitnik

Many factors affect acoustic impedance of waves. These factors include density of the medium, surface area of the waveform, and frequency of the waves. Another factor which may affect acoustic impedance is curvature, or whether or not the acoustic wave must travel around a

bend. This experiment was designed to test the effects of curvature on acoustic impedance. In order to test the effects of curvature on acoustic impedance a high-volume high-frequency driver was used to create acoustic waves which then were directed through a series of curved copper piping. The experiment seems to provide evidence that curvature does affect acoustic impedance. Preliminary results show that the curvature raises the acoustic impedance. These results may mean that further bending or curling would increase the acoustic impedance even further.

The Spiral Arm Pattern Speed for Different Components of the Interstellar Medium in NGC 3184 (Poster, Table 17)

Presenting Student: Jacob Lichtenberg

Mentor: Dr. Jason Speights

We test for a rigidly rotating spiral pattern in NGC 3184 by applying different versions of the Tremaine-Weinberg method to CO, H α , and HI intensity and velocity data sets. Those data sets produce different results when using the original method, which assumes a single value for the pattern speed. The result for the CO data is the largest, and the result for the HI is the smallest. This is explainable if the pattern speed decreases with increasing radius by noting that the extent of the CO data is the smallest in radius, whereas the extent of the HI data is the largest. This interpretation is supported by the results for the general method, which shows the same decreasing trend with increasing radius for all three data sets. All three data sets also show evidence for an approximately rigid pattern in the central region, extending to where the two-arm pattern transitions to multiple arms. It is unclear, however, if this is due to bias from the regularization used to obtain those results. We are unable to find evidence for rigid rotation of the pattern beyond this transition. The results for the outer region closely follow the speed of the material, consistent with a shearing pattern, or multiple overlapping modes. The results rule out the existence of a single, rigidly rotating spiral wave mode in NGC 3184. They also demonstrate the possibility for bias when applying the original method to different types of data. Our findings contribute to a growing body of evidence for the existence of galaxy spiral arm pattern speeds that decrease with increasing radius.

Viability of Additive Manufacturing to Reduce the Weight of Ceramic Armor Strike Plates (Poster, Table 36)

Presenting Students: Travis Wiles, Fatih Elmali, Nathan Compher

Mentor: Mr. Scott Hemphill

The current design of body armor employed by military and law enforcement includes the use of ceramic plates that are inserted into the Kevlar carriers/vests to raise the level of ballistic protection too include high velocity rifle rounds. By the nature of the high strength ceramic material the plates are very dense and thus heavy. Current manufacturing processes limit the design to that of a solid slab of ceramic material. This project explores the viability of using

additive manufacturing techniques (which currently do not exist) to introduce an internal architecture that would be equally as effective as the current design, but lower the overall weight of the plate. Both numerical and full scale modeling methods were employed to validate the concept.

Window Wizard (Poster and Physical Display, Table 24)

Presenting Students: Isaac Robinson, Zane Beal, Christopher Santana, Levi Hartsock, Jairus Chaney

Contributing Student: Jacob Williams

Mentors: Dr. Mahdi Norouzi, Mr. Duane Miller

One of the most common tenets taught to students of engineering is that one should incorporate and construct ideas with the intention of improving the lives of those throughout society. Through surveys conducted by the team, it has been shown that owners of property, specifically homeowners and landlords, experience a common issue of having opened windows during unfavorable circumstances (i.e. rain, the wind, too hot/cold, and high humidity.) Being unable to close a window during any of these conditions could result in costly property damage for the owner. Thus, the team has developed a device that monitors environmental conditions, through the use of an Arduino Uno and electrical sensors, which operates a motor that opens/closes a window based on the atmospheric surroundings. The team takes a unique approach to this project through the incorporation of various sensors and the Arduino platform into the design, allowing a greater control of the device, a simpler design, and customizability for the user.

DEPARTMENT OF PSYCHOLOGY

Critical Thinking and Paranormal Belief in Self-Avowed Skeptics and Believers (Poster, Table 7)

Presenting Students: Michael McTaggart, Alexis Young

Contributing Students: Florent Grain, Krystal Rowan

Mentor: Dr. Alan Bensley

Background: Studies investigating whether critical thinking (CT) skills are related to paranormal belief have produced mixed results. For example, Alcock and Otis (1980) and Morgan and Morgan (1998) found that skeptics scored significantly higher on the Watson-Glaser Critical Thinking Appraisal (WGCTA) than believers. However, Hergovich and Arendasy (2005) found no significant correlation between scores on the Revised Paranormal Belief Scale (RPBS) of Tobacyk (1988) and the WGCTA. Burke et al. (2014) found that students receiving CT instruction on paranormal beliefs showed no significant increase on the WGCTA but a reduction in RPBS scores. To further examine the relationship between CT instruction, CT skills and paranormal beliefs, we gave beginning psychology majors a CT argument analysis test and a new measure, the Paranormal, Superstitious, and Magical Belief Inventory (PSMBI) of Bensley (2016). We expected that CT-instructed students would significantly improve their scores on the CT test and decrease their PSMBI scores after instruction. We also expected a number of self-reported believers in the paranormal to become self-reported skeptics. Method, Participants: Participants included 34 undergraduates from a beginning CT psychology course at a small, mid-Atlantic university. Participants received course credit for participating. The mean age of participants was 20.91 years (SD = 5.42), and most were female (76.5%), sophomores (47.1%), and white (48.5%). Measures and Procedure: Pre-test and post-test measures of paranormal beliefs and CT skills were completed (with other measures) as a department assessment during students' regular classes. To test paranormal belief, we administered the PSMBI, containing 40 self-report items (i.e., more than the RPBS) assessing common paranormal, superstitious and magical beliefs. Participants reported their level of agreement with each statement from 1 (Strongly Disagree) to 7 (Strongly Agree) on each three subscales: Paranormal, Superstitious, Magical/Witchcraft. Participants also self-reported "Yes/No" on three different questions; "Do you consider yourself a believer in magic, paranormal, and/or superstitious?" To assess CT skill, participants completed Analyzing Psychological Statements (APS), a 20-item, multiple-choice test that requires distinguishing arguments from non-arguments, finding assumptions, and identifying kinds of evidence and their strengths and weaknesses. The APS has adequate test-retest reliability (Bensley, Lilienfeld, & Powell, 2014). Results and Discussion: A paired samples t-test found that post-test APS scores (M = 12.45, SD = 3.79) were significantly higher than the pre-test APS scores (M = 8.91; SD = 3.43), $t(32) = 5.65$, $p < .001$, $d = 0.98$. Likewise, post-test PSMBI scores (M = 141.76, SD = 33.18) were significantly lower than the pre-test PSMBI scores (M = 143.71; SD = 31.48), $t(33) = 2.16$, $p < .05$, $d = 0.38$. Finally, a chi-square analysis on self-reported believers on the pre-test found significantly more changed to self-reported skeptics on the post-test (71.4%) than remained believers (28.6%), $\text{Chi-Squared} = 3.86$, $p = .05$. As

predicted, students receiving CT instruction showed significant improvement in their CT skill and a significant, but small, decrease in paranormal belief. However, these findings, although encouraging, should be replicated with more students and a control group who do not receive CT instruction.

Examining the “Sameness/Difference” Concept in Cotton-Top Tamarins (*Saguinus oedipus*) (Poster, Table 29)

Presenting Students: Spencer Schading, Amanda Miller, Kristina Kuss, Ashley Barfield, Kristofer Ervin, Seth Dawson, Aimee Lewis

Contributing Students: Krystal Rowan, Taylor Bailey, Maya Ellis

Mentor: Dr. Erica Kennedy

The ability to understand the relational concept of “sameness” and “difference” has been argued to be limited in species other than humans. The purpose of this study was to examine the capacity of cotton-top tamarins (*Saguinus oedipus*) to learn a relational rule in order to solve a problem to obtain a reward. The task involved hiding food under one of two same size cups. There were six cups representing “difference” that displayed four different colored shaped stickers, while there were six cups representing “sameness” that displayed the same color and shape stickers. One “sameness” cup and one “difference” cup was presented with the cup representing “sameness” always hiding the food reward. A random number generator was used to allocate cups to either the “right” or “left” position on a platform. The specific cups used for each trial were also randomly assigned. At the start of each trial, a partition was used to block the monkey’s view of cup placement and where the food reward was hidden. For each trial the monkey searched under one cup. If the cup selected was the “sameness” cup the monkey received the food reward. However, if the “difference” cup was selected the monkey received no reward, and was shown where the reward was located. If the monkey selected the “difference” cup the trial was repeated a second time. We analyzed the proportion of times that the monkeys chose the “sameness” cup compared to levels predicted by chance. We predicted that if the monkeys were able to select the correct cup at levels above chance, then this would provide evidence of cotton-top tamarins using the relational concept of “sameness”.

Self-Assessment of Paranormal Belief, Superstition, and Magical Thinking in Psychology Students (Poster, Table 7)

Presenting Students: Alexis Young, Michael McTaggart

Mentor: Dr. Alan Bensley

Summary: A largely neglected question about the assessment of paranormal belief concerns whether people who self-identify as believers score higher on measures of paranormal belief than self-identified non-believers. We designed a new 40-item, self-report inventory, the Paranormal, Superstitious, and Magical Belief Inventory (PSMBI), to sample more paranormal beliefs with more items and more items expressed in a negative (reversed) format than the

commonly used Revised Paranormal Belief Scale (RPBS) of Tobacyk (2003). Because few studies have examined respondents' labeling of themselves as believers, we asked students to identify themselves as either a believer or a non-believer in the paranormal overall, and more specifically in superstition, and in magical thinking. We expected that students who described themselves as believers in the paranormal would score higher on the PSMBI overall than non-believers, and that those describing themselves as superstitious would score higher on the PSMBI superstition/luck subscale and that those describing themselves as believers in magical thinking would score higher on the PSMBI magical thinking/witchcraft subscale.

Method, Participants: Participants included 105 undergraduate students recruited from two beginning psychology course at small, mid-Atlantic university as part of a psychology department assessment in the 2016 academic school year. Participants received course credit for their participation. The mean age of participants was 20.74 years, and most were female (72.9%). Seniors accounted for 11.2% of the total, freshmen 27.1%, sophomores 31.8%, and juniors 25.2%. **Measures and Procedure:** The PSMBI consists of 40 questions containing common paranormal, superstitious and magical beliefs on which participants reported their level of agreement ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) on each of the paranormal items that form three subscales: Paranormal, Superstitious, Magical/Witchcraft. Participants were also asked to self-report "Yes/No" on three different questions; "Do you consider yourself a believer in magic, paranormal, and/or superstitious?" The first and fourth authors administered the PSMBI and other measures during regularly scheduled classes, requesting that students report honestly. **Results and Discussion:** After recoding the PSMBI negative items, we conducted independent samples t-tests comparing means of self-identified believers versus non-believers on the PSMBI and its subscales. The comparison of believers to non-believers on paranormal belief overall from the PSMBI was significant, $t(62) = 6.10, p < .001, d = 1.53$, with believers scoring significantly higher ($M = 159.45, SD = 25.90$) than non-believers ($M = 114.48, SD = 33.16$). Likewise, believers in superstitious had significantly higher superstition subscale scores, $t(63) = 7.33, p < .001, d = 1.86$, with believers higher ($M = 31.81, SD = 8.30$) than non-believers ($M = 16.97, SD = 7.78$). Finally, believers in magical thinking scored significantly higher than non-believers on the PSMBI witchcraft/ magic subscale, $t(61) = 4.23, p < .001, d = 1.60$, with believers scoring higher ($M = 28.88, SD = 4.67$) than non-believers ($M = 17.56, SD = 7.32$). Our results show that students who self-identify as believers in the paranormal, superstition, and magical thinking scored consistently and substantially higher than non-believers on the PSMBI subscales measuring those kinds of belief.

DEPARTMENT OF SOCIAL WORK

Academic Success and Participation (Poster, Table 14)

Presenting Student: Karissa Brenneman

Mentor: Dr. Terry Russell

Research in the pursuit of best practices and evidence for those practices is a vital function of social work as a profession. Additionally, social workers are expected to evaluate their own practice. To that end, social work majors are required to engage in a single system design study during the Basic Research Methods course. This exploratory study examines the relationship between participation in the class process and academic success. Class process includes attendance, readings, and participation during lecture sessions. Academic success was measured by weekly quizzes given on the week's lecture material. The visually significant results suggest a positive association between attending class and the outcome of quiz performance.

DEPARTMENT OF VISUAL ARTS

What is the Fate of the Visual Arts in the Trump Whitehouse? (Physical Displays, Tables 5, 6, and 12)

Presenting Students: Rebecca Ayres, Blake Barber, Shelby Brothers, Rondal Curtis, Alexander George, Zachary Johnson, Maria Luzon, Preston McLaughlin, Anthony Riggio, Rhiannon Ritenour, Rachael Thompson

Mentor: Ms. Judith Dieruf

Advanced Painting students this semester are researching and responding to the place of Visual Art in the Trump Presidency. Recently a high school student's painting of racial protest hung in the Capital was censored; a Federal lawsuit has been filed on the student's behalf. Major galleries provide artworks each term for the White House to suit the taste of the President. Obama's selected work has been removed, but to date President Trump has replaced the drapes with gold and moved a few sculptures. He is planning to eliminate funding for the National Endowment for the Arts. It remains to be seen what the fate of the Visual Arts is in the Trump White House, but students are submitting work that presumably would or would not hang this term.

WOMEN'S STUDIES

The Ugly Truth: Women's Participation in Politics and the Gender Gap in Nigeria (Oral Presentation)

Presenting Students: Ashley Savage, Victoria Ozoms

Mentor: Dr. Julie Hartmann-Linck

Women play an important role in society today. A majority of the population consists of women; they also play a vital role in society as originators of prosperity. In many ways women have contributed to the national development of Nigeria, by controlling occupations such as food processing, pottery making, trade, cooking and many more. Nigerian women make up 49.4 percent of Nigeria's population. But still, society continues to deprive them of the privilege of being a part of the political atmosphere by taking away the chance to actively participate in decision-making. Just like the United States there is also an issue like gender gap in Nigeria. Nigerian women have faced a lot of problems when it comes to politics and equality of wages. As usual, there is discrimination from men and other influences of the society in almost every aspect against women. This study is aimed at gaining insight on the factors involved that affect participation from Nigerian women in politics and along with factors influencing the gender gap.

Women and Incarceration (Poster, Table 13)

Presenting Student: Linsey Ngyele

Mentor: Dr. Julie Hartmann-Linck

Incarcerated women have always presented a special set of circumstances and needs. Women are the fastest growing segment in the United States Department of Corrections. Because women's incarceration rates have become so high, prison officials, researchers, and social service workers have started taking a look at the particular physical, emotional, and social needs of incarcerated women and using these to understand what approach works to decrease recidivism for female offenders. After a lengthy history of trial and error, and often times abusive situations, prisons have finally started to implement programs that are unique to the needs of women. These programs include community based, holistic approaches to drug addiction treatment and abuse counseling, as well as nursery programs that allow mothers and babies to stay together during incarceration. These programs have been shown to reduce the recidivism rate and have a positive outcome on the lives of female offenders, their families, and their communities.

CLAS Undergraduate Research Working Group

Karen Keller, Biology (Chair)
Phillip Allen, Geography
Matthew Crawford, Chemistry
Judith Dieruf, Visual Arts
Justin Dunmyer, Mathematics
Robert Hein, Visual Arts
Mark Hughes, Mathematics
Erica Kennedy, Psychology
Jean-Marie Makang, Philosophy
Eleanor McConnell, History
Jill Morris, English
Benjamin Norris, Chemistry
Xunyu Pan, Computer Science and Information Technologies
Elesha Ruminski, Communications
Terry Russell, Social Work
Rebekah Taylor, Biology

**Ahmad Tootoonchi, Interim Provost
(Opening Remarks)**

Cindy Troutman, Executive Administrative Assistant, CLAS
Shannon Gribble, University Advancement

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Additional funding for the Symposium was provided by The FSU Foundation. In addition, many projects featured in the Symposium were funded by Foundation grants, Faculty Development grants, PELEF grants, and the Student Government Association.

We would like to thank the staff of the Print Shop, the Lane Center, the Physical Plant, and Chartwells for all of their assistance in the preparation of the Symposium.

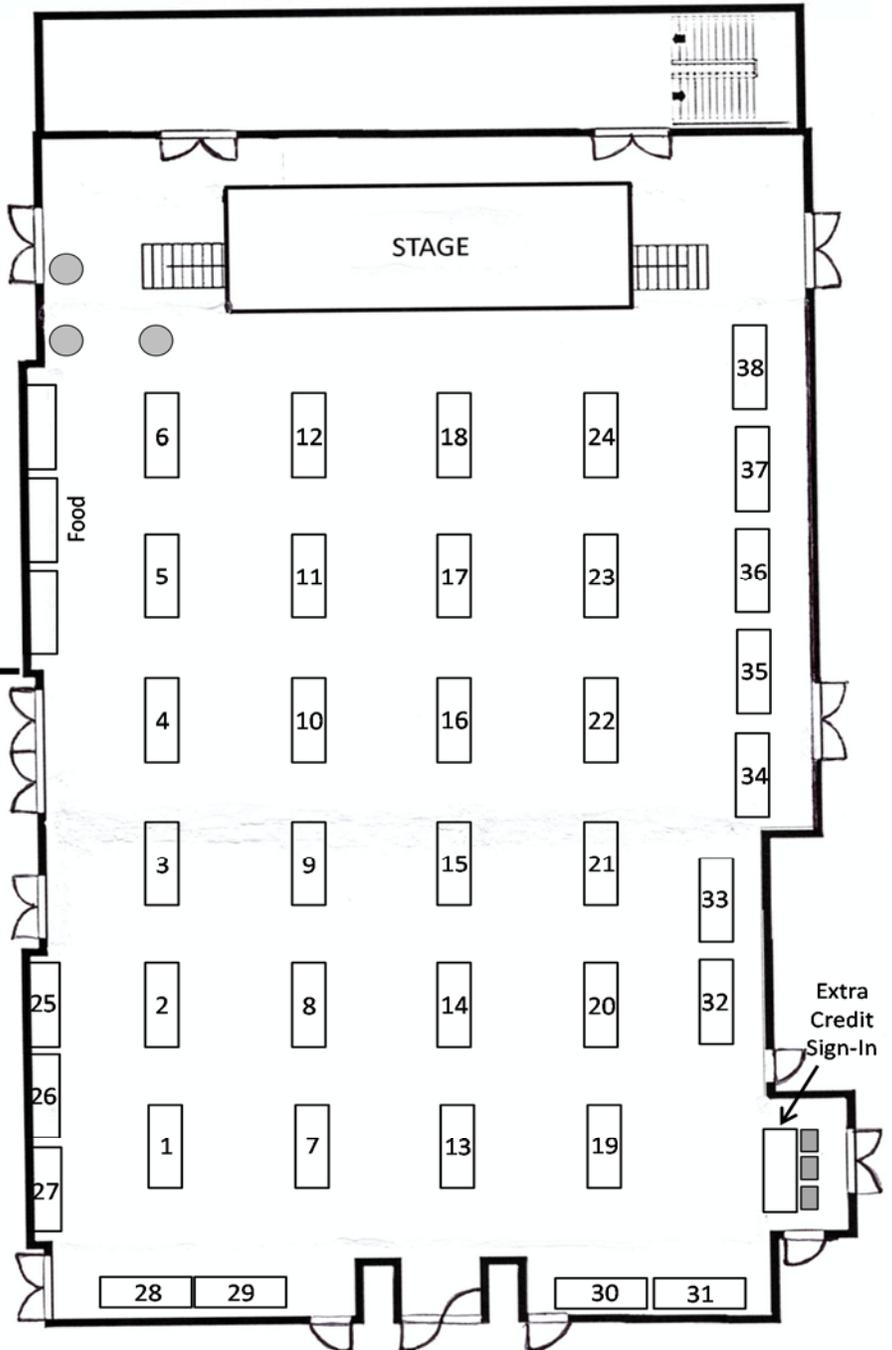
Most importantly, we would like to thank the Students and their Faculty and Staff Mentors for making the Symposium possible.

College of Liberal Arts and Sciences Undergraduate Research Symposium 2017

Alice R. Manieur Assembly Hall (ARMAH)

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Information

Registration

**Oral Presentations
are in Rooms 108,
109, 110, 111, and
113**



LANE CENTER ROOM 108	
11:30-12:00	Romantic Relationships and “Situationships”: College Students Relationship Construction on Social Media and in the Public Sphere <i>Kaylah Calvert</i>
12:00-12:30	Communicative Civil Disobedience <i>Michael Bartholomew</i>
12:30-1:00	Every Color has a Note <i>Andranay Peyton, Courtney Sinkler, Jermykl Spencer, Tyler Vaughn</i>
1:00-1:30	Defending the Epicurean View of Emotions <i>Andrew Beachy</i>
1:30-2:00	The Effects of Curvature on Acoustic Impedance <i>Jack Bluebaugh</i>

LANE CENTER ROOM 109	
11:30-12:30	Frostburg State and the 1960’s: A Roundtable Discussion <i>Alexus Brandon, Trace Livengood, Kaitlyn Roush</i>
12:30-1:00	A Millennial Engagement: Bernie Sanders and Political Campaign Communications in the Digital Age <i>Nicole Leighty, Eddy Adams, James Kirk</i>
1:00-1:30	Distinguishing Black Cohosh from Look-Alikes <i>Laura Price</i>
1:30-2:00	TEDxFrostburgStateU: Reality or Fiction? <i>Patrick Broussoul</i>

LANE CENTER ROOM 110	
11:30-12:00	Down in the Valley: Subsidence of Historic Coal Mines in the Georges Creek Basin, MD <i>Olivia Lewis</i>
12:00-12:30	Development of an Undergraduate Peptide Synthesis Lab for Organic and Biochemistry Courses <i>Brian Day, James Larrimore</i>
12:30-1:00	Spatial Distribution of Heavy Metals in Arboretum Soils <i>Dakota Hamilton</i>

LANE CENTER ROOM 110	
1:00-1:30	Increasing the Sustainability of a Threatened Tree Species, Butternut (<i>Juglans cinerea L.</i>), for Use in Traditional Dyes for Cherokee Basketry <i>Madison Lawrence, Olivia Goldstein, Andrew Wall</i>
1:30-2:00	Nativescaping Frostburg: Creating Sustainable Landscapes on Campus <i>Amanda Beeman</i>

LANE CENTER ROOM 111	
11:30-12:00	<u>Panel: Controlling Substances: Medical, Recreational, and Workplace Contexts</u> How Do We Stop the Pain? Preventing Impaired Operators in the Transportation Industry <i>John Shaffer</i> Marijuana Legalization: An Inside Look into the Thoughts of Frostburg State University vs The Nation <i>Clyde Burke-Coursey</i>
12:00-12:30	The Ugly Truth: Women’s Participation in Politics and the Gender Gap in Nigeria <i>Ashley Savage, Victoria Ozoms</i>
12:30-1:00	<u>Panel: Gender in the Workforce</u> Challenging the Glass Ceiling: Women in Sports Media and Public Relations <i>Deborah Aiyegbusi, Brandon Reitz</i> The Future of Female Infantry in Marine Corps Battalions <i>Jacob Schmid</i>
1:00-1:30	A Case Study in Small Group Communication: Creating a PSA on the Local Opioid Addiction Crisis <i>Kambawamukor Harris, Stephen Owings, Renee Poffenberger</i>
1:30-2:00	Funding After-School Programs: A Stepping-Stone for Opening More Opportunities for Generations to Come <i>Harden Crosson III, Chazz Bradner, David Diggs</i>

LANE CENTER ROOM 113	
11:30-12:00	<p><u>Panel: Sustainable Frostburg</u> Fracking is Banned in Frostburg: The Big Picture <i>Bethany Maglidt, Erin Kroder</i> Creating a Sustainable Plate: How Frostburg Grows Makes It Easy <i>Rosemary Wehberg</i></p>
12:00-12:30	<p><u>Panel: Current Controversies in Sports Culture</u> Why D1 Athletes Shouldn't Be Paid <i>Patrick Bell</i> Am I Safe, or Do I Have Space for These Jordan's? Analysis of the Worth of Air Jordan's and the Violence and Entrepreneurship the Brand Has Caused <i>Brandon Roberson</i></p>
12:30-1:00	<p>Don't BAN Thin, Love the Skin You're In: How B.A.N (Beautiful and Natural) Models Can Help the Modeling Industry <i>Shantia Hamler, Taishi Cornish</i></p>
1:00-1:30	<p>CAD Boeing 747-400 Model Redesign and 3-D Printing <i>Garrett Wiles, Brian Leech, Nicholas Baicar</i></p>
1:30-2:00	<p>Heat Sink Design and Thermal Analysis Project <i>Zane Beal, Jon Walton, Kevin Heinz, Jacob Lichtenburg</i></p>