COLLEGE OF SCIENCE AND TECHNOLOGY
2019 Spring Poster Display

Biology

1. **Faith Carranza,** (Mentor: Dr. Jonathan Stoltzfus, Biology)
   Funding: Neimeyer-Hodgson Research Grant, Student Grant for Research and Creativity
   Steroid Hormone Biosynthesis by DAF-9 in Nematodes
   Humans infections with *Strongyloides stercoralis* can be fatal, and current chemotherapeutics are ineffective. New potential drug targets include proteins that regulate parasite development. We hypothesize that the gene *daf-9* encodes a cytochrome P450 protein that synthesizes a steroid hormone called dafachronic acid (DA). DA promotes development into free-living adulthood, while lack of DA results in development into infectious larvae. We are performing rapid amplification of cDNA ends to amplify and sequence the beginning 5' sequence and the ending 3' sequence of the *daf-9* gene in *Rhabditophanes*, a free-living relative of *S. stercoralis*. Using the 5' and 3' sequence, we aim to characterize the *daf-9* gene structure and clone it into an expression vector that will be used in future gene function studies. A better understanding of how parasite development is regulated is crucial in creating effective chemotherapeutics.

2. **Patrick Clemens,** (Mentor: Dr. John Wallace, Biology)
   A Study of the Economic Viability of the Maryland State Park System: A Benefit-Cost Analysis
   Benefit-cost analyses are done by the National Park System and federal government to determine value of policies and programs, but are rarely done at the state or local level. The goal of this project was to do such an analysis at the state level for the Maryland Park Service. Upon completion, the economic viability of the park system in Maryland could be determined. The objectives of the project were to analyze the costs of operating the state park system to determine the taxpayer burden as well as ascertaining the economic benefit of state parks to Maryland's public. To achieve the stated objectives, official state budgetary documents and economic reports were analyzed, in addition to studying non-use values of the park such as wildlife conservation. The study determined that while the state parks are expensive for the state to run, the positive economic and natural impacts that state parks provide to the state are much higher than the cost of operation.

3. **Mireya Lopez Jimenez, Sierra Miller,** (Mentor: Dr. Carol Ely Hepfer and Dr. Jonathan Stoltzfus, Biology)
   Funding: Biology Student Investigator Grant, Neimeyer-Hodgson Research Grant, Student Grant for Research and Creativity
   Differential expression of alternatively spliced twitchin and kettin isoforms may affect contractile properties of squid muscles
   Significant differences exist in contractile properties of various squid muscles, but underlying molecular mechanisms are not understood. Twitchin and kettin are large proteins that may control muscle elasticity and extensibility. Preliminary research suggests that squid muscles express different isoforms of twitchin and kettin as a result of alternative messenger (m)RNA splicing and this may be crucial in regulating muscle function. Our goal

was to determine which isoforms are produced in squid and to establish if a correlation exists between muscle contractile properties and the isoforms expressed. Continuous cDNA composites including all exons possible for each gene were created and used to assemble genomic scaffolds that served as references to analyze RNA-Seq data using bioinformatic software. Results indicate that differential exon expression alters the structure of these proteins and impacts contractile properties of obliquely striated muscles in invertebrates.

4. **Liam McTigue,** (Mentor: Dr. Christopher Hardy, Biology)
Funding: Biology Student Investigator Grant, Keever Biology Research Training Fund, Student Grant for Research and Creativity
Creek Lodge Flora Project
The purpose of the Creek Lodge Flora Project is to catalog and voucher as many unique plant species as possible on Millersville University's newly acquired Creek Lodge Property. The inventory will be accomplished by cataloging and mapping of each unique species on the property, and will be made available to the University community via the creation of a custom portal on NatureAtlas – a biodiversity informatics website created locally by Millersville's James C. Parks Herbarium (www.natureatlas.org). All species in the inventory will be vouchered by preserved specimens of plants deposited in the James C. Parks Herbarium.

It is important to catalog and voucher the unique species within this property for several reasons. The first of which is to provide accurate historical records of the plants that grow there so future students and researchers have a baseline for future studies. The second reason is for educational purposes: a floristic inventory of this property will provide educators and students with a checklist of which plants they should expect to see there; this will be useful for different field activities in courses such as BIOL 100 (Fieldtrip to the Bush activity), BIOL 221 (various lab activities), BIOL 325 (regular on-campus fieldtrips), BIOL 343 (various lab activities which involve the collection or identification of plants) and possibly even courses such as ornithology (BIOL 346). Lastly, a floristic inventory can provide a baseline for assessing the health and quality of the ecosystem of the Creek Lodge Property: rare or otherwise threatened species can be identified for protection and exotic invasive species can be located and targeted for removal.

As of April 2019, 133 unique plant species have been identified on the property, nine of which are new records for Lancaster County. Of the 133 species, 72 are native and 61 are exotic.

5. **Cross Truesdell,** (Mentors: Dr. John Hoover, Biology and Dr. Kevin Robinson, Mathematics)
Funding: Biology Student Investigator Grant
The Effects of Test Sequence in a Battery of Behavioral Tests with C57BL/6J Mice
The objective of this study was to determine whether the performance of mice in a battery of three behavioral tests was affected by the sequence of the tests. The test battery included the open field test (OFT), elevated plus maze (EPM), and tail suspension test (TST). Young adult, female mice were randomly assigned to one of six treatment groups. The sequence of the tests varied for each group. The behavioral parameters measured in each test included those reported in the scientific literature, such as the time spent in the center of the OFT box, the time spent on the open arms of the EPM, and immobility time in the TST. Statistical analyses (ANOVA and Tukey's t-tests) were performed to detect any treatment effects. However, the results revealed no significant differences among the

treatment groups for the behavioral parameters examined. Therefore, we conclude that the sequence of the tests in the test battery was not an important factor that affected the animals' behavior.

6. **Morgan Wagner,** (Mentor: Dr. Judith Cebra-Thomas, Biology)
Funding: Neimeyer-Hodgson Research Grant
Expression of Neural Plate Border Specifier Pax3 in Slider Turtle Trachemys scripta)
During vertebrate development, neural crest cells (NCCs) migrate away from the neural tube and form craniofacial bone. Unlike other vertebrates, turtles have two waves of NCC migration, instead of one. Late migrating NCCs are implicated in forming the plastron, the ventral portion of the shell. The goal of this project was to examine how NCCs enter dormancy, become active for the second wave of migration and form bone. This was observed through the characterization of Pax3 expression. Pax3 is a marker expected to be expressed in NCCs during the dormant stage of migration. Immunofluorescence of NCCs showed that Pax3 is expressed throughout NCC migration. Additionally, PDGFRα was observed to be expressed in late migrating NCCs, which supports that these cells form osteoblasts. Confirmation of an unused population of NCCs in the neural tube between waves of migration, and their ability to form osteoblasts, helps in understanding the mechanisms controlling migration and plastron formation.

Chemistry

7. **Kyra Brakefield,** (Mentor: Dr. Edward Rajaseelan, Chemistry)
Funding: Ms. Karen A. Murley Research Fund
New Green Chemistry Catalysts
New triazole and imidazole based N-heterocyclic carbene complexes of iridium and rhodium have been synthesized and characterized using multinuclear NMR and x-ray diffraction. The cationic complexes show good catalytic properties in the reduction of C=O and C=N bonds.

8. **Aubrey Davis,** (Mentor: Dr. Maria Schiza, Chemistry)
Funding: Neimeyer-Hodgson Research Grant, Student Grant for Research and Creativity, South Eastern Pennsylvania Section of the American Chemical Society Travel Grant
Using SERS to Characterize Materials in Cultural Artifacts
Silver and gold nanoparticles can be used to characterize pigments and materials found in cultural artifacts. Nanoparticles in combination with Surface Enhanced Raman Spectroscopy (SERS) are used to analyze both dry pigments as well as colorants extracted from easily obtained artwork. SERS utilizes noble metal nanoparticles to enhance signals obtained by standard Raman Spectroscopy, enabling analysts to use a much smaller sample size. This renders SERS a virtually non-destructive method as opposed to other forms of analysis which is especially critical when sample preservation is important. It was found that this method of analysis works best on organic pigments such as alizarine, while pigments derived from mineral sources, such as malachite, gave no useful signal. Currently, studies are being done to identify peaks in the Raman spectra and correlate them to functional groups in the pigment structure in order to potentially identify the composition of materials in physical samples.

9. **Froylan Fernandez,** (Mentor: Dr. Steven Bonser, Chemistry)
Funding: College of Science and Technology UG Travel Fellowship, Neimeyer-Hodgson Research Grant, Student Grant for Research and Creativity
Physical Organic Study of Ring Strain on Yellow Dye Containing Couplers
High Dye Yield (HDY) couplers are partial dyes that, upon reaction with an oxidized color developer, release a high-extinction yellow dye. Relative to magenta and cyan dyes, yellow photographic dyes have low molar attenuation coefficients. Evaluating the yellow dye portion of the HDY coupler with enhanced optical and physical properties may, therefore, render these materials attractive for bioimaging applications. This research is focused on better understanding the effects of conformational torsion on the absorption properties of (E)-2-(5-(tert- butyl)benzo[d]oxazol-2-yl)-3-(4cyclopentylamino) phenyl)acrylonitrile by varying the ring size of the bicyclic amino-ketone portion of the yellow chromophore. In order to probe the changes in electronic and physical properties, ultraviolet-visible and fluorescence spectroscopy will be employed. Amplification of the yellow dye may extend its application to new imaging systems such as cell staining. The development, synthesis, and evaluation of (E)-2-(5-(tert- butyl)benzo[d]oxazol-2-yl)-3-(4-(cyclopentylamino)phenyl)acrylonitrile derivatives as enhanced yellow dyes are presented.

10. **Rachel Laughlin, Gillian Good,** (Mentor: Dr. Steven Kennedy, Chemistry)
Funding: Student Grant for Research and Creativity
Studies of Inverse Electron Demand Diels-Alder Reactions on Substituted Imines
Nitrogen and oxygen containing heterocycles including benzopyrans are relevant due to their wide variety of biological applications. 4-Aminobenzopyrans and their derivatives are of particular interest as they interact with potassium channels, making them valuable anti-hypertensive and anti-ischemic drugs. A recent study by Kumar *et al*. reports an inverse electron demand Diels-Alder reaction of substituted salicylimines and 2,3-dihydrofuran. Our initial goal was to optimize this reaction through screening a variety of commercially available acid catalysts. We used course-based undergraduate research to help expedite reaction optimization; it allowed us to quickly screen multiple reactions, and obtain preliminary data, in an advanced laboratory setting. Our long-term goal is to explore the substrate scope of this reaction, utilizing a small library of substituted imines previously synthesized in our lab.

11. **Michael Minich,** (Mentor: Dr. Daniel Albert, Chemistry)
Funding: Student Grant for Research and Creativity, SEPSACS
Temperature Controlled Sample Holder for Reimagining the Iodine Absorption Experiment
It is common for an undergraduate chemistry student to perform verification experiments to confirm the hypothesis given to them by a professor. This inhibits students from developing inquiries of his/her own. Many professors typically add specific questions to an experimental result sheet or report guide asking the student to think about variables that the experimenter could control. This is only somewhat effective, because the student only thinks about this after the experiment has been completed and will not always be able perform the experiment with controlled variables due to time constraints, resource availability, and the like. We strive to include inquiry to an already established verification experiment in our physical chemistry curriculum.

The original experiment takes a high resolution UV/Vis spectrum of iodine gas which tells the relative population of molecules being excited to higher vibrational states based on the peak intensity. The spectrum is difficult to interpret for some because of hot band activity.

By increasing the temperature, many changes occur. One change is the sloid state iodine will sublimate more increasing the vapor pressure as well as the intensity of all peaks in the spectra. Also, a molecule can begin in the higher vibrational states prior to analysis and the spectrum will reflect this. We will develop a heating unit for the UV/Vis, using 3D printing and an Arduino microcomputer, to control the temperature for vibrational state control. This will allow experimenters to produce spectra with different intensities at different wavelengths. This means the experimenters can take notice of the change in vapor pressure based on increased intensities, as well as more readily distinguish fundamental data from hot band data without being told specifically. This also leads the experimenters to make their own conclusions as to what else has changed within the molecule based on a single variable change such as temperature.

12. **Cale Mitzel,** (Mentor: Dr. Steven Bonser, Chemistry)
Funding: Student Grant for Research and Creativity
Progress towards the synthesis and chemistry of 2-sulfobenzoyldiaziridines
Diaziridines are a class of three-membered ring heterocycles that contain one carbon and two nitrogen atoms. They are useful intermediates in the synthesis of more complex heterocyclic compounds, some of which have found applications in the pharmaceutical industry. Although several studies on the synthesis and chemistry of 1,2-diaroyldiaziridines have appeared in the chemical Literature, there are no reports on their 2-sulfobenzoyl analogues. The purpose of this Poster is to present the progress towards the synthesis of some novel 2-sulfobenzoyldiaziridine derivatives in order to study their chemical reactivity.

13. **Liam Schroeder,** (Mentor: Dr. Kathryn Allen, Chemistry)
Funding: Neimeyer-Hodgson Research Grant, Student Grant for Research and Creativity, Noonan Endowment Award
Thiophene-based Covalent Organic Frameworks
Covalent Organic Frameworks (COFs) are 2D or 3D porous molecules made entirely from light atoms that form covalent bonds with each other such as B, C, N, S and H. Due to their light weight, high surface area, and crystalline characteristics, they have a variety of applications including gas storage or even as an electron donor in solar cells. Their high crystallinity and ability to be fully conjugated over a large area shows promise for solar cell applications. The problem is that COFs themselves are not great at absorbing light, so they need to be modified to do so. Polythiophene has been extensively studied as a polymer that can absorb a large portion of the visible light spectrum. Our plan is to incorporate individual thiophene units into a COF to synthesize a fully conjugated material that can be an exceptional electron donor in a solar cell. The goal of this research is to synthesize similar COFs and find what makes a more crystalline COF, and consequently, a better solar cell.

14. **Jessica Sharrow,** (Mentor: Dr. Steven Bonser, Chemistry)
Funding: Neimeyer-Hodgson Research Grant
Progress Toward the Synthesis and Chemistry of 1-Aroyldiaziridines
Diaziridines are three-membered rings made up of two nitrogen atoms and one carbon atom. These rings could give rise to some novel pharmaceuticals via the less explored pathway of N-N bond cleavage of the three-membered diaziridine ring. The anticipated compounds are 1,3,4-Oxadizolines and/or Amidines that will be achieved with treatment of either heat or base. For this project, the synthesis, purification, and characterization of these new compounds using electron-donating substituent groups on the reactant diaziridines will be completed in a continuation of a previous student's research.

Additionally, the study of the effect of electron-withdrawing substituent groups bound to the diaziridine rings will also be explored.

15. **Samantha Simon,** (Mentor: Dr. Steven Kennedy, Chemistry)
Funding: Student Grant for Research and Creativity
Expanding the scope and utility of pentaerythritol acetal formation
Monoacetals derived from pentaerythriol and substituted benzaldehydes are useful intemediates in a variety of synthetic applications. Our previous work expanded the substrate scope of Collard's selective monoacetal formation within an advanced undergraduate laboratory setting, in which two-dimensional NMR is utilized to elucidate molecular structure. In an effort to expand the synthetic utility of this userfriendly and environmentally benign reaction, we are exploring possible synthetic routes, starting from the monoacetal, (2-(4-bromophenyl)-1,3-dioxane-5,5-diyl)dimethanol.

16. **Abdullah Syed,** (Mentor: Dr. Kathryn Allen, Chemistry)
Funding: Neimeyer-Hodgson Research Grant, Student Grant for Research and Creativity, Noonan Endowment Award
Synthesis of Highly Emissive Covalent Organic Frameworks for Optoelectronic Applications
We are creating macromolecules called covalent organic frameworks (COFs), which are a type of material that repeats in a porous pattern in three dimensions. The great potential of COFs is their structural regularity, which makes them excellent candidates for the active layer in a solar cell. Our proposed COF will be made using bianthracenes and connecting them with imine linkages by using terepthalaldehydes as linkers. A sample of the COF can be tested for absorbance and emission properties by methods of UV-Vis Diffuse Reflectance Spectroscopy (UV-Vis DRS). Another technique used to help identify our COF is powder x-ray diffraction (PXRD), which is used to measure the crystallinity and structural regularity of the COF. This procedure will be carried out in collaboration with Northwestern University with the assistance of Dr. William Dichtel's group. The goal of this project is to produce a structure which will make an effective component to be used in the active layer in a solar cell.

17. **Frances Wenrich,** (Mentor: Dr. Kathryn Allen, Chemistry)
Optimizing the Buchwald-Hartwig Coupling Conditions for Benzothiadiazole
Covalent Organic Frameworks (COFs) are a rapidly growing field in chemistry research. COFs are porous, crystalline materials that are 2D or 3D porous molecules. COFs have favorable properties: light weight, high surface area and crystalline characteristics. This makes them applicable for various uses including gas storage and serving as an electron donor in solar cells. Because of their high crystallinity and ability to fully conjugate over a large area, these COFs may be useful when working with solar cells; however, COFs need to be modified in order to effectively absorb light. Polythiophene is a polymer which can absorb a wide range of the visible light spectrum. Our plan is to use the Buchwald-Hartwig coupling reaction to help synthesize the individual benzothiadiazole which will eventually undergo a reaction with a thiophene structure we have made in our lab. The goal of this research is to optimize the Buchwald-Hartwig coupling for the benzothiadiazole synthesis.

Computer Science

18. Henry Schmale, (Mentor: Dr. David Hutchens, Computer Science)
Converting Grasst to BASH
In Spring of 2018, we upgraded and ported an automated grading system known as grasst. This grading system was built in the 90s and remains in use at the Computer Science department at Millersville for many lower level courses. This system was originally written in csh, with certain components written in C++. We ported the grader parts to Bash, to enable new features like structured programming and the use of shell functions. Bash also enabled automatic completion of certain user actions in the grading script. Updating these old scripts and making modifications brought to light many of the challenges of software maintenance. We used creative solutions for maintaining compatibility with existing configuration files. For example, we redefined setenv, the operation that sets environment variables in csh, to be a function in bash that accomplishes the task, allowing us to source the original csh formatted file. We also used functions to replace complex aliases. One obvious lesson is the importance of languages that support structured programming with functions. Since csh lacked functions, the original code was less modular and readable than it would have been with functions.

Earth Sciences

19. Cassandra Alexander, Kyle Ehmann, Samantha Ferguson, Nathan Murry,
(Mentor: Dr. Robert Vaillancourt, Earth Sciences)
Density Driven Seasonal Enhancement of Phytoplankton at the New England Shelf Break Front Using the Coastal Pioneer Array's Mobile Platforms
The New England shelf break front is a biologically productive ocean region and an important commercial fishing site. Time series observations at this site have been difficult until recently. The Ocean Observatories Initiative's Pioneer Array is a series of platforms and sensor systems deployed at this frontal site and is used to measure ocean properties and processes year around. We used the Pioneer Array's fleet of autonomous gliders to test our hypothesis that enhanced biological production at the shelf break front occurs only when the density surfaces are oriented in such a way that upwelling of bottom water delivers nutrients to the euphotic zone. Our preliminary results support this hypothesis and show a spring-time enhancement of primary production, as accumulated chlorophyll a, at the ocean's surface associated with density surfaces along which upwelling has previously been observed. Evidence for upwelling using bottom turbidity plumes as passive tracers is also presented.

20. Kyle Ehmann, **David Seavey,** (Mentor: Dr. Richard Clark, Earth Sciences)
Undergraduate Research Training on New Remote Sensors for Air Quality and Meteorological Monitoring
Research training is an important component of concept learning and skills development. Not only are students exposed to modern instruments and new measurement techniques, they also engage in the calibration of instruments, quantification of uncertainty, troubleshooting, data collection, reduction, and processing, quality assurance, archiving, analysis and presentation. The purpose of this project is to apply these research training principles to the configuration, installation, and operation of an air quality monitoring

system, including site selection for representativeness. The sensor package is contained in the Vaisala® Air Quality Transmitter 400, which measures trace gases. The data is transmitted to the communication gateway, Vaisala® Multi Observational Gateway 100, which sends the data signal to the Vaisala Cloud where it can be accessed, downloaded, and displayed. The process steps will be reported, including the composition of an operator's manual for knowledge continuity.

21. **Poushali Ghosh**, (Mentor: Dr. Ajoy Kumar, Earth Sciences)
Funding: REU
A 3D Reconstruction of the South Santee River as part of the Part of the Hampton Plantation Virtual Landscape Project
The Hampton Plantation State Historic Site in South Carolina represents a significant part of America's history. The Virtual Hampton project aims to reconstruct the plantation's history along with its cultural elements in a 3D immersive and digital visualization to educate the public of Hampton's true beauty. The South Santee River was an important resource in the landscape and vital to the function of the plantation. This study uses highly accurate LIDAR data and ArcGIS software to convert the landscape into a digital terrain and the Unity 3D game engine software to reconstruct the Santee River network. The physical aspects of the river can be modeled using Unity's particle system effect. Experiments with the visualization showed that rivers and channels needed to be treated as different types of bodies to cater to their varying behavior. The final flow model created using these methods can be used for practical purposes such as the past functionality of the river as irrigation.

22. **Timothy Keebler**, (Mentor: Dr. Richard Clark, Earth Sciences)
Funding: College of Science and Technology UG Travel Fellowship, Noonan Endowment Award
Ring Current Density Error Analysis Using Curlometry
Significant discrepancy exists between ring current density calculated from plasma pressure and by using the curlometer technique and Cluster spacecraft data. Literature suggests a ring current density of ~20-30 nA/m^2 using the curlometer technique, well above calculations using plasma pressure yielding ~2-10 nA/m^2. In an effort to identify sensitivities and possible error sources, the curlometer technique was subjected to a series of parameter perturbations of spacecraft data, as well as simulated currents, to assess performance. Curlometry is sensitive to current density gradients across the tetrahedron volume where linearization assumptions break down, creating false currents in other components, but the effect is too small to have significant impact on total current density. This analysis was unable to identify any noteworthy source of error in the curlometer technique or Cluster dataset, but was also unable to reproduce high current density results of previous curlometer studies. For example, in the perigee pass of 18 March 2002, previous papers suggest a curlometer-derived azimuthal current of 20 nA/m^2, whereas this study finds the value to be only 7 nA/m^2 using the same technique. Thus, a careful reanalysis of curlometer results is required to reach consensus.

23. **Jade Chi-Mei Liu, Connor Aghili,** (Mentor: Dr. Ajoy Kumar, Earth Sciences)
Funding: Student Grant for Research and Creativity
Mapping Gulf Coast Erosion with Feature Extraction and Thematic Change Detection
The Chandeleur Barrier Islands act as natural breakwaters which protect the mainland from coastal erosion. Anthropogenic interference alongside climate and environmental factors can have an effect on coastal erosion in the form of: rainfall intensity, hurricane impact,

flooding, and runoff (Anderson et al., 2014). Coastal Erosion has led to loss of: vegetation, sediment for coastal rebuilding, valuable dynamic coastlines, coastal resilience, valuable natural habitats, economic value and private property (Labuz, 2015). In the past 30 years, the global surface temperature has risen 0.2℃ per decade (Hansen et al., 2006) and over the last decade, barrier islands and sandy spits were severely eroded with a significant rise in sea-levels. This has a great impact on society in terms of coastal protection measures. In this study, coastal erosion & deposition of the Mississippi coastline and four Gulf Coast Barrier Islands were investigated by satellite data imagery. By combining 2001 and 2011 LandSat imageries using layer stacking methods, maps were extracted to feature coastlines and barrier islands. Thematic change detection was used to create coastline erosion and deposition after classifying land and water. This study also investigated Hurricane Katrina in 2005 and how severe weather events are known to cause significant erosional effects.

24. Sheila-Ruth Ngu, (Mentor: Dr. Brian Billings, Earth Sciences)
Funding: The Weather Risk Management Association (WRMA)
Economic Value of Weather Forecasts in Spraying for the Oriental Fruit Moth (OFM) Affecting Apple Orchards in South-Central Pennsylvania
The project presented on the poster sought to determine the Economic Value of Weather Forecasts in Spraying for the Oriental Fruit Moth (OFM) Affecting Apple Orchards in South-Central Pennsylvania. This project compared two treatment models. The weather model based phenology or growing degree days (GDD) and the non-weather dependent model. The comparison is made for the years 2015, 2016, 2017 and 2018 to determine the amount of money saved by using one treatment model over the other.

25. Patrick Roelant, (Mentor: Dr. Richard Clark, Earth Sciences)
Funding: Student Grant for Research and Creativity
A case study of 2018-02-20 – a quiescent sun
This study focused on establishing a baseline for characterizing the atmospheric and high energy flux conditions during a quiescent period of minimal solar activity that we could then use to compare future profiles. With the deep and extended solar sunspot minimum that is still a continuation of Solar Cycle 24, the case study of 2018-02-20 appeared to be an excellent candidate for capturing the quiet sun using the resources that we had. X-ray and □-ray radiation counts and flux of UV-A (315-400 nm) and UV-B (280-315 nm) were measured using a balloon-borne platform. This poster presents data from one launch that ascended to a burst altitude above 30 kilometers (~10 hPa), and summarizes the conditions on 2018-02-20. It should be noted that February 20 2018 in the northeastern U.S. was abnormally warm (sfc-temp 20° C), which had the advantage of modifying the troposphere to one more characteristic of a broader season. The conditions of the sun and the earth's atmosphere is exemplary of a quiet sun.

26. Timothy Sakowski, (Mentor: Dr. Talor Walsh, Earth Sciences)
Funding: MU-MUSE, Noonan Endowment Award, Student Grant for Research and Creativity
Evaluating Subsurface Fractures in the Appalachian Basin
Fractures are important because fluids such as hydrocarbons or groundwater move through them. This fluid flow impacts our ability to manage resources efficiently. Unfortunately, it is hard to accurately predict the location, orientation, and characteristics of subsurface fractures. This is due primarily to two factors: 1) Lack of accessibility due to the limited availability of core, and 2). lack of research into the factors that influence subsurface fractures.

The goal of this experiment is to explore correlations between fracture characteristics and modern-day depth, lithology, and rock properties. In order to do this, a core sample drilled from the Appalachian Basin (Norwich, Pennsylvania, United States) was examined to see what relationships between the different factors could be identified. Both natural and drilling-induced fractures were observed, and the natural fractures included minor faults, veins, and iron-oxide stained fractures.

Geography

27. Jason Malkowski, (Mentor: Dr. John Wallace, Biology)

An Assessment of the Threat of Invasive Species on Reforestation Efforts Within the Susquehanna Riverlands Conservation Landscape

The Susquehanna Riverlands Conservation Landscape is a greenway corridor along the east and west banks of the Susquehanna River that falls within York and Lancaster Counties. The Lancaster County Conservancy currently owns and manages 28 preserves within the Conservation Landscape. This project will focus on two preserves, Reed Run and House Rock Nature Preserves, both within this Conservation Landscape. Within the two nature preserves, there two invasive species threatening the current condition of these natural areas, that include, the Tree-of-Heaven (*Ailanthus altissima*) because of the trees ability through potent biochemistry to establish itself very efficiently in a disturbed landscape and a newly-arrived non-native insect, and the Spotted Lanternfly (SLF) (*Lycorma delicatula*) which uses the *A. altissima* as a host tree for reproduction. The purpose of this study was to assess these preserves for the distribution of *A. altissima* and its impacts on native tree species in an effort to understand and reduce the populations and indirectly reduce the potential for SLF invasion into these preserves. Using population data previously collected, I measured the overall threat of the invasion of tree of heaven; soil, native tree measurements, and current degree of invasion using GPS location and mapping analysis software. The significance of this project is to provide an assessment of the level of threat from invasive species in this area to properly manage and preserve the landscape and minimize SLF infestations.

28. Lindsey Tracy, (Mentor: Dr. Jessica Kelly, Geography)

Geospatial Analysis of Veteran Access to Health Care Services and Other Benefits in Pennsylvania

Equitable access to health services is vital to ensuring the well-being of vulnerable populations. Pennsylvania boasts the fourth largest population of veterans in the country, with the majority of those veterans in one of the following groups: male, white, 65-74 years old, high school graduates, and Vietnam era. This study examines Pennsylvania veterans' access to health care and other services using geospatial analysis. The accessibility to health care is determined by geographic distances to service locations, travel time, and available modes of transportation. Utilizing data from the US Census and the Department of Veterans Affairs, advanced GIS analysis illustrates the access challenges facing Pennsylvania's veterans.

Mathematics

29. **Noelle Shellenberger,** (Mentor: Dr. Zhigang Han, Mathematics)
Classical and Transformational Approaches for Triangle Center Proof
The purpose of this research is to explore the Classical and Transformational perspectives on triangle center theorems. We will be looking at proofs regarding the existence and construction of four different triangle centers: the circumcenter, the incenter, the orthocenter, and the centroid. Additionally, we will look at the proof regarding the Euler line. To explore each perspective, we will first prove the theorem through a classical approach. Then, the theorem will be rephrased and reproven in a transformational setting. We will then conduct a comparison of each proof to discuss the utility of each approach and to explore the positive and negatives of each perspective.

Physics

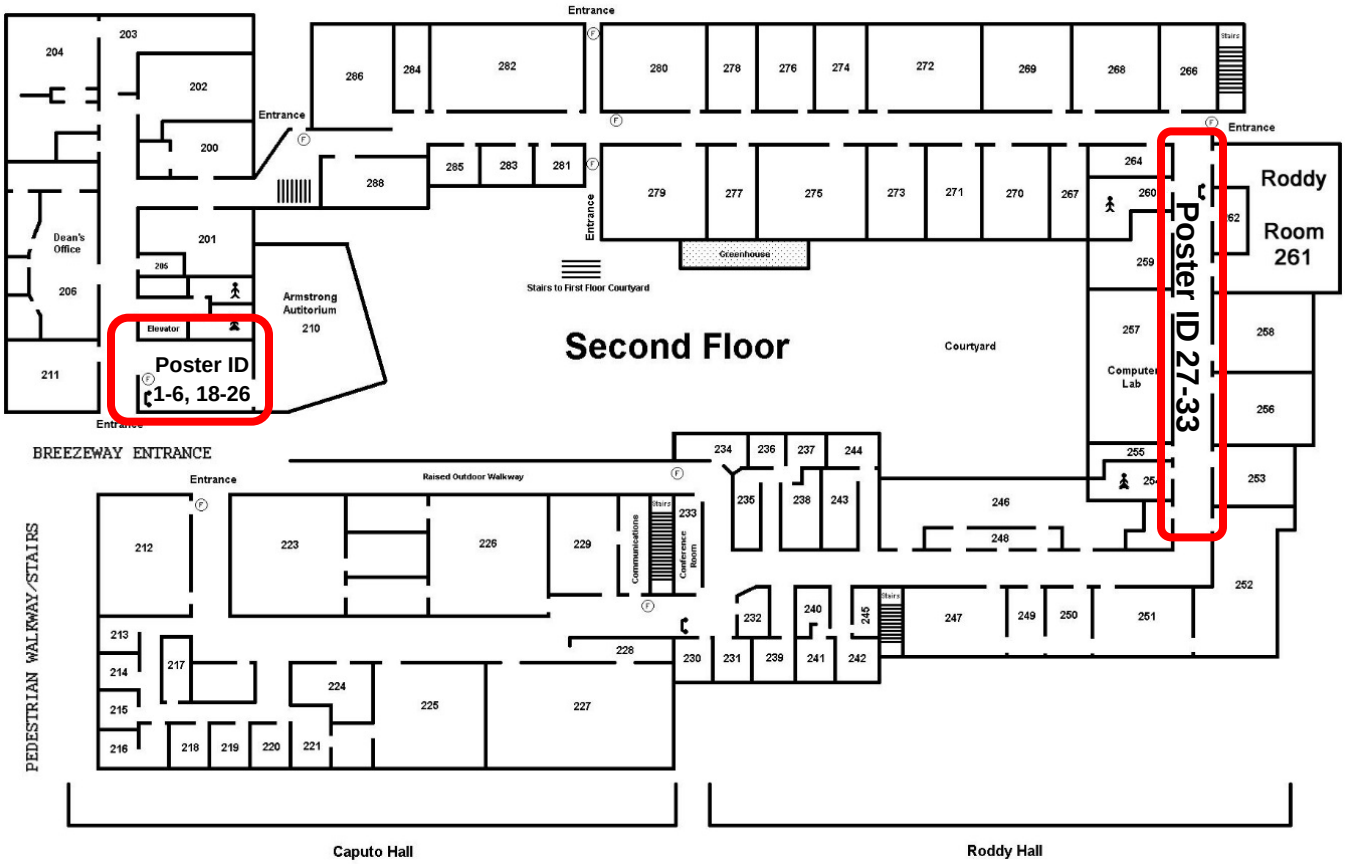
30. **Cory DeLong,** (Mentor: Dr. Sean Hendrick, Physics)
X-ray Analysis of Jets
Centaurus A and M87 are two galaxies that exhibit strong x-ray emission. Jets are powerful forms of radiation with two main forms of radiation considered in this paper, synchrotron and Bremsstrahlung radiation. Both jets are from Supermassive Black Holes going through an evolutionary stage in their life. Data for M87 and Centaurus A were taken from Chandra data Archive. The spectra for the jets was modeled with power laws to examine x-ray spectral slope. M87 and Centaurus A were fit using the same models, three for synchrotron (nonthermal) only and one for Bremsstrahlung (thermal). Centaurus A exhibited a good fit when account for thermal emission, while M87 fit best when synchrotron was the only source of emission.

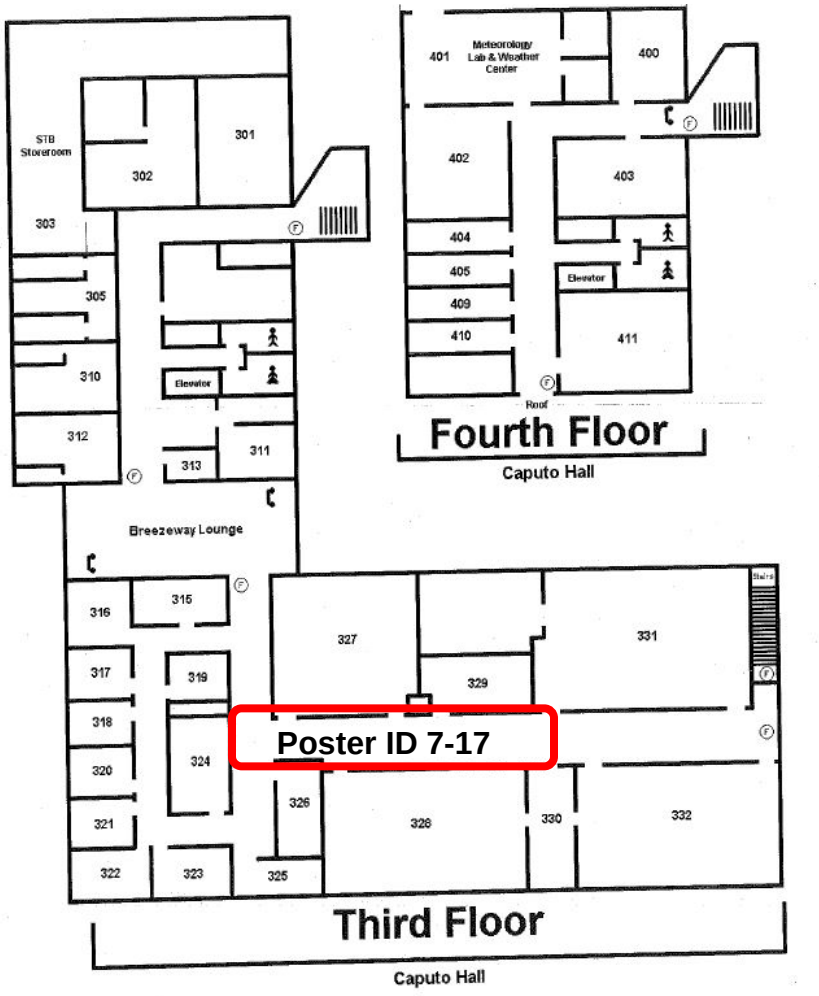
31. **Alexander Fedok,** (Mentor: Dr. Fariha Nasir, Physics)
The Anomolous Muon g-2 and Supersymmetry
My research is studying the Anomalous g-2 of the Muon using Supersymmetry and computational methods with the assistance and expertise of my advisor Dr. Fariha Nasir. The Electron's g-factor is one of the most precisely measured/predicted quantities in physics, this is in contrast however to the Muon g-2. Initially carried out at CERN, the Muon g-2 experiment has alluded to some interesting propositions for the future of our standard model. One way to explain the Muon's Anomalous g-2 is through supersymmetry, going beyond the standard model due to the Muons sensitivity to (potentially new) virtual particles. Hence, to avoid the expenditure of a post-LHC collider, we are using ISAJET (“A Monte Carlo Event Generator for p p, pbar p, and e+ e- Interactions”). Using the base ISAJET v7.88 package, we are able to rebuild certain functions to allow us more capabilities catered to our interests, in order to investigate various SUSY models to resolve this anomaly.

32. **Michael Rosen,** (Mentor: Dr. Natalia Dushkina, Physics)
Using Laser spectroscopy for studying the transitions of Rb and other Alkali metal atoms
Saturated absorption spectroscopy has various applications such laser cooling which have many relevant uses in atomic physics and quantum optics. The spectroscopic studies in this project included the measurement of the Doppler-broadened absorption profiles of the D2 transitions of Rubidium at 780 nm using first a regular diode laser and then a Fabry-Perot diode laser. By using the technique of saturated absorption spectroscopy to improvement

the resolution beyond the Doppler limit and measurement of the nuclear hyper fine splittings.

33. **Joseph Wright, Steven Knauss, Samuel Brennan,** (Mentor: Dr. Mark Atwater, Applied Engineering, Safety and Technology)
Funding: Student Grant for Research and Creativity
In-Situ Application of Magnetic Fields for Aligned Carbon Nanofiber Growth
Bulk random nanofiber growth has been demonstrated through the usage of chemical vapor deposition (CVD) with ethylene gas and metal catalysts. The alignment of these randomly grown nanofibers due to the ferromagnetic properties of the catalyst itself has not been demonstrated. An applied magnetic field is used to attempt to alter the growth directions of the nanofibers through the manipulation of the movement of the growth catalyst.


Entrance
Second Floor
Poster ID 1-6, 18-26
Poster ID 27-33
Roddy Room 261
Armstrong Auditorium 210
Dean's Office
Elevator
Greenhouse
Courtyard
Computer Lab
Stairs to First Floor Courtyard
BREEZEWAY ENTRANCE
Raised Outdoor Walkway
PEDESTRIAN WALKWAY/STAIRS
Caputo Hall
Roddy Hall


Meteorology Lab & Weather Center
STB Storeroom
Elevator
Roof
Fourth Floor
Caputo Hall
Breezeway Lounge
Poster ID 7-17
Third Floor
Caputo Hall