


UNDERGRADUATE *and* GRADUATE *research conference*

APRIL 21, 2022

Moth (*Galleria Mellonella*) Larval Polyethylene Matrix,

by Rahalla, and Andrew Keth.



Results and Discussion

The average number of wax moth larvae that completed their life cycle in a matrix of polyethylene was lower than the number of individuals that completed their life cycle in a beeswax matrix (Figure 2).

This was different than results from our prior experiments that used plastic bags instead of pelletized polyethylene. The combined results of all of these experiments suggest that wax worms eating plastic grocery bags are more likely to survive than those consuming polyethylene pellets or beeswax. It is likely that the thin plastic bags are easier to consume than the pellets.




Figure 3: Cup housing. Plastic (top right), wax (bottom).



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Abstracts

Allis, N.C., Department of English and Modern Languages (English). *Allen Ginsberg: A Voice Before Stonewall*

For decades, the LGBTQ+ community was marginalized and discriminated against solely because of whom they chose to love. Despite widespread marginalization and discrimination, the community has always had voices. One of the biggest and most prominent voices of the LGBTQ+ movement during its early days was Allen Ginsberg. A prolific poet, Ginsberg is remembered today for his poem “Howl” and his vivid imagery. While his publisher was facing an obscenity trial for *Howl and Other Poems*, Ginsberg was using his voice to inspire members of the LGBTQ+ community. Ginsberg served as a voice for the LGBTQ+ community before the events at the Stonewall Inn in 1969.

Faculty sponsor: Dr. Ellen Foster

Arth, C.M., Department of Biology and Geosciences (Biology). *Identification of Key Mitochondrial Stress Response Genes Using 2,4-Dinitrophenol*

See Lehn C.R.

Barroso, P., and Jones, J., Department of Information and Library Science; Historical Conneaut Cemetery; Enhancing Transcription by Digitization of Cemetery Records.

Conneaut Cemetery is a historic site located in northwestern Pennsylvania. This burial ground, established along French Creek in Crawford County, is the resting place of frontier families: congregants of the early Presbyterian Church first known as French Creek or Sugar Creek Congregation. Recorded burials dating to 1804 preceded the building of the original log church. A remote site location, church transitions, lack of endowment funds and weathering of stones have contributed to degrading conditions and disrepair. The late Eugene F. Throop of Saegertown abstracted the vital statistics from monuments in Conneaut Cemetery, along with many other cemeteries in Crawford and Mercer counties. William B. Moore next made a complete literal transcription of the extant stones in Conneaut. This information was published in Crawford County Genealogy in 1978. The tombstones were then professionally photographed by the late Edward W. Hildebran of Cochran. The physical prints were organized in envelopes by row and stone location corresponding to the cemetery organization. In conjunction with an established workflow committee, the project team developed the transcripts into metadata format. Specifically, the tombstone information has been transcribed onto Google sheets, mapped to Dublin Core metadata standards, and uploaded to an Omeka website. The physical photographs were digitized using an overhead camera station and correlated with the respective tombstone information on the cemetery website. This digitizing and cataloging effort provides public access to Conneaut Cemetery burials, supporting future genealogical and family research for years to come.

Faculty sponsor: Dr. Rhonda Clark

Biggie, J., Department of Biology. *Investigating the Anti-Apoptotic Effect of Zinc on MG-63 Osteoblast-like Cells Through Localization Studies of Channel Proteins ZnT1 and ZiP1 for Diabetes Induced Osteoporosis Treatment*

See Rearick, K.

Campbell, K., and Dean, S., Department of Biology. *Studying the effect of NSAIDS (Aleve, aspirin, ibuprofen) on SH-SY5Y neuronal cells in presence and absence of amyloid beta protein*

Neurodegeneration is a complex process that leads to progressive brain damage due to loss of neurons. The cause of neuronal loss in various degenerative disorders like Alzheimer's disease, Parkinson's disease, Huntington's disease, etc. is not entirely understood, despite exhaustive research. Non-steroidal anti-inflammatory drugs (NSAIDs) are regularly used by more than 60 million Americans and are effective in relieving pain, reducing fever and inhibiting inflammation. Previous research has shown ibuprofen to dissolve amyloid plaque proteins in SH-SY5Y human neuroblast cells, suggesting its potential therapeutic ability in treatment of Alzheimer's disease. While the implication that ibuprofen seems to have neuroprotective abilities, we hypothesize that not all NSAIDs would have the same effect of dissolving amyloid plaques. Through this project, we investigated the impact of various NSAIDs like ibuprofen, Aleve, aspirin and Tylenol (steroid control) on amyloid plaques in SH-SY5Y cells. Our preliminary findings lead us to believe that certain NSAIDs do help in dissolving amyloid plaques, but the exact mechanism is not clearly understood. In addition, previous experiments in our lab showed NSAIDs to have acute neuroprotective effects but chronic neurodegenerative effects. Through future molecular experiments we hope to investigate the signaling mechanisms involved in the impact of NSAIDs on amyloid plaques.

Faculty Sponsor: Dr. Natasha Dias

Dean, S., Department of Biology. *Studying the effect of NSAIDS (Aleve, aspirin, ibuprofen) on SH-SY5Y neuronal cells in presence and absence of amyloid beta protein*

See Campbell, K.

Doran, A., Department of Management and Marketing. *Assessment of the Impact of Nature on Mental Health*

Cook Forest is a state park in northwestern Pennsylvania with 8,500 acres and 13 miles of the Clarion River. The beautiful park is known for its towering white pines and hemlocks, which are a national natural landmark. There are numerous scenic views to appreciate, space for kayaking, guided activities, programs, and many other outdoor opportunities. According to the World Health Organization, mental health is "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community." Nature-based solutions are an excellent tool in preserving one's mental health. Research has proven many benefits of nature. Increased time outdoors can reduce mental fatigue, prevent illnesses, and lead to higher productivity. (Wolf, 2014). Aerts and Van (2018) summarized several studies that have shown that children with more exposure to nature are less likely to develop emotional, cognitive, and even physical issues. This demonstrates importance and benefits of nature immersion early in life. Outdoor exposure can also reduce stress, boost memory, assist concentration, and improve one's overall mood. (Bratman et al. 2012). During the past 30 years, adult obesity has doubled, and childhood obesity has tripled in the U.S. The CDC recommends weekly physical activity to combat the health risks imposed by obesity. Having improved walkability and increased access to recreation would help to reduce unhealthy lifestyles. One study found that seniors with more nearby parks, trees, and spaces to walk showed a greater longevity over a five-year time frame. Thus, the purpose of this research study is to display several benefits of nature to masses in Northwest Pennsylvania. People will be more encouraged to attend state parks after hearing all the potential advantages. This study will involve literature review and survey to assess the impact of nature on mental health and to understand perception of people on nature and mental health. The results from this study will help encourage more people to visit state parks such as Cook Forest. The evidence can be used to make attending these parks much more appealing and even compelling.

Faculty Sponsor: Dr. Nripendra Singh

Greener, D., Hynds, M., and Johnson, A., Department of Biology. *Genetically Linking ERAD and UPR via Expression of Antitrypsin*

In humans, approximately 12% to 15% of newly synthesized proteins become misfolded and must be removed. Otherwise, their accumulation can detrimentally impact the cell and has been linked to a number of genetic disorders. Retrenchment of these aberrant proteins causes problematic stress on the cell. Endoplasmic Reticulum Associated Degradation (ERAD) is a constitutive quality control processes that destroys misfolded proteins through selective targeting and ultimate destruction by the 26S proteasome. The 26S proteasome, which requires the ADD66 gene for its formation, is involved in ERAD. Due to the accumulation of misfolded proteins, ERAD can be overwhelmed and induce the activation of the Unfolded Protein Response (UPR). Both of these cell stress response pathways are taxing on the cell and can lead to apoptosis, or cell death, if active for too long due to an excessive number of misfolded proteins. Despite the importance of ERAD and UPR in managing cellular stress, the mechanisms of these biochemical pathways and how they work together has not been completely elucidated. To gain insight into these processes, our project will study the growth of various yeast strains in an ADD66 background strain to determine if they are involved in ERAD or the UPR. By studying how ERAD and the UPR work, what other proteins are involved, and the overall regulation of these two pathways, our line of inquiry hopes to gain better insights into cell stress response. Therefore, that information can be utilized to mitigate the effect of various genetic disorders linked to cellular stress.

Faculty Sponsor: Dr. Craig Scott

Guth, A.F., Department of Biology and Environmental Geosciences (Biology). *Assessing the Prevalence of Borrelia burgdorferi in Ticks in Clarion and Surrounding Counties*

See Spang, S.J.

Halvyn, A., Department of Biology. *Hunting for Phage – An Alternative Treatment for Medically Significant Bacteria*

See Rearick, K.

Holt, N., Rollan, K., Laugand, J., Smith, R., Lockwood, A. and Kazar, S., Department of Chemistry, Mathematics, and Physics; Department of Biology and Geosciences. *Water Quality of Roadside Springs in Western and West Central Pennsylvania*

Roadside springs are commonplace in western Pennsylvania. Many have been used as a primary drinking source for residents of rural areas for decades. One of the main issues with using this water is that usually the water quality has not been tested, which is important, especially with the prevalence of acid mine drainage (AMD) across Pennsylvania. Prior spring analysis conducted by Penn State Extension water resources specialists collected single water samples from 37 roadside springs located in 21 counties across Pennsylvania between April 2013 and May 2014. However, there is limited data collection and analysis in Pennsylvania counties such as Clearfield and Venango. This study measured pH, iron (Fe) and manganese (Mn) in four roadside spring waters in Clearfield and Venango counties and compared the results to water drinking standards and the previously reported data. A Geographic Information System (GIS) map was also created to illustrate contributing factors in water quality at the roadside springs selected, such as AMD, adjacent mined areas, and distance to roads.

Faculty Sponsors: Dr. A. Lockwood and Dr. S. Kazar

Hynds, M., Department of Biology. *Genetically Linking ERAD and UPR via Expression of Antitrypsin*

See Geener, D.

Johnson, A., Department of Biology. *Genetically Linking ERAD and UPR via Expression of Antitrypsin*

See **Geener, D.**

Jones, J., Department of Information and Library Science; Historical Conneaut Cemetery; Enhancing Transcription by Digitization of Cemetery Records.

See **Barroso, P.**

Joseh, J., Department of Biology. *Investigating the Anti-Apoptotic Effect of Zinc on MG-63 Osteoblast-like Cells Through Localization Studies of Channel Proteins ZnT1 and ZiP1 for Diabetes Induced Osteoporosis Treatment*

See **Rearick, K.**

Kazar, S., Department of Chemistry, Mathematics, and Physics; Department of Biology and Geosciences. *Water Quality of Roadside Springs in Western and West Central Pennsylvania*

See **Holt, N.**

Lander, N., Department of Management and Marketing. *Nonprofit Marketing Strategies for Revitalization and Arts*

The topic of research is having the ability to apply nonprofit marketing techniques. If applied correctly, it can be essential to the survival of the nonprofit organization. Inside the success for nonprofit organizations, it is essential to know who your audience is and have the ability to create an eye-catching logo. It is important to not ignore the community outreach and to not be afraid to explore your brand. During the communication phase, organizations need to frame their issues, values, metaphors, examples, and tone. During this phase, people are encouraged to think about the many social problems by using communications to appeal to specific values such as cultural beliefs and ideals, resulting in new and productive ways to help the organization communicate. Carefully consider how their content, tone, and solutions are presented for audience members to understand, interpret, and act on social communications frame aspects that impact how social sector correspondents can influence communities. Nonprofits can use frames to help them succeed. Finally, there are two main reasons why research is essential when rebranding or renaming a nonprofit. The first is that it allows you to involve all its stakeholders. The second reason is that studies should be used to shape the aspects of a rebrand that will set your company apart. Obtain the unique perspectives of those affected by the brands name through interviews, surveys, and focus group discussions. This encourages everyone to participate in the process and ensures that you have considered the different perspectives of your employees, board of directors, partners, and those people you want to help. Their advice will be valuable when looking for a new name or messaging strategy. We have identified a relationship with how nonprofits successfully utilize these concepts to get an audience to know of their brands. Then those nonprofits that do not use the foundations lack the organization's awareness. We believe that nonprofit organizations need to follow the marketing techniques for building successful organizations.

Faculty Sponsor: Dr. Nripendra Singh

Laugand, J., Department of Chemistry, Mathematics, and Physics; Department of Biology and Geosciences. *Water Quality of Roadside Springs in Western and West Central Pennsylvania*

See **Holt, N.**

Layton, B., Department of Biology and Geosciences (Biology). *Studying the Effect of Phytic Acid and Calcium Oxalate on Human Embryonic Kidney Cell Proliferation*

Kidney stones are a common health problem found in 5% of the U.S. population. Postmenopausal women over age 50 tend to have a decline in bone density, which could lead to osteoporosis. Thus, they are recommended to ingest 1200mg of calcium per day from all sources. However, ingesting this much calcium in a personal diet is impossible. Doctors often prescribe calcium supplements to postmenopausal women. According to an article published in the journal of Bone and Mineral Research, nearly one in four adults with osteoporosis tend to develop kidney stones due to overaccumulation of calcium deposits. By using the human embryonic kidney cells (known as HEK cells), we studied the effect of calcium oxalate on cell proliferation. Our preliminary results show calcium to inhibit cell growth and division. Phytic acid, a substance found in many plant-based foods, can bind to minerals like iron, zinc, and calcium to impair their absorption in the body. We studied the effect of phytic acid together with calcium oxalate and found that phytic acid indeed reduced the negative effect of calcium oxalate on cell growth. Our data demonstrates the importance of dietary phytic acid in regulating the effect of calcium in bone metabolism without impairing kidney cells, which needs to be investigated further.

Faculty Sponsor: Dr. Natasha Dias

Lehn C.R., Arth, C.M., and Probst, S.R., Department of Biology and Geosciences (Biology). *Identification of Key Mitochondrial Stress Response Genes Using 2,4-Dinitrophenol*

Cellular stress responses are an understudied, yet vital part of a cell's physiology. Metabolic biochemical pathways have many implications in human diseases, such as cystic fibrosis and Leigh syndrome. These pathways are subjected to alterations when they are under cellular stress. One such pathway is the Krebs cycle, which occurs in the mitochondria of eukaryotic cells. Using *Saccharomyces cerevisiae* as a model organism, our research project utilizes a yeast knockout library, which is an isogenic collection of mutant strains, to identify genes involved in mitochondrial stress response. This library can help identify which genes are involved in the cell's response to its exposure to 2,4-dinitrophenol (DNP), a known causative agent of cellular metabolic stress. The screen was performed by inoculating a specified optical density (600 nm) of yeast into complete nutrient media to ensure consistency of growth. Sterile filter discs were placed on the media and the yeast strains were exposed to predetermined concentrations of DNP. These spot assays were incubated for three days with images taken every 24 hours to monitor growth. By using three parental wild-type strains as baseline controls (BY4742, RSY607, and W303), a screening of various yeast knockout strains was assayed for their associated mitochondrial function. Seventy mutant strains have been studied to date with differences in yeast growth being recorded and statistically analyzed. Furthermore, future experiments should elucidate which genes are involved in mitochondrial stress response pathways as well as better define how these biochemical pathways operate.

Faculty Sponsor: Dr. Craig M. Scott

Lockwood, A., Department of Chemistry, Mathematics, and Physics; Department of Biology and Geosciences. *Water Quality of Roadside Springs in Western and West Central Pennsylvania*

See Holt, N.

McCanna, B., Department of Management and Marketing. *Attracting and Retaining Customers Through Social Media and Service Quality*

The purpose of this research study was to find out the importance of social media and service quality to attract and retain customers for a small local restaurant in our region to help sustain its business. The methodology includes observation and secondary research via readings. I read a series of related qualitative and quantitative research articles on service industry. It helped provide the necessary foundation for making both qualitative and quantitative research approaches for the project. The factors that were found to impact attracting and retaining customers via social media were: word-of-mouth, comments about the service, reviews, influencers, and the restaurant's postings. From service quality perspective: price (Ampountolas et al., 2019), design, employee competence, food quality (Santos, 2017), and special offers (Ridderstaat et al., 2020). Additionally, I used observation and interview technique for my research. I observed the restaurant's practices and current market environment including competitors. My observations were validated with interviews, which proved that competitors were doing a better job as compared to my client in attracting and retaining their customers. The other research question was to understand what aspects of a restaurant's service are important for consumers in the surrounding regional demographic by collecting their opinions on the factors that were derived from secondary research and initial findings. Thus, future steps in this research study are to collect data using surveys on new, current, and former customers who are willing to express their honest opinion on various factors that are important to them about the restaurant, their expectations for good restaurant service, and their perception on factors that help attract and retain customers. After data collection, we can find out the results and compare them with existing research to find out if there is a significant correlation and how to bridge the service quality gaps for my client.

Faculty Sponsor: Dr. Nripendra Singh and Dr. Brandon Packard

Probst, S.R., Department of Biology and Geosciences (Biology). *Identification of Key Mitochondrial Stress Response Genes Using 2,4-Dinitrophenol*

See Lehn C.R.

Rearick, K., Biggie, J., and Joseh, J., Department of Biology. *Investigating the Anti-Apoptotic Effect of Zinc on MG-63 Osteoblast-like Cells Through Localization Studies of Channel Proteins ZnT1 and ZiP1 for Diabetes Induced Osteoporosis Treatment*

Diabetes mellitus is a common metabolic disease that can impair osteogenesis through a decrease in osteoblast activity, leading to an increased fracture risk. While it is known that diabetes mellitus affects bone, the underlying connection between diabetes and osteoporosis remains unidentified. Deficiencies of zinc are seen in the course of aging and in diabetic patients. Additionally, zinc supplements have been shown to exert positive effects in type-2 diabetes. Our study is aimed to examine the mechanism underlying diabetes-induced osteoporosis and determine the protective effects of zinc, and its association with osteoporosis and diabetes. Previous studies in our lab showed zinc to have an inhibitory effect on advanced glycation end product (AGE)-induced MG-63 cell apoptosis through MTT enzymatic cell viability assays, PCR and qPCR molecular experiments. Furthermore, our qPCR data showed that ZnT1, ZnT4 and ZiP1 zinc channel proteins played a significant role in transporting zinc ions across the cell membranes. As a continuation of this project, we attempted to study the localization of ZnT1 and ZiP1 channel proteins in the plasma membrane and ER membrane through western blot experiments. Through these experiments, we hope to provide a better understanding of the underlying mechanism of diabetes-induced osteoporosis and indicate zinc as a novel micronutrient for its prevention and treatment.

Faculty Sponsor: Dr. Natasha Dias

Rearick, K., and Halvin, A., Department of Biology. *Hunting for Phage – An Alternative Treatment for Medically Significant Bacteria*

As pathogenic bacteria evolve, antibiotic resistance has become more of a concern. We are in need new of treatment options, and bacteriophages could be the solution. Bacteriophage is located particularly in soil throughout the environment. This virus's capabilities consist of locating the specific bacterial cell, infecting and subsequently bursting the cell, essentially killing the bacterium. This could be given to humans as an alternative to antibiotics by a process of "phage therapy." The harmful bacteria within the body are incapable of developing any type of resistance to the bacteriophage. The bacteriophage is so specific on the targeted organism(s) that they will not cause any harm to the beneficial bacteria found throughout the human body. This project aims to discover, isolate, and propagate bacteriophage present in environmental soil and/or water samples that can potentially be used as a treatment for medically significant bacteria such as *Pseudomonas aeruginosa* and *Mycobacterium smegmatis*. We used standard microbiology techniques to isolate bacteriophage from soil sample collected in various soils located in western Pennsylvania. We are still currently working on the isolation of phage that kills a variety of bacteria that are significant as antibiotic-resistant organisms.

Faculty Sponsor: Dr. Helen Hampikian

Rollan, K., Department of Chemistry, Mathematics, and Physics; Department of Biology and Geosciences. *Water Quality of Roadside Springs in Western and West Central Pennsylvania*

See Holt, N.

Smith, R., Department of Chemistry, Mathematics, and Physics; Department of Biology and Geosciences. *Water Quality of Roadside Springs in Western and West Central Pennsylvania*

See Holt, N.

Spang, S.J., and Guth, A.F., Department of Biology and Environmental Geosciences (Biology). *Assessing the Prevalence of *Borrelia burgdorferi* in Ticks in Clarion and Surrounding Counties*

Lyme disease in western Pennsylvania is an issue most people in the area are very familiar with. The disease is caused by the spirochete bacteria *Borrelia burgdorferi*, which is vectored within ticks, typically of the *Ixodes* species. The bacteria can be spread to humans and pets when female ticks latch on to the skin of their prey to consume blood. In the early stages of infection, sufferers experience fever, fatigue, headache, joint and muscle pain, and an erythema migrans rash (skin lesions with a bullseye appearance). There is currently no human vaccine for Lyme disease, therefore taking preventative measures to limit tick exposure is our only protection. The objective of this study was to determine the prevalence of Lyme disease-carrying ticks in commonly used outdoor areas in the Clarion region and neighboring counties. Ticks were collected from various local areas including the Clarion Loop Hiking trail and local forests in Armstrong County. DNA was extracted from the ticks and screened using Polymerase Chain Reaction (PCR) for the presence of *B. burgdorferi* specific genes, including the *16s rRNA* gene. To ensure the stringency of our DNA extraction technique, the extracted DNA was additionally examined for the presence of a tick-specific gene (the *Ixodes 16S rRNA* gene). Samples testing positive for the presence of the *Borrelia* 16s rRNA gene will undergo further analysis via screening for *B. burgdorferi* specific virulence determinants. These include flagellin B (*flaB*) and outer surface protein A (*ospA*). Determining the prevalence of *B. burgdorferi* in our collected ticks can provide important information to people who spend time outdoors in our local region, particularly in regard to the necessity of taking tick prevention measures.

Faculty Sponsor: Dr. Helen Hampikian

Vogt, A., Department of Business (Marketing). *The Role of Well-Being in Nature-Based Solutions*

The purpose of this project is to look at how nature-based solutions influence tourists' well-being. The study will look into the various activities that can be done at Cook Forest and determine which ones give visitors the highest levels of satisfaction. Cook Forest is located in northwestern Pennsylvania. It is approximately 8,500 acres and located near the town of Clarion. Once called the Black Forest, the area is famous for its stands of old-growth forest. Cook Forest State Park's Forest Cathedral of towering white pines and hemlocks is a National Natural Landmark. There have been several studies saying that people who have spent time in nature have been proven to be less stressed and anxious, thus improving the well-being of the tourists and also the residents of Lapland, Finland (Maria et al. (2018). Reports of "high" well-being were significantly higher when participants spent more than 60 minutes in nature versus those who spent 0 minutes in nature. People who spend 1-59 minutes in nature did not have better well-being than those who spent 0 minutes in nature (Mathew et al., 2019). By examining the benefits that nature has on well-being, we will be able to better advertise these high points and bring more tourists to Cook Forest. Through the data that will be collected, not only will we be able to possibly increase tourism in the area, but we will have the ability to compare our data with the data of other parks in the state.

Faculty Sponsor: Dr. Nripendra Singh



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