
CELEBRATION OF
Muhlenberg
2021
Celebration of Student Research, Scholarship and Creative Work
Muhlenberg College

Celebration of Student Research, Scholarship and Creative Work

A fundamental component of the Muhlenberg liberal arts experience is the support and celebration of student work, including research, scholarship and creative activity. Every year, students from across the curriculum present their research and scholarship in this interdisciplinary poster fair.

We invite members of the Muhlenberg community to share in this celebration of student-faculty collaboration.

All photos in which students and faculty are not wearing face masks were taken during the Summer of 2021 when facemasks were optional indoors.

1. Phytocompound, linalool, modulates the $GABA_A$ receptor

Marielle Avola, Lindsay Helock and Cassandra Salib

We investigated the biochemical and physiological effects of linalool on the gamma-aminobutyric acid type A receptor ($GABA_AR$) in vitro using two-electrode voltage clamping in *Xenopus* oocytes. $GABA_ARs$ are the major inhibitory receptors and target of anxiolytic drugs in the central nervous system. Linalool, a phytocompound, demonstrates anxiolytic behavioral effects, suggesting it acts upon $GABA_ARs$. We applied nM-mM concentrations of linalool to $GABA_ARs$. Linalool independently activated the receptor at physiological irrelevant concentrations. Linalool dose-dependently potentiated low GABA concentrations at an EC_{50} =138 µM (n=9). If linalool potentiates the receptor, linalool-containing plants may have clinical applications in anxiety and insomnia treatment.

Advisor: Jeremy Teissere, Muhlenberg College

Funded by: Neuroscience Collaborative Research Program

2. Vaping in the COVID-19 Era

Johannah Bessell

Vaping (use of e-cigarettes) has increased in popularity; however, current research shows that it results in negative health outcomes. Currently, SARS-CoV-2, the virus that causes COVID-19, has killed over four million people worldwide. A cross-sectional study utilizing an online survey was conducted to determine the impact of the pandemic on vaping behavior. Results showed that vaping frequency increased for 25.58% of ever-vapers, stayed the same for 23.25%, and decreased for 9.30%; non-vapers were more aware of health risks regarding vaping compared to ever-vapers; non-vapers were more likely to follow health and safety guidelines compared to ever-vapers. Overall, better health communication is needed to educate vapers on the health risks of vaping.

Advisor: Chrysan Cronin, Muhlenberg College

Funded by: Public Health Summer Research Grant

3. Non-Steroidal Anti-Inflammatory Drug Conjugates for the Treatment of Alzheimer's Disease

Tony Brach and Anna-Maria Haddad

Neurodegenerative diseases and more specifically, Alzheimer's Disease (AD) have complex disease pathologies and limited treatment options. One possible treatment for AD is non-steroidal anti-inflammatory drugs; however, they have not shown high clinical efficacy. We present the synthesis of several NSAIDs conjugated to blood-brain barrier shuttles via various linkages (e.g., carbonate, carbamate, amide, etc.) in yields ranging from 82.4% to 89.9%. All molecules were characterized via nuclear magnetic resonance (NMR) spectroscopy, thin layer chromatography (TLC), and infrared (IR) spectroscopy. These conjugates could possibly serve as viable anti-inflammatory drugs with improved brain bioavailabilities for the treatment of AD.

Advisor: Sherri Young, Muhlenberg College
Funded by: Provost's Grant for Faculty-Student Collaborative Research

4. Inactivation of L-DOPA Dioxygenases as an Indicator of Substrate Quality

Sara Ringenbach

LmbB1 is an extradiol dioxygenase that acts on L-DOPA, a close structural analogue of L-tyrosine, by cleaving the double bond outside of the two hydroxyl groups of its catecholic ring. SsDDO and JING are homologous thermophiles from the same family that are also capable of cleaving L-DOPA. Recent findings have shown that these three enzymes can act on alternative substrates, and L-DOPA may not be the native substrate for the thermophiles. Oxygen consumption occurs in the first irreversible step of the reaction. We can study inactivation of the enzymes with L-DOPA and other substrates using an oxygen electrode.

Advisor: Keri Colabroy, Muhlenberg College
Funded by: NSF CHE 1708237

5. Exploring Spin-Qubit Coupling for Quantum Computation

Hunter Caplan and Yujin Kim

The goal of our quantum computing project was to simulate the coupling between quantum spin systems using various different simulated experiments. Visualizations were created using a Bloch sphere in order to help better conceptualize these spins. We hope to use these simulations to extract coupling information from future experiments to develop quantum bits.

Advisor: Charles Collett, Muhlenberg College

Funded by: Provost's Grant for Faculty-Student Collaborative Research

6. Indigenous Perspectives on the Earth: Decolonizing Sustainability

Amanda Clark

Indigenous peoples sustained communities on this continent for centuries before colonizers arrived, yet within generations of colonization the land they built a relationship with was dramatically changed by commodification. Though the lifeways of Indigenous peoples did not cause the environmental disasters that we face, Indigenous populations are hit hard by the impacts of environmental injustice. Furthermore, their knowledge on sustainability is systematically ignored, despite the promises that practices of many Indigenous communities hold for a healthy future of people and the planet. My research focuses on Indigenous environmental ideologies and forms of justice in the hopes of recentering important voices.

Advisor: Maura Finkelstein, Muhlenberg College

Funded by: David C. Rabold Grant for Interdisciplinary Summer Research in Sustainability Studies

7. Fungicide Odor-Pollution Negatively Impacts Floral-Odor Learning and Recognition in the Bumblebee Bombus Impatiens

Natalie David

Since 1950, numbers and diversity of bumblebees have declined steadily. Previous work has shown that agrochemical odor-pollution can impact bumblebee foraging behavior. This study investigates the effects of odor-pollution from three common fungicides on *Bombus impatiens'* odor learning and recognition of wild-bergamot. Fungicide-odor pollution was tested as: background pollution during learning, background pollution during floral-odor recognition, and point pollution. Scent analysis found large odor structure differences between fungicides and wild-bergamot, implying that fungicide-odor is perceptually distinct. Alarmingly, each fungicide disrupted learning and recognition for at least one concentration. Inability for foraging bumblebees to recognize rewarding floral-scents presents negative large-scale implications.

Advisor: Jordanna Sprayberry, Muhlenberg College

Funded by: Summer Research Grant from Dean of Academic Life

8. Canary and Blue Influences

Ian Butz

This project compares the covers of the Canary and Blue magazine, published by Allentown High School students from 1902-1947, to 20th century American art influences. Many Canary and Blue covers have similarities to contemporary commercial magazine covers that reflect cultural trends, while others reference aspects of early 20th century regional and national fine arts movements. I organized the covers in thematic groups: female figures, male figures, landscapes, still-lifes, abstract and narrative. The covers depict a narrative of historical and cultural changes in the early 20th century including women's rights, abstract and regional art influences and evolving printing and illustration techniques.

Advisor: Margo Hobbs, Muhlenberg College

Funded by: Summer Research Grant from Dean of Academic Life

9. Investigating L-DOPA Dioxygenase Enzymatic pathways using Electrospray Ionization (ESI) Mass Spectrometry

Lam Doan

Lignin, one of nature's most abundant polymers, contains catechols: hydroxylated aromatic rings. L-DOPA dioxygenase (B1) can cleave L-DOPA catechols, upcycling them into an antibiotic, lincomycin. In the presence of oxygen and its native substrate, the enzymatic reaction produces the linear product AHMS which rapidly cyclizes into CHAPCA. Recently, it has been shown that B1 also works on other non-native substrates such as dopamine, DHHCA, and their derivatives. In order to study the enzymatic pathways on these alternative substrates, we use electrospray ionization (ESI) mass spectrometry to detect the mass-over-charge (m/z) ratio of the starting materials and their products.

Advisor: Keri Colabroy, Muhlenberg College

Funded by: NSF CHE 1708237

10. Scribbling Women: Comparing Sensation Fiction Writers Then to True Crime Podcasters Now

Alyssa Duvak

This thesis explores the contemporary consumption of the true crime genre but also its specific narrative structure: how are real life stories turned into fiction or retellings fit for consumption? What does true crime give to its audience that horror does not? But how does it also borrow from traditions of science fiction and horror—genres both cultivated and dominated by so-called "scribbling women?" This study will focus on the reclaiming of a genre by women—from gothic horror novels, to the male-dominated "pulp novel," to the contemporary true crime podcast.

Advisor: Francesca Coppa, Muhlenberg College

11. Cultural Orality and Youth Involvement: Translating the Hebrew Bible for a Zulu Audience

Elizabeth Gershater

When translating the Hebrew Bible into the Zulu language for an audience comprised of its indigenous speakers, there are a number of considerations and complications that can arise: cultural appropriation by non-indigenous translators, the ways in which the orality of Zulu culture influences how the translation will be transmitted to its audience and the inclusion of Zulu youth in the translation process. Related considerations that translators would do well to keep in mind include translating rhythm across languages, the use of Zulu ideophones and rendering the name of the Hebrew God, YHWH, appropriately in the translation.

Advisor: Sharon Albert, Muhlenberg College

12. Music and its Effects on Attention for those with Mental Health Issues

Emma Roppo

This current study aims to investigate how different types of music affects the attention span for those with ADHD, ADD, Depressions and Anxiety. Past research has found that, though noise is typically viewed as detrimental to cognitive behaviors, people with ADD and ADHD perform better with noise (Soderlun, Sikstrom, and Smart, 2007). Other research has found that the level of activation in the central nervous system is lower in those with ADHD than those without ADHD. Music could also benefit the attention of those with depression and anxiety.

Advisor: Laura Edelman, Muhlenberg College

Funded by: Provost's Grant for Faculty-Student Collaborative Research

13. Match.edu & Web-based Inventory Management: Fall 2021 Software Engineering Projects

Rebecca Zipper and Eli Coopersmith

Software development is a skill best learned via engaging with the process firsthand. Throughout the fall 2021 semester, teams of three to four students have been designing and implementing their own projects based on needs they have identified in businesses and the community. The first group is developing a college search mobile application akin to a dating app, designed to assist high school students in the selection of a college that is the right fit for them. A second group is creating a web-based inventory management system to provide an intuitive interface companies can use to record and track their inventory.

Advisor: Joseph Helsing, Muhlenberg College

14. COVID-19 and its Effect on College Instruction

Rose Glantz

This paper explores how undergraduate institutions in Pennsylvania, New Jersey and New York responded to the COVID-19 pandemic utilizing institutional-level data on reopening plans and finances and county-level data on COVID cases. It assesses whether or not the type of institution, private or public, had an effect on the degree to which the institution offered online vs in-person instruction. Additionally, it examined the effects of an institution's endowment, change in endowment, cumulative COVID cases per capita and rise in case count. Using a logit regression model, I conclude that endowment and institution type affect the likelihood of an institution adopting online modalities.

Advisor: Lindsey Nagy, Muhlenberg College

15. Structural Barriers and Teacher Innovation: How Career and Technical Education Teachers Make Accommodations for Emergent Bilingual Students

Jodie Goldberg

Emergent Bilinguals (EBs) face institutional barriers that limit their opportunity to progress academically. In career and technical educational (CTE), EBs are struggling to meet the requirements necessary to be career ready. Using a sequential mixed-method study, we identified school supports for EBs within CTE and how that ultimately influenced teachers abilities to provide accommodations. We found that CTE schools lacked the necessary support within the school to properly ensure the success of EBs. On a classroom level, teachers were able to make accommodations for EBs through innovative techniques, but ultimately struggled as a result of the lack of school support.

Advisor: Mark Emerick, Muhlenberg College

Funded by: Provost's Grant for Faculty-Student Collaborative Research

16. Music and Movement

Mallory Holson

We conducted a study to understand emotional responses to music and movement. This study aims to isolate and combine movement and music to determine which art form may have a greater influence on the perception of the emotion and how might the conjunction of music and dance compare to the power of each stimuli separately. We predicted that when the music and dance are experienced simultaneously, the emotional response will be higher than music or dance experienced alone (Reason et al., 2016).

Advisor: Laura Edelman, Muhlenberg College

Funded by: Provost's Grant for Faculty-Student Collaborative Research

17. Dracula's Map: Follow the Journeys of Dracula's Main Characters.

Morgan Bishop

Dracula's Map is a web-based project which compiles all of the times, dates and locations of the primary characters of Bram Stoker's Dracula, and uses this information to reconstruct the novel along geographic lines. Stoker's Dracula, written as a series of diary entries, letters, telegrams and articles, is known for its sense of suspense, which derives primarily from dramatic irony, and the differences between audience-available and character-available information. By reconstructing the novel along geographic lines, website viewers can reconceptualize the limits of information and information-access for the characters of the novel.

Advisor: Tim Clarke, Susan Falciani Maldonado, Jordan Noyes, Brittany Robertson and Lora Taub, Muhlenberg College

Funded by: Summer Digital Scholars Program, Practicing the Liberal Arts Grant from Mellon Foundation

18. Representations of Motherhood in U.S.S.R. Propaganda Art

Abbey Robuck

This project examines representations of motherhood as constructed by the Soviet government from the years 1917 to 1991. By analyzing various pieces of propaganda art produced during these time periods and situating those images within their proper historical context, the author hopes to uncover broader public health/women's issues trends in both the past and modern day.

Advisor: Mohsin Hashim, Muhlenberg College

Funded by: Summer Digital Scholars Program, Practicing the Liberal Arts Grant from Mellon Foundation

19. Experimenting with Absurdist Acting in Contemporary Postrealist Drama: 365 Days/365 Plays by Suzan-Lori Parks

Alex Austin, Alejandra Cepeda Bátiz, Marin Diddams, Jaxson Goldsmith, Irene Keeney, William Maloy, Thomas Riley, Jalil Robinson, Alison Rutyna, Celeste Samson, Desire Suarez and Abigail Mack Zuckert

The first Black woman to win the Pulitzer Prize for Drama, Suzan-Lori Parks is one of the most significant living American playwrights. Though complex and challenging, her plays are produced and taught throughout the English-speaking world. Apparent in her work is a socially-conscious concern for historically reclaiming Black American experience. Less apparent is her formal lineage, which may trace back to mid-20th century European theatrical Absurdists like Samuel Beckett. Our project experiments with a suite of short contemporary plays drawn from Parks' 365 Days/365 Plays, to which we apply acting principles usually used for Beckett plays like Waiting for Godot.

Advisor: Troy Dwyer, Muhlenberg College

20. Squeeze Her Hand: Anthems for Grief During COVID

Will Howitt

In May of 2020, I lost my grandmother to COVID-19. Since then, I have been inspired to create a body of original music surrounding the themes of loss, grief, family, time and remembrance during the pandemic. Last winter, I sat down with my immediate family and conducted interviews exploring their memories of my grandmother, how loss during the pandemic was unique, and what they believe her legacy should be. Since then, I've worked with Professor Ardizzoia of the Music department to turn these interviews into text/lyrics for music.

Advisor: Andrew Ardizzoia, Muhlenberg College

21. A Helmet of Her Own?

Shivani Iyer

Despite its alarmingly high incidence rate for concussions, there is great push back against the use of helmets in women's lacrosse. This project examines the origins and social factors influencing the controversy surrounding the use of protective headgear in the sport at the secondary educational and collegiate level and how the recent development of a helmet specific to the women's game has altered, or fails to alter, the outcome of this debate. Through conducting a series of interviews with twenty stakeholders, key factors influencing the variety of perspectives and an understanding of how and why such claims originated were attained.

Advisor: Kathleen Bachynski, Muhlenberg College

Funded by: Public Health Summer Research Grant

22. Iron Binding of L-DOPA Dioxygenase

Nyjah Johnson

Iron Binding of L-DOPA Dioxygenase is a key component to understanding enzyme activity in wild type and mutant proteins. Using the Ferrozine™ reagent, which detects iron II and III, we tracked iron binding in different L-DOPA dioxygenase proteins. My goal was not only to grow and purify the enzymes, but also to conduct a reconstitution method with Fe^{II} and evaluate the percent iron bound by the protein. I also tracked how fast an enzyme lost its iron over time and did a heating experiment to see if heating at higher temperatures changed the rate at which Fe^{II} was lost.

Advisor: Keri Colabroy, Muhlenberg College

Funded by: Provost's Grant for Faculty-Student Collaborative Research and NSF CHE 1708237

23. Speedy Spectroscopy: Studying the Pre-Steady State Kinetics of LmbB1 and 6-NitroDOPA

Paige Jones

LmbB1, a bacterial L-DOPA dioxygenase, cleaves L-DOPA in an antibiotic synthesis pathway in an obscure mechanism. The natural intermediates of the reaction cannot be detected using UV-Visible spectroscopy, so the pre-steady and steady state kinetics of L-DOPA derivatives are studied. An anaerobic steady state assay was used to determine the wavelengths at which intermediates in the NO_2DOPA reaction can be detected. The pre-steady state kinetics were then observed at those wavelengths on the stopped-flow spectrometer. The insight we are gaining about LmbB1's mechanism may allow for the creation of novel products with commercial applications in antibiotic and biofuel production.

Advisor: Keri Colabroy, Muhlenberg College

Funded by: Research in the Chemical and Biochemical Sciences Fund, The Buzzard Summer Research Award and NSF CHE 1708237

24. In Fuchs Endothelial Corneal Dystrophy, How Estrogen Biotin Affects the Mitochondrial DNA with Oxidative Damage

Sylvie Kimpton

Previously published articles from the Jurkunas Laboratory have stated the continuation on research of the effects of estrogen in relation to Fuchs endothelial corneal dystrophy (FECD) is imperative. My project this summer was to work on the next research publication about whether or not estrogen enters the mitochondria in the eye causes more damage to the cell. I worked on in-vitro cell lines that where either treated with estrogen or not and were either wild type NQO1 or knockout NQO1.

Advisors: Varun Kumari and Neha Deshpande of the Jurkanas Laboratory, Massachusetts Eye and Ear Hospital, Boston, Massachusetts

25. Motor Activation Facilitates Perceptual Understanding: A Post-hoc Exploration

Jacob Lader

We created a paradigm in which a motor task was paired with one of two randomly interspersed primary visual tasks of equal difficulty. A staircase procedure was used to determine stimulus difficulty at ~75% accuracy for each primary task and individual. If two primary tasks of the same difficulty show differing proficiencies after the addition of a secondary task, then the affected task may share neural resources with the secondary task. Our secondary task facilitated concurrent performance of the orientation—but not brightness—task. We performed a power analysis to determine the correct sample size for a confirmatory replication study.

Advisor: Matthieu de Wit, Muhlenberg College

26. Studying Single Turnover Reactions of L-DOPA Dioxygenase with a Non-native Substrate

Sebastian Leyes Porello

L-DOPA Dioxygenase (LmbB1) is an enzyme originating in the bacterial species *Streptomyces lincolnensis*, where it functions as an extradiol dioxygenase. This class of enzymes utilizes Fe^{III} and molecular oxygen to cleave double bonds in catecholic ring structures. This enzyme has applications in that it can be used to produce the antibiotic lincomycin and may be useful in accessing currently inaccessible carbon sources like lignin. The native substrate of LmbB1 is L-DOPA, which recyclizes after cleavage. Our lab is interested in studying LmbB1 and its homologues (NocArt, JING, SsDDO) and how they react with non-native substrates such as Dopamine and DHHCA.

Advisor: Keri Colabroy, Muhlenberg College
Funded by: NSF CHE 1708237

27. The Transcription Factor FAX-1 and its Role in the Movement and Sleep of *C. elegans*

Danny Monzo

The evolutionarily-conserved nuclear receptor transcription factor FAX-1 in *C. elegans* functions in the development of neurons that regulate movement and sleep. Despite an understanding of the gene's function, no clear downstream transcriptional targets are known. To learn more about the gene's downstream transcriptional targets, I used a bioinformatic approach to identify candidate genes that might be regulated by FAX-1. Currently, I am using transgenes to test the hypothesis that FAX-1 directly regulates the transcription of some of these candidate targets. Doing so will hopefully elucidate the role FAX-1 plays in developmental and sleep pathways.

Advisor: Bruce Wightman, Muhlenberg College

Funded by: Vaughn Summer Research award

28. The Effect of Social Media on Body Image and Disordered Eating Habits

Angeles Morales

Exposure and interacting with social media influences individuals' perceptions of themselves and their bodies. Social Comparison Theory notes the tendency for people to compare oneself to others. Fardouly & Holland (2018) suggest that women who have a greater tendency to make appearance comparisons to others are more likely to make changes to face, hair and skin after Facebook usage. These same comparisons can alter eating habits in efforts to attain a more ideal figure in young women. This project examines how social media has the potential to create disordered body image and eating habits in female adolescents and young adults.

Advisor: Stefanie Sinno, Muhlenberg College

Funded by: Rosenberg Research Award

29. Using "Soccer Balls" as a Reducing Agent/ Surfactant for AU-NP Synthesis

Hannah Morris

This summer, I collaborated with Professor Gooch to study the synthesis of gold nanoparticles. The goal of our research was to design a more green and environmentally friendly way of creating gold nanoparticles. The ratio of the gold to the Keplerate/POM, Mo-132, was varied with the hope that the hybrid material, a mix of the two reagents, can lead to enhanced or novel properties. Various conditions such as pH and ionic strength were tested to see if nanoparticle synthesis was impacted. Additional experiments will be conducted during the year and the results obtained this summer will help guide future research.

Advisor: Jonathan Gooch, Muhlenberg College

Funded by: The KeriLyn C. Burrows, Ph.D. '72 Research Fund in Honor of Donald W. Shive, Ph.D.

30. Slimy State of Mind: Habituation and Disruption of Memory with the Use of a Sedative in Physarum olycephalum

Emma Muller and Ava Duskic

Physarum polycephalum is a unicellular, non-neuronal organism that demonstrates aspects of memory. Three experiments were conducted, in which *Physarum* crossed a bridge to reach the oats: (1) habituation to 5% vinegar (a repellant), (2) disruption of habituation using Valerian root (sedative) and (3) relearning (savings). Results showed time to cross significantly decreased from the first to the last trial (habituation). Valerian exposure disrupted vinegar-habituated "memory," resulting in increased speed to cross the bridge when compared to controls, and speed did not decrease during re-learning (no savings). Our findings support memory disruption via Valerian root in an organism without a brain.

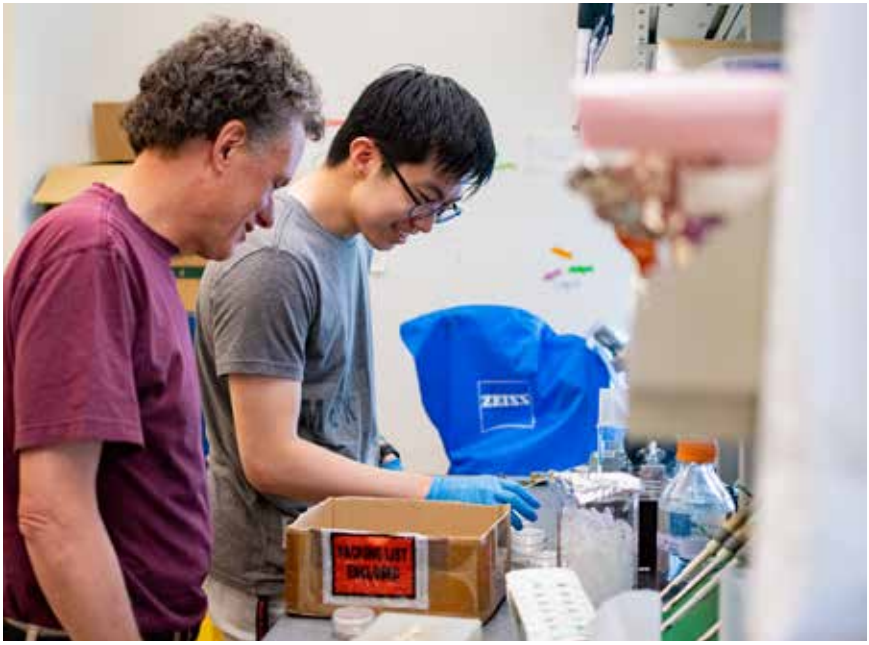
Advisor: Gretchen Gotthard, Muhlenberg College
Funded by: Neuroscience Collaborative Research Program

31. Insulin Signaling in Salt Stress Response and Sleep

Long Nguyen

Sleep is fairly significant in our lives yet its functions and mechanisms remain unclear. *Caenorhabditis elegans* serves as an invertebrate model for sleep. When exposed to a highly salty environment, the nematode worm can be forced into an arrested sleep state. daf-2 encodes for an insulin receptor, and previous findings have shown that disruption of the insulin signaling pathway leaves *C. elegans* more susceptible to sleep-inducing osmotic stress. The egl-4 is required for normal sleep. I tested whether this gene, like other pro-sleep genes, is required for sleep and arrest in insulin signal-compromised animals under osmotic stress.

Advisor: Bruce Wightman, Muhlenberg College
Funded by: Vaughn Summer Research award



32. Heart and Shoal: Examining Social Approach and its Mitigation of the Stress Response in Danio rerio

April Nussbaum and Jacob Krawitz

When confronted with stress, living beings work to mitigate the negative aspects of the stress response. "Social buffering" is a phenomenon in which social cues reduce stress. We are interested in understanding the neural causes and consequences of social buffering. Our study examined the behavioral responses of zebrafish, *Danio rerio*, to various ecologically relevant stressors. When exposed to a stressor, we found that male and female zebrafish strongly preferred to group with other individuals rather than to hide under a physical refuge. We also found that exposure to visual social cues reduced the behavioral stress response.

Advisor: Leah Wilson, Muhlenberg College

Funded by: Neuroscience Collaborative Research Program

33. Elimination of Single-Use Plastic: Feminine Hygiene Products

Claire Pancoast

The climate crisis has pushed humans into a state of urgency where we must now reap the consequences of our actions. Do we, as humans, pay any mind to what we pollute our environment with? Feminine hygiene products are often overlooked when it comes to thinking about the materials that go into landfills each year. Therefore, educating the public of this less thought about pollutants may help people re-examine the materials they use in their everyday lives and where it goes once they are done with it.

Advisor: Erika Bagley, Muhlenberg College
Funded by: RJ Fellows Program

34. Estimating the Risk for Tick-Borne Pathogens in the Lehigh Valley

Sarah Raab and Aviv Campbell

Blacklegged ticks (*Ixodes scapularis*) can transmit pathogens and are native to the Lehigh Valley region. Lyme disease, caused by the bacterium *B. burgdorferi* is the most common tick-borne disease. In June 2021, we sampled the abundance and diversity of ticks from ten forested sites around the Lehigh Valley. A subset of 50 nymph stage ticks will be tested for pathogens by the Pennsylvania Department of Environmental Protection. We compare the 2021 density with data from previous years. The 2021 density of nymphs was not significantly different from most of the six previous seasons for which we have data.

Advisor: Marten Edwards, Muhlenberg College
Funded by: The Crist Family Research Fellowship

35. Comparing GPS-Based Methods to Estimate Distance Measurements in a Tick Field Study

Aviv Campbell and Sarah Raab

Determining the abundance of Lyme disease vector blacklegged ticks (*Ixodes scapularis*) as a function of distance allows for estimates of tick density. Sampling distance can be estimated using the GPS unit that is built into smartphones. Different mapping applications interface with the GPS unit and provide distance information. We found that different applications display inconsistent distance results when simultaneously provided with the same GPS data. We compared three applications to determine which one provided the most accurate data. Reliable estimates of tick density are essential to assess the risk for tick-borne disease.

Advisor: Marten J. Edwards, Muhlenberg College
Funded by: Trainer Summer Research award

36. The Search for Positional Priming

Anna Riordan

Syntactic priming is the tendency to reuse the syntactic structures of a preceding sentence with potential benefits in fluency. Prior investigations into positional priming, a proposed type of syntactic priming, have failed to control for confounding variables. This study aims to replicate previous experiments done by Smith & Wheeldon (2001) and Frazer & O'Seaghdha (2011) while controlling for lexical priming. Our findings suggest that positional priming facilitation exists independently from the effects of lexical priming.

Advisor: Alexandra Frazer, Muhlenberg College
Funded by: Provost's Grant for Faculty-Student Collaborative Research

37. Mapping Brood X Periodical Cicadas in Eastern Pennsylvania

Maya Schlesinger

Brood X of the 17-year periodical cicadas emerged in Pennsylvania this year. All three species of periodical cicadas that emerge in a particular year are considered a "Brood." Throughout the past several generations of Brood X, there appears to have been a decrease in ranges with some local extinctions. However, very little data was collected on their distribution to support this. The mapping we did this year will allow future researchers to compare and discover changes in distribution or population. From there, external factors such as climate change and human development can be considered as potential contributors to these changes.

Advisor: Marten Edwards, Muhlenberg College
Funded by: Trainer Summer Research award

38. Effects of E-liquids on M1 Macrophage Phagocytosis of Oral Pathogens

Raivat Shah

Electronic-cigarettes vaporize flavored e-liquids into an aerosol which enters the oral cavity. *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans* are pathogenic species of bacteria implicated in periodontitis. Macrophages are host white blood cells that phagocytose pathogenic microbes. The purpose of this study was to determine the effects of e-liquids -/+ flavors on phagocytosis of oral pathogens. THP-1 human monocytes were grown, differentiated to macrophages, and exposed to -/+ flavored e-liquids. Then, a phagocytosis assay involving macrophage exposure to oral pathogens was conducted. We found that e-liquids -/+ flavors alter macrophage phagocytosis of these oral pathogens, suggesting that vaping may influence oral disease.

Advisor: Giancarlo Cuadra, Muhlenberg College
Funded by: Summer Research Grant from Dean of Academic Life

39. Elizabethan Dress, Gender and Politics

Lottie Segal

Queen Elizabeth I was a force to be reckoned with in her time as rule of the British Empire. But how does one turn a woman into a legend, an idol, a queen? Portraits were part of the answer to this question. The website Elizabethan Dress, Gender, and Politics explores the queen's portraits and how her place as a female ruler impacted how she was portrayed to her people. Through carefully chosen dress, the portraits influenced the politics of the empire. Her time as queen is shown though her portraits in order to explore Queen Elizabeth's fashions and reign.

Advisor: Tim Clarke, Susan Falciani Maldonado, Jordan Noyes, Brittany Robertson and Lora Taub, Muhlenberg College
Funded by: Summer Digital Scholars Program, Practicing the Liberal Arts Grant from Mellon Foundation

40. *Must Go On* - A Podcast Project

Niamh Sherlock

Must Go On is a six-episode, limited series podcast made as a part of the Summer Digital Scholars Program. It chronicles the development of "virtual theatre" during the COVID-19 pandemic and explores the ways digital theatre has impacted the art form, beneficially or detrimentally. This research project centers around questioning if virtual theatre, or aspects of it, has a future post-pandemic. Once digital theatre is no longer the only safe option, will it continue to grow? Through research and interviews, *Must Go On* debates that question from many perspectives, creating a snapshot of theatre during the summer of 2021.

Advisor: Tim Clarke, Susan Falciani Maldonado, Jordan Noyes, Brittany Robertson and Lora Taub, Muhlenberg College

Funded by: Summer Digital Scholars Program, Practicing the Liberal Arts Grant from Mellon Foundation

41. I Miss You: Queer Femme Intimacies with the Heterotopic Boyband

Olivia Sica

My research this summer focused on a subgroup of BTS fans who identify as queer, lesbian or women-loving-women (wlw). I endeavored to answer why these people were so devoted to a group of men whose content appears to cater to a straight female audience. Using Michel Foucault's idea of the "heterotopia" as a frame, I examined the homoerotic qualities of the boyband itself that lead to queer femmes being drawn to it. I also used existing scholarship about other boybands (The Beatles, NSYNC) to develop theories about the intimacy and desire that queer femmes feel towards BTS.

Advisor: Casey Miller, Muhlenberg College

Funded by: Summer Research Grant from Dean of Academic Life

42. Examining Rates of Evolution in the Insulin Signaling Pathway Across Drosophila Species

Jonah Silverman

In order to gain insight into how genes within a biological network evolve, one can compare similarity and differences of gene coding sequences between evolutionary relatives. Working with the Genomics Education Partnership, I and other members of the Hark Lab mapped various genes from the insulin signaling pathway of *Drosophila melanogaster* in other *Drosophila* species. Our data reveals a range of conservation between *D. melanogaster* genes and the most divergent taxa. I then examined whether the number of protein to protein associations or level of gene expression is connected to evolutionary rate and found more support for the latter.

Advisor: Amy Hark, Muhlenberg College

Funded by: James R. Vaughan '52 Student Research Award in Biology

43. 6-Substituted Derivatives of Dopamine as Substrates of L-DOPA Dioxygenase: Understanding Steric and Electronic Substituent Effects

David Strzeminski

Dioxygenase enzymes are nature's catalysts for the breakdown of catecholic rings, such as those found in the woody tissue of plants. This chemistry has tremendous potential not only in the degradation of plant material, but also in natural product biosynthesis. A suite of synthetic dopamines, derivatized at the 6-position and varied in substituent size and electron-withdrawing character, were examined as substrates of L-DOPA dioxygenase via in-silico docking and analysis of the enzyme catalyzed transformations by mass spectrometry and UV-Visible spectroscopy. 6-bromodopamine, 6-cyanodopamine and 6-carboxydopamine were robust substrates, while cyclicdopamine and 6-nitrodopamine exhibited limited turnover.

Advisor: Keri Colabroy, Muhlenberg College

Funded by: Provost's Grant for Faculty-Student Collaborative Research and NSF CHE 1708237

44. In Vitro Evaluation of Non-Steroidal Anti-Inflammatory Drug Conjugates

Madison Trump and Michael Albdewi

Non-steroidal anti-inflammatory drugs (NSAIDs) are suspected to be helpful in treating neurodegenerative diseases such as Alzheimer's Disease; however, insufficient quantities are able to get into the central nervous system due to plasma-protein binding and limited brain bioavailability. We hypothesize that NSAID brain bioavailability could be improved through conjugation to a blood-brain barrier (BBB) shuttle in order to improve BBB permeability and suppress plasma-protein binding. Here, we present the in-vitro stability and preliminary parallel artificial membrane permeability assay for the blood-brain barrier (PAMPA-BBB) results for a series of NSAID conjugates. PAMPA-BBB was performed with the carbamate naproxen conjugate and the Log effective permeability (Pe) values obtained ranged from -5.77 to -4.47. These conjugates have the potential to improve treatment of neurodegenerative diseases by increasing the brain bioavailability of anti-inflammatory drugs.

Advisor: Sherri Young, Muhlenberg College

Funded by: Stehly-Smart Memorial Fund for Research in Chemistry

45. Navigation of Cell Migration in *C. elegans* Development

Isabella van der Weide

We investigated the role of fax-1, a gene encoding a transcription factor, in regulation of *C. elegans* distal tip cell (DTC) migration. The DTCs are a pair of migratory cells that, through their u-shaped migration, form the hermaphrodite *C. elegans* gonad. We found that fax-1 mutant animals exhibit low-penetrance DTC migration defects, that fax-1 is expressed in the DTCs during and only during migration, and that in fax-1 mutants, expression of unc-5 netrin receptor appears more variable. This suggests that FAX-1 might be required to decrease noisiness of unc-5 transcription.

Advisor: Bruce Wightman, Muhlenberg College

Funded by: The Crist Family Research Fellowship

46. Semantic and Phonological Influences on Word Production

Megan Webber

This research examines the reaction time between visual processing of an image and utterance of that image. The categories of words are items in a house, transportation, animals, food and tools. Within the categories the words start with the same phoneme. The participants are individually shown images of the words and we will observe how long it takes for them to process the image and say the word. This summer we began to collect data, however we couldn't get 60 participants. We are completing the data collection this fall and will observe and analyze the data once collecting is done.

Advisor: Alexandra Frazer, Muhlenberg College
Funded by: The Crist Family Research Fellowship

47. Asexuality in Mainstream TV

Sarah Wedeking

There is little to no asexual representation in mainstream media, specifically in television. Seeing as other sexual identities are represented (examining gay, lesbian and transgender people), it is disheartening to have no visibility for asexuality. This affects not only the education surrounding the orientation, but the actual process of acceptance and validation. I examine the representation we do have, and how it has a positive impact on the ace community. I also look at ace-coded characters and how that perpetuates acephobic ideologies. My website reveals that we desperately need more ace rep.

Advisor: Elizabeth Nathanson, Muhlenberg College

Funded by: Summer Digital Scholars Program, Practicing the Liberal Arts Grant from Mellon Foundation

48. U.S. Climate Change Opinion: Drought Exposure and Coastal Flooding Vulnerability

Samantha White

The National Surveys on Energy & Environment (NSEE) is a survey on energy and climate policy. Many scholars have examined political party, level of education and religiosity as indicators of climate change opinion. However, geography and severe weather exposure have been examined less frequently. Using the NOAA-funded drought exposure index and measuring respondents' proximity to coasts, this research examines how exposure to drought and coastal flooding vulnerability impacts climate change beliefs. While these indicators are less significant than political parties, drought exposure and coastal flooding vulnerability both play a role in predicting U.S. climate change opinion.

Advisor: Chris Borick, Muhlenberg College

Funded by: David C. Rabold Award for Interdisciplinary Summer Research in Sustainability Studies

49. Effects of E-liquids on Oral Commensal Biofilms

Christina Xu

Electronic cigarettes have increased in popularity among adolescents. The mouth is the first site of exposure to the e-cigarette aerosol and is home to commensal bacteria, which grow as biofilms. This project tests the effects of e-liquids with flavors on the biofilm growth of oral commensal bacteria. Biofilms of four *streptococci* species were grown and exposed to increasing e-liquid concentrations. Biomass was analyzed using a crystal violet staining procedure. Death curves showed inhibition with increasing e-liquid concentrations. Scanning electron microscopy depicted biofilm architecture. E-liquids alter oral *streptococci* biofilm biomass. This project promotes further understanding of e-liquids' implications on oral health.

Advisor: Giancarlo Cuadra, Muhlenberg College
Funded by: Summer Research Grant from Dean of Academic Life

50. Exploring Somatic Musicality in Dance Practices Through the Lens of Dalcroze Eurhythmics

Danica Schofer

My summer 2021 research project explores the Dalcroze method, a system of learning music through movement developed by Swiss composer Emile Jacques-Dalcroze (1865-1950) as an entry-point to somatic musicality (the feeling of embodied music-making) within dance practices. After preliminary embodied research and Dalcroze training with Longy Institute of Music and Carnegie Mellon University, I applied Dalcroze concepts to dance/music improvisation, composition, and technique. My culminating website portfolio included an original choreographic/compositional piece entitled "Rainstorm" and a series of technical/creative exercises for ballet.

Advisor: Prof. Megan Flynn, Muhlenberg College
Funded by: Summer Research Grant from Dean of Academic Life

51. Affinity of LmbB1 homologs for Varying Substrate Alternatives of L-DOPA

Riri Yoza

LmbB1 acts on L-DOPA in a biochemical pathway that produces the antibiotic lincomycin. The affinity of LmbB1 and its homolog *S. hygroscopicus jingganensis* L-DOPA dioxygenase (JING) for their substrates can be assessed with Michaelis-Menten kinetics using data collected from the UV-Spectrometer. By changing the oxygen concentration in the substrate-enzyme reaction, it is possible to measure K_{MO2} and assess the affinity of the enzyme for its co-substrate oxygen in a reaction with L-DOPA, Dopamine or DHHCA. Although JING is thermophilic and more stable, affinity for its substrates was weaker than the enzyme LmbB1.

Advisor: Keri Colabroy, Muhlenberg College
Funded by: NSF CHE 1708237

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