

2020

Celebration of Student Research and Scholarship



Muhlenberg College

Research &
Scholarship

Celebration of Student Research and Scholarship

Student research, art and scholarship is a fundamental component of the Muhlenberg liberal arts experience. 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.



1. Vibrational Strong Coupling

Brian Acquaviva, Alexandria Lerner, Malak Rayes

Strong coupling to molecular vibrations generates hybrid light-matter polaritonic states allowing for a novel means to control the physical and chemical properties of molecules. To date, vibrational strong coupling within a Fabry-Pérot cavity has been shown between a photon and one or more molecular vibrations in either homogeneous liquid phases or solid phases. Since many important chemical processes occur on surfaces, investigation of heterogeneous strong coupling is necessary. In this work, vibrational strong coupling hybridization is demonstrated between solid polymethylmethacrylate and liquid water.

Advisor: Dr. Justin Sparks

College Funded by: ACS PRF

2. An Overview of the Methods Used to Probe the Cis/Trans Isomeric Behavior of Peptoids

Michael Albdewi

Peptoids have exploded as a class of peptidomimetic compounds with a range of properties and advantages over peptides. Because of the presence of a tertiary amide in the peptoid backbone, these molecules exhibit unique conformational behaviors and cis/trans isomerization, which may impact their physicochemical properties and biological activities. The complexity that arises when examining the conformation of peptoids has warranted the implementation of various tools and spectroscopic techniques towards its study. Herein, we review methods used to study the cis/trans isomerism of peptoids.

Advisor: Dr. Sherri Young

College Funded by: Research in Biochemical and Chemical Sciences Fund

3. The Intersections of Gender and Racial Hierarchies within Leonard Bernstein's West Side Story

Alice Banta

I show that Leonard Bernstein's identity as a bisexual Jewish artist shaped portrayals of race, gender, and sexuality in West Side Story. Thanks to his personal experiences and the values ingrained in him by his education, he implicitly constructed a hierarchy between Latin American music, jazz, and music of the Stravinskian "French school" that mirrors the surrounding white supremacy of the 1950s. Despite some radical theatrical elements and Bernstein's attempt to make it a plea for racial tolerance, West Side Story is not politically radical, but reproduces the systems of oppression at the root of the violence within the show.

Advisor: Dr. Cassandra Hartford

College Funded by: Summer Research Grant from Dean of Academic Life

4. The Muhlenberg Summer Digital Scholars Pilot Program

Rachel Bensimhon, Shuhong Tang

“In late 2019, Muhlenberg’s Digital Learning Team was tasked with developing a summer program that would foster undergraduate digital scholarship, allowing students to learn about the theories, tools, and ethics of creating and sharing research from across disciplines within a digital realm. Grounding in digital scholarship provides yet another avenue by which Muhlenberg students can pursue undergraduate research, and developing a summer program will create a community of practice that would share and support the growth of this student work.” (from <http://trexlerworks.muhlenberg.edu/dh/s/bergds/page/about>)

Advisor: Susan Falciani Maldonado and Brittany Robertson

College Funded by: The Andrew W. Mellon Foundation's Practicing the Liberal Arts grant

5. Comparing and Contrasting Ecological Impacts of Carbon Dioxide Acidification in Freshwater and Marine Ecosystems

Aviv Campbell, Renee Heller

With rising global emissions, CO₂ dissolves into aquatic systems, causing acidification. This process has been well-studied in marine ecosystems, but only recently considered in freshwater systems. The extensive marine research can be used to inform and provide a framework for understanding freshwater acidification. Overlapping taxa in both systems like phytoplankton, zooplankton, snails, arthropods, and bivalves are impacted by acidification depending on location, nutrient source, calcification, motility/sessility, acid-base regulation, reliance on chemical cues, and larval sensitivity. This review endorses connections within aquatic sciences; and advocates for future studies to consider both freshwater and marine systems in their conclusions.

Advisor: Dr. Erika Iyengar

College Funded by: Vaughn Summer Research award



6. The Potential Predictors and Outcomes of a School-Based Mindfulness Intervention

Sarah Cehelyk, Thomas Spinelli

Prior research with Shanthi Project has indicated an association between mindfulness interventions and overall reductions in problem behaviors as well as an increase in prosocial behaviors; however, these outcomes varied by classroom. Based on our previous work, we believe that teacher buy-in and teacher engagement with the program play a role in how mindfulness programs are received by students. Because of this, our work this summer focused on questionnaires provided to the teachers which focus on previous experience with mindfulness, perceptions of mindfulness on individual and classroom level as well as opinions regarding social-emotional learning.

Advisor: Dr. Mark Sciotto

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

7. Emulating a Quantum Computer with an FPGA

Jackson Davis

Inspired by recent research, I designed an FPGA-based quantum computer emulator. I created a chain of communication between a PC running Python to create quantum states and gates and an FPGA to compute their output. By moving state measurement to the PC and keeping only gate operations on the FPGA, I was able to free some space on the FPGA. Also, a separate emulator with the restriction that all numbers are real, not complex, freed up enough space to have room for an additional emulated qubit. I successfully implemented and tested some basic quantum algorithms, such as the Deutsch-Jozsa algorithm.

Advisor: Dr. Charles Collett

College Funded by: Summer Research Grant from Dean of Academic Life

8. Building Interactive Models of the GABA(A) Receptor

Emily Drake, Jonathan Henry*

The gamma-aminobutyric acid receptor (GABA_AR) is an ionotropic neurotransmitter receptor, and the primary mode of inhibition in the brain. The effects of benzodiazepines, barbiturates, neurosteroids, alcohol, and anaesthetics occur through molecular interactions with the GABA_AR . Many plant-derived compounds are thought to be GABAergic due to their proposed anxiolytic or hypnotic effects, notably, passionflower. Through modelling different subtypes of GABA_AR , we can better understand the impact of structure on receptor function, predict the effects of these plant-derived compounds, and provide insight into the future synthesis of novel GABAergic drugs.

Advisor: Dr. Jeremy Teissère

College Funded by: Lake Road Fellowship

** These students contributed equally to this work.*

9. Potential VPCA Pathway Containing Extremophiles

Snow Du

VPCA is one of the molecules that is called synthon, which is a relatively a small molecule that can make a larger one. For example, VPCA can be the synthon that makes lincomycin. Our study focuses on the species that have the pathway to make VPCA or other synthons, for example, in *Streptomyces lincolnensis*, its VPCA pathway contains LmbB1, LmbB2, LmbA, LmbW and LmbX. We are trying to discover how far and wide in the evolutionary tree this pathway spreads and specifically the ones are extremophiles for further study.

Advisor: Dr. Keri Colabroy

College Funded by: NSF CHE 1708237

10. Acupuncture in Contemporary China: The Rise of Modern Chinese Medicine

Ethan Forrer

Traditional Chinese medical practices and theories have continuously developed in the Chinese area for thousands of year and is now commonly refereed as Traditional Chinese Medicine (TCM). The TCM currently practiced in China is not the same as it was only 70 years ago, although the theories have been carried over. Current TCM utilizes many techniques and practice from Western Medicine and now exists as a hybrid between the two. This research was aimed to learn more about the relationship between Chinese and Western ideals and practices that is present in Modern Chinese Medicine.

Advisor: Dr. Lui, Dr. Feng

College Funded by: Study Abroad

11. Two Bit Quantum Gate

Alexander Gardner

This past summer my research focused on simulations of molecular nanomagnets (MNM), little quantum spins that we're trying to use for quantum computing. These simulations are useful because we can test whether our particular MNMs will work as qubits – or quantum bits – which are the building blocks for quantum computing. I was trying to perform quantum gates with two interacting spins, doing this by simulating the effects of radio frequency pulses, whose frequencies match the energy difference between different energy states we are trying to transition between. I was able to show that using the right RF pulses should allow us to create a good CNOT gate with our MNMs, which is a big step towards showing their viability as qubits.

Advisor: Dr. Charles Collett

College Funded by: Summer Research Grant from Dean of Academic Life

12. Exploration of Alternative Linkages of N-Benzylamide Non-Steroidal Anti-Inflammatory Drug Conjugates

Michael R. Gatazka

Low brain bioavailability of non-steroidal anti-inflammatory drugs (NSAIDs) has, in part, limited the potential therapeutic use of these compounds for central nervous system (CNS) diseases such as Alzheimer's disease (AD). We recently reported a series of NSAIDs linked to an N-benzylamide blood-brain barrier (BBB) shuttle with potential for improved CNS delivery. Herein, we present the synthesis of altered shuttles with carbonate and carbamate linkages that possess different physicochemical properties, which could expand the therapeutic capabilities of NSAIDs for AD. These shuttles were coupled to NSAIDs using a carbodiimide coupling strategy that is predicted to afford the conjugates in high yields.

Advisor: Dr. Sherri C. Young

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

13. Variable Flowering Phenology Dependence on Climate Change by Native and Non-Native Plants

Cole Geissler

We tested the hypothesis that rising temperatures associated with climate change impact plant flowering phenology, and that trends varied between native and non-native species. We ran regressions using herbarium records of 20 native and 16 non-native species and NOAA temperature data occurring in Eastern Pennsylvania counties from 1884 to 2015. Responses varied, with some species flowering earlier and others later; native species had more significant historical trends than non-native species. Almost all species showed significant trends when incorporating climate data. Variable responses reflect climate change's significant relationship with flowering phenology shifts but also the possible presence of other influencing factors.

Advisor: Dr. Richard Niesenbaum

College Funded by: Trainer Summer Research award

14. Steady-state Kinetics on 6-Substituted Derivatives of Dopamine as Substrates of L-DOPA Dioxygenase

Alexander Goldberg

Dioxygenase enzymes are essential protein catalysts for the breakdown of catecholic rings. This powerful chemistry is used in nature to make antibiotics and other bioactive materials as well as degrade plant material, but our understanding of the substrate space for these powerful enzymes is limited. Here we report the steady-state kinetic analysis of 6-substituted dopamine derivatives as substrates of L-DOPA dioxygenase, and an analysis of that activity as a function of the electron withdrawing nature of the substituent. The variety of substrates accepted by the enzyme is indicative of the utility of extradiol cleavage in semisynthetic and bioremediation applications.

Advisor: Dr. Keri Colabroy

College Funded by: NSF CHE 1708237 and the Research in Biochemical and Chemical Sciences Fund



15. A Glimpse of the Future: Performance Art for Identity and Development in Southeast Asia

Caya Greenspan-Layman

This research examines the ways in which contemporary Southeast Asian performance artists foster individual, group, and regional identities and dialogue, leading to forms of democracy and sustainable development in Southeast Asia. Performance art, an artform frequently used to address social and political issues, is often censored for challenging state-constructed national and regional identities. Through a snowball sampling method, data was collected from archival materials to identify creative actors of interest. I examine how artists continue to perform and network throughout the region, and consider the implications for identity, local communities, and national development.

Advisor: Dr. Janine Chi

College Funded by: Summer Research Grant from Dean of Academic Life

16. Development of General Chemistry Labs

Camryn Griffon, Hannah Morris

In light of the Covid-19 pandemic, science classes have had to develop experiments that students can perform outside of a science laboratory. Through this summer research, General Chemistry virtual and at-home labs were created such that students can receive the same quality lab experience from home that they would experience in a conventional lab setting. Such labs will be implemented in the Fall 2020 semester, including the qualitative analysis Nine Bottle Problem, the titration of Vitamin C with iodine, and the determination of specific heat capacity of various metals. Student learning will be assessed based upon student performance and feedback.

Advisor: Dr. Silvia Porello

College Funded by: Research in Biochemical and Chemical Sciences Fund

17. A Review of the Impact of Peptoid Flexibility and Conformation on Physicochemical Properties

Maria Guadalupe Vazquez

Peptoids, a class of compounds mimicking peptides, have been extensively studied in the last few decades for their potential application as therapeutics and as materials. These molecules offer a number of advantages over peptides including increased stability, improved permeability, and a straightforward synthesis. Peptoids possess a tertiary amide leading to greater flexibility and novel conformations that can impact their properties. Herein, we present a literature review of various structure-property relationships relating peptoid flexibility and conformation to various properties (e.g. permeability, stability, binding, etc.) of peptoids.

Advisor: Dr. Sherri Young

College Funded by: Schuler Scholar Program

18. Physiological Color Change Across Timescales, Mechanisms, Functions, and Taxa

Austin Hoffman

Color change among the animals serves a multitude of functions such as crypsis, thermoregulation, signaling, and sexual communication. Extensive study of these behaviors has been largely restricted to model systems like chameleons and cuttlefish. However, rapid physiological color change occurs via a variety of mechanisms that appear evolutionarily conserved across animal taxa. Animals such as cuttlefish and some arthropods display extremely fast color change using direct control of chromatophores or by altering water refractivity on their cuticle, respectively. Other animals change more slowly using melanosome release within chromatophores. Mechanisms cluster within taxa, suggesting compromise between adaptation and evolutionarily conserved equipment.

Advisor: Dr. Erika Iyengar

College Funded by: Trainer Summer Research award

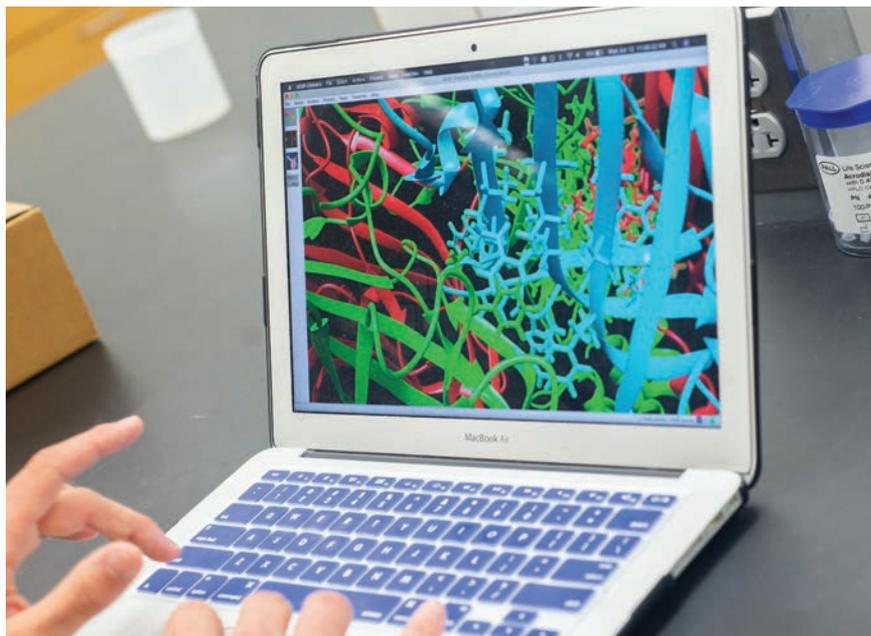
19. Exploring the Impacts of Flavored E-liquids on Oral Commensal Biofilms

Michelle James

The objective of this study was to determine if E-liquids from electronic cigarettes could alter the growth of oral commensal bacteria. Oral bacteria were grown in the presence of varying amounts of E-liquids +/- flavors. Biomass of each species was quantified using the crystal violet biomass assay. Results show that 1% E-liquids +/- flavors increased the overall growth of the oral bacteria. Higher concentrations of E-liquids with cinnamon, strawberry or menthol resulted in dose-dependent growth inhibitions. The results suggest that flavored E-liquids can steer oral microbial environment ecology away from homeostasis. These changes may increase the risks of oral diseases.

Advisor: Dr. Giancarlo Cuadra

College Funded by: Vaughn Summer Research award



20. Understanding Americans' Perceived Risk of Climate Change and Support of Climate Change Policy

Francesca Jones

Previous research has highlighted that while Americans are often aware and even concerned about climate change, there is a great lack of urgency when compared to other countries. In this study, we explore how perceived risk of climate change predicts support of climate change mitigation and adaptation policies. To further understand this relationship, we consider how perceived risk and policy support differ across sociodemographics. Results suggest a positive correlation between perceived risk and policy support, as well as suggesting that of all the sociodemographic factors considered, strength of political identity is most strongly correlated with perceived risk and policy support.

Advisor: Dr. Richard Niesenbaum

College Funded by: The David C. Rabold Fund for Interdisciplinary Research in Sustainability

21. Travelling Back into the Evolutionary History of L-DOPA Dioxygenase

Paige Jones

Using multiple sequence alignments, basic local alignment search tool from the National Center for Biotechnology Information's website and genome context analysis, 21 organisms were observed to explore the evolutionary history of lmbB1, an L-DOPA dioxygenase from the antibiotic producer *Streptomyces lincolnensis*. Two organisms were found to potentially have an additional step in the antibiotic producing VPCA pathway that hydroxylates the product, which resembles proline. Seven organisms had only lmbB1 and lmbB2 homologs with no other VPCA pathway proteins. Six organisms had only a VOC family protein. More distantly related proteins had transcription factors and proteins associated with metabolism nearby.

Advisor: Dr. Keri Colabroy

College Funded by: NSF CHE 1708237

22. Verb Voice in Reports of Violence Against People of Color

Madeleine Kemo

The purpose of this study was to investigate the use of active versus passive voice in news reports and on social media. Previous studies have shown that passive voice when reporting acts of domestic violence against women can lead to victim blaming. We were interested in how police brutality is discussed in the media depending on the victim's race. We collected 300 news articles and 1000 tweets to analyze verb voice and other factors. Data analysis is ongoing. Next, we plan to experimentally investigate how people describe similar instances of violence and the consequences of linguistic choices on blaming.

Advisor: Dr. Alexandra Frazer

College Funded by: Summer Research Grant from Dean of Academic Life

23. Evolution of The Insulin Signaling Pathway in Drosophila

Zach Lill

The field of comparative genomics contributes to our understanding of the evolution of biological pathways. One of the most studied pathways today is the insulin signaling pathway due in part to its translational potential. Working in collaboration with the Genomics Education Partnership, we described the structures of important genes in the pathway (chico, Pten, Pdk1, Akt1, foxo, and Tor) across *Drosophila* species. We then analyzed the percent identities of these genes between species to determine the level of conservation at the protein level. We found that downstream elements were more highly conserved than those upstream in the insulin signaling pathway.

Advisor: Dr. Amy Hark

College Funded by: Vaughn Summer Research award

24. Impact of Acidification on Use of Chemical Cues in Aquatic Environments

Elizabeth Long

While the impact of acidification on the structural integrity of organisms in aquatic systems (marine and freshwater) has received attention, recognition of its important impact on the efficacy of chemical cues used by fish, molluscs, and arthropods has recently emerged. Because chemical cues are used for many crucial behavioral decisions, including predator avoidance, prey detection, and detection of proper habitats, interference with cue detection through pH decreases can negatively impact evolutionary adaptations. Whether the pH alteration affects the cues themselves or alters the animal's ability to detect or appropriately respond to the cues is currently under investigation.

Advisor: Dr. Erika Iyengar

College Funded by: The Crist Award

25. Electron Spin Resonance

Jose Maldonado

This project focuses on designing the hardware to build an electron spin resonance (ESR) probe, and the software to control it. To perform ESR at low temperatures, a sample probe must first be designed and created to place samples in the cryostat, center them in the magnetic field, and transmit signals to and from the resonators. Electromagnetic field modeling will then be applied to the sample probe, created as a CAD design, on an HFSS software to simulate radio-frequency excitation to the antenna to see what the response of the resonator would be.

Advisor: Dr. Charles Collett

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

26. In Silico Investigation Into the Genetics of Arousal in *C.elegans*

Danny Monzo

Transcription factors are proteins that bind to certain genetic sequences that either repress or enhance transcription. I explored two genes, *fax-1* and *unc-42*, that encode for transcription factors that regulate neuron identity and have a direct effect on the insulin and arousal pathways in *C. elegans*. I used ChIPseq data to explore potential binding sites for *fax-1* and *unc-42*. These data sets were supplemented with microarray and RNAseq data in order to identify target genes that are regulated by *fax-1* and *unc-42*. This resulted in approximately 40 genes of interest that are regulated by either *fax-1*, *unc-42*, or both that can be tested further by direct genetic studies.

Advisor: Dr. Bruce Wightman

College Funded by: Vaughn Summer Research award

27. Becoming Unorthodox: An Exploration of Queer Time

Miriam Morton

Queerness, religion, and time are often seen as rigid in their definitions. My research sought to expand the boundaries to include a wide range of experiences. Specifically, I explored the connections between the Satmar Orthodox Jewish community and queerness through anthropological theory, journals, and popular media. Deborah Feldman's memoir *Unorthodox: My Hasidic Roots Uncovered* and the Netflix series *Unorthodox* were central to this project in providing context for the Satmar community based on their individual experiences. Both provided a way to understand and evaluate elements of queerness within the Satmar community.

Advisor: Professor Sharon Albert

College Funded by: Summer Research Grant from Dean of Academic Life

28. Crafting a Conceptual Framework to Contextualize Foraging Behavior of Bumblebees

Vijay Rao, Jessica Sommer

Bumblebees are essential pollinators within both natural and agricultural contexts. As such their foraging behaviors are vital for successful proliferation of angiosperms. Bumblebees rely on visual, olfactory, and other sensory modalities, relevant at different spatial scales, in order to locate and acquire resources. It is necessary to evaluate the specific behavioral phases of bumblebee foraging in order to understand the implications of changing environmental conditions. The interplay of sensory modalities and the spatial scales at which they are relevant must be clearly understood before the impacts of agriculture, urbanization and other human alterations to their natural landscapes can be identified. In addition, the lack of a comprehensive framework denoting the different phases of foraging results in inconsistencies within the literature.

Advisor: Dr. Jordanna Sprayberry

College Funded by: Vaughn Summer Research award



29. Latinx Communities and HIV/AIDS in the Lehigh Valley: Access to Medical Care and Representation

Victoria Retterholt

In the Lehigh Valley, HIV/AIDS has disproportionately affected the Hispanic/Latino community. Organizations such as Latino AIDS Outreach, Latinos for Healthy Communities, New Directions Treatment Services, the AIDS Activity Office, and the AIDS Service Center were all instrumental in providing resources to the local Hispanic/Latino community such as education and financial resources. Through interviews with former community leaders and archival research, it became clear that the main mode of transmission for Hispanic/Latino individuals in the Lehigh Valley was via intravenous drug use (IDU), and secondary transmission was from infected male partners infecting their female partners.

Advisor: Rachel Hamelers

College Funded by: The Public Health Research Fund

30. The Cyclic Influence of Tragedie en Musique Propagandistic Opera and French Politics in the Seventeenth Century

Tess Rhian

Opening with forty minutes of music designed to praise King Louis XIV, it was expected that the prologues of Tragedie en Musique operas would function as propaganda. This research analyzes the relationship between Jean-Baptiste Lully's operas and King Louis XIV's political acts in France during the Seventeenth Century. Through a tandem exploration of libretti and historical records I examine the entirety of the opera Armide and analyze its function as religious propaganda. The opera contains layered subliminal messages about the internal French conflict between the Catholics and Protestants, and the external conflict between France and the Muslim Ottoman Empire.

Advisor: Dr. Cassandra Hartford

College Funded by: Summer Research Grant from Dean of Academic Life

31. Using Pre-steady State and Steady-state Kinetics to Examine The Roles of Active Site Residues in L-DOPA Dioxygenase

Miranda Robinson

L-DOPA dioxygenase is predicted to bind iron at the interface of two subunits using two histidine residues and a glutamate residue from different subunits. A neighboring tyrosine and histidine are also proposed to participate in catalysis. To investigate the roles of these active-site residues, steady-state and pre-steady state activities of mutant L-DOPA dioxygenases were examined as a function of pH and substrate concentration.

Advisor: Dr. Keri Colabroy

College Funded by: NSF CHE 1708237

32. Molecular Genetics of Sleep

Jordan Schneider

Similar to humans, *Caenorhabditis elegans* display sleep-like behavior that is controlled by an evolutionarily conserved insulin signaling pathway. Previous evidence from the Wightman Laboratory suggests that insulin signaling may be potentiated by transcription factors FAX-1 and UNC-42 to promote arousal in neurons. In order to understand how FAX-1 and UNC-42 regulate the arousal versus sleep decision, we performed an in silico investigation into data from Chromatin Immunoprecipitation (ChIP Seq), RNA sequencing (RNA Seq), DNA microarray, and conserved nuclear receptor cis-regulatory binding site experiments. Together, these data helped me to identify candidate genes that may function in neurons to regulate arousal.

Advisor: Dr. Bruce Wightman

College Funded by: Vaughn Summer Research award

33. Grit and When to Quit: Student- Athlete Attitudes Towards Sport-Related Injuries

Isabel Schwartz

This study compared college athletes' attitudes towards injuries with their perception of their coach's attitudes on injuries. Fifty-five participants responded to an online survey that contained a grit scale, prompts describing a more supportive and less supportive coach, and questions regarding past injury history and their current head coach. While 80% of athletes surveyed reported hiding an injury from their coaches or trainers, student-athletes perceived that their coaches largely shared their attitudes regarding when to report an injury based on pain level. Future research should include broader samples of participants from all NCAA divisions and sports.

Advisor: Dr. Kathleen Bachynski

College Funded by: Summer Research Grant from Dean of Academic Life



34. Development of Sexually Dimorphic Branchiae in *S. Benedicti*

Caitlin Segarra

Very little is known about the structure, function, and development of the external gills of marine worms. These gills, known as branchiae, are presumed to have respiratory and possibly excretory functions. We used the scanning electron microscope (SEM) to describe the step-by-step developmental sequence of *Streblospio benedicti*'s paired branchiae, which are attached to the head. While identifying the adult branchiae's anatomical features, we discovered the branchiae are sexual dimorphic. This summer, we uncovered how the unspecialized branchia matures into the male branchiae, which is significantly more complex than the female's.

Advisor: Dr. Elizabeth McCain

College Funded by: Vaughn Summer Research award

35. Effects of Short and long Sessions of Tetris on Consolidation of Emotional Memory

Rebecca Shear

The goal of this study was to better understand memory consolidation. Working memory (WM) has limited resources for cognitive tasks like visuospatial processing (Kessler et al., 2020). When multiple cognitive tasks compete for these resources, there will be reduced information processing and memory can become less vivid and less emotional. Visuospatial tasks like Tetris interfere with consolidation and are being used to treat psychological disorders (like PTSD, phobias, etc.). We tested how duration of engagement with the visuospatial interference task Tetris impacts consolidation of emotional memory.

Advisor: Dr. Gretchen Gotthard

College Funded by: Neuroscience Collaborative Research Program

36. Development of Tickemon Go, a Mobile Phone Application to Assist in Active Tick Surveillance

Jonah Silverman, Adam Cantor

We developed a phone application in order to streamline active surveillance of tick-borne pathogens. The app collects GPS data, along with applicable metadata including tick prevalence, species diversity, and environmental metrics specific to the date, time and location that data was generated. The OpenStreetMaps API and the OpenWeatherMAP API are utilized for map and weather information and the app generates .gpx and .json files containing location data and metadata respectively. All this is stored locally as well as on Google's Firebase database. This project serves as a step towards standardizing tick surveillance for biological research and public-health initiatives.

Advisor: Dr. Marten Edwards and Dr. Jorge Silveyra

College Funded by: Trainer Summer Research award

37. Polyoxometalates and Metal Nanoparticles

Nesya Sloane, Hani Tolaymat

Our group wrote an academic review article that surveys the literature in the field of polyoxometalate and noble metal nanoparticle composite syntheses. Polyoxometalates are large molecules made up of many metal and oxygen atoms. When they are combined with small amounts of noble metals like silver, gold, platinum, or palladium, they produce even larger composite structures. These composite structures have numerous potential uses including drug and pollutant detection in liquids, antibacterial properties, and catalytic applications.

Advisor: Dr. Jonathan Gooch

College Funded by: Research in the Chemical and Biochemical Sciences Fund and Russell N. Smart and David Stehly Summer Research Grant

38. Virtual Docking of L-DOPA Derivatives into L-DOPA Dioxygenase

David Strzeminski

The enzyme L-DOPA dioxygenase cleaves L-DOPA and other catecholic substrates to make products useful in natural product biosynthesis and in the conversion of lignin to usable biofuels. In order to predict possible substrates of L-DOPA dioxygenase, synthetic derivatives of L-DOPA were docked virtually into the active-site of the recently-solved crystal structure using USCF Chimera and AutoDock Vina software. Out of the eight derivatives examined, dopamine, 6-bromodopamine, 6-cyanodopamine, 6-carboxydopamine, and 6-hydroxydopamine bound to the active-site iron in a way consistent with the natural substrate, while 6-nitrodopamine, 6-cyclicdopamine, and 6-ethyldopamine did not.

Advisor: Dr. Keri Colabroy



College Funded by: NSF CHE 1708237

39. Biodiversity of Allentown's Managed Green Spaces

Morgan Tietz

Urban green spaces support and preserve biodiversity. They can also be used to support ecosystem services. I studied two basic types of managed urban landscapes; those managed for aesthetic purposes and those for ecosystem function with the goal of elucidating how each may support biodiversity and taxa prevalence in different ways. Using sweep netting, I observed the prevalence of insect taxa in five managed landscapes at three different locations. Using the Simpsons Diversity Index to calculate biodiversity, I concluded that landscapes managed for ecological function were more biodiverse than landscapes managed for aesthetic purposes

Advisor: Dr. Richard Niesenbaum

College Funded by: The David C. Rabold Fund for Interdisciplinary Research in Sustainability



40. Coral and Mollusk Mucus and Anthropogenic Environmental Disruption

Isabella van der Weide

Ocean warming and acidification present a growing threat to many marine invertebrate organisms. This review presents current research on the potential impacts of these stressors on coral and mollusk mucus production. Mucus production is important to individual organisms and coral mucus has major ecological importance due to its vital role in nutrient cycling in reef communities. Both corals and mollusks tend to increase mucus production upon initial exposure to a stressor. However, over longer exposures, coral mucus production tends to decrease. This may indicate that these corals are no longer able to afford the energetically expensive process of mucus production.

Advisor: Dr. Erika Iyengar

College Funded by: Vaughn Summer Research award

41. Semantic and Phonological Influences on Word Production

Megan Webber

We examined the relationship between semantic blocking, the tendency for naming to slow when items belong to the same semantic category, and phonological preparation, the tendency for naming to be facilitated when words share their initial sounds, using a blocked cyclic naming procedure. We picked five categories and onsets, and varied whether items were related phonologically, semantically, both, or neither. The participants will be shown images in each condition and we will measure reaction times. We hope to collect data this Fall, but adjustments to data collection will be needed due to Covid-19.

Advisor: Dr. Alexandra Frazer

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

42. Almost Pythagorean Triples

Lynn Yao

We study a method to generate all the almost Pythagorean triples and almost Eisenstein triples with the assist of their primitive triples. Suppose (a, b, c) are all positive integers without common factors. We defined the almost Pythagorean triples as the triples that can satisfy $a^2+b^2=c^2+1$ and the almost Eisenstein triples as the triples that can satisfy $a^2+ab+b^2=c^2+1$.

Advisor: Dr. Byungchul Cha

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

muhlenberg.edu

