WILLIAM PATERSON UNIVERSITY OF NEW JERSEY

COLLEGE OF SCIENCE AND HEALTH

RESEARCH

INTERNSHIPS AND EXTERNSHIPS

GARDEN STATE—LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION

CELEBRATING STUDENT RESEARCH ACTIVITIES 2018

TENTH EDITION

EDITED BY: DR. DANIELLE DESROCHES, COVER BY RITA LEVINE

RESEARCH
INTERNSHIPS, EXTERNSHIPS

WILLIAM PATERSON UNIVERSITY

COLLEGE OF SCIENCE AND HEALTH
BIOLOGY DEPARTMENT
Garden State-Louis Stokes Alliance for Minority Participation
(GS-LSAMP)
&
Minority Association of Pre-medical Students (MAPS)

Celebrating Student Research Activities
2019
Tenth Annual Edition

TABLE OF CONTENTS

Research Internships

William Paterson University, Biology Department

William Paterson University, Chemistry Department

Catalytic Activity of a New Generation of Platinum Nanoparticles
Terrence Hopkins*, *Gurjeet Longia and Dr. Bhanu P. S. Chauhan

William Paterson University, Environmental Sciences Department

***Enchodus* from the Arkadelphia Formation-Midway Group Contact (K-Pg), Hot Spring County, Malvern, Arkansas: Implications for the effects of the K-Pg Mass Extinction Event on a Piscivorous Food Web**
Kristina Hayek*, *Dr. Martin Becker, Harry Maisch and Christopher Gocklin

The Extinction of Iconic Megatoothed Shark *Otodus megalodon*: Preliminary Evidence from 'Clumped' Isotope Thermometry
Chelesia Clarke*, *Allison Neumann*, *Drew Pedersen, Troy Nixon, Clint Mautz, Dr. Michael Griffiths, Dr. Martin Becker, William Paterson University; Dr. Kenshu Shimada, DePaul University; Dr. Sora Kim, University of California Merced; Dr. Robert Eagle, University of California Los Angeles; Harry Maisch IV, The City University of New York.

Meeting /Presentations

Conferences Photographs

Student awards

Introduction

This is the 11th year the Garden State Louis Stokes Alliance for Minority Participation (GS-LSAMP) program has put together such publication in order to recognize the research efforts and successes by William Paterson University science majors.

As in previous years, Summer Research Internships and Externships have provided students with the opportunity to work on or off campus, in a laboratory or in their field of interest, under the supervision of a faculty. Such opportunity has allowed them to experience firsthand "how scientists work" and how to conduct scientific research. Many actively participated in specific projects, learn new techniques including the use of elaborate laboratory equipment, computer -assisted analyses, animal husbandry and handling, to name a few. Others have spent their summers volunteering or shadowing physicians in Hospitals and Health Clinics. Such internship has proven to be a valuable asset for students applying to Graduate or Professional school, or in job placement or career selection following graduation.

All the summer interns have presented their summer experience at one of our monthly, well attended, meetings in the Fall 2018 and Spring 2019 semesters. Additionally, several GS-LSAMP students presented their work at the Undergraduate Research Symposium which took place at WPU in April 2019 and 8 of them won awards for their posters. Others have gone to Regional meetings, including GS-LSAMP Annual STEM meeting at Rutgers University (October 2018). Four of our students won first Place. Most of these abstracts or summaries are in their own words and represent an honest and candid account of their work. Other abstracts are more formal and were presented at a national scientific meeting. Several of the projects were published in Peer Reviewed journals. An example of such achievement is a February 26, 2019 paper published in the American Society for Microbiology journal Sphere by Dr. James Arnone from Biology with his research team including mostly GS-LSAMP students

These summer internships would not have been possible without the support of the Biology, Chemistry and Environmental Sciences faculty who have volunteered to mentor our students. Others have provided contacts for off campus opportunities.

This past summer, GS-LSAMP was able to provide stipends to 15 students. This support as well as this publication would not be possible without the support of Dr. Venkat Sharma, Dean of COSH who funded 10 more students, and of Dr. Jean Fuller-Stanley, Associate Dean of CSH, LSAMP project director at WPU. Many thanks to the Provost, Dr.Warren Sandmann, for providing the additional funding needed, Thanks to his support, an additional 8 students were funded. In addition, Dr. Donna Rennar -Potacco, Director of the SEC provided support for 4 of the applicants. **A total of 40 students** were involved, our largest group since the start of the GS-LSAMP program. A big thank you as well to Rita Levine for assisting in all matters related to GS-LSAMP and for her technical and graphic support with this manuscript.

We hope that next's year publication will include many more interns and mentors.

Dr. Danielle Desroches

Professor
Human Physiology and Neuro-endocrinology, PhD
Integrated Math and Sciences (IMS) Director
Anatomy and Physiology Coordinator
Minority Association of Pre Medical Students (MAPS) Coordinator
Biology Biotechnology Club (BBC) Faculty Co Advisor
Garden State Louis Stokes Alliance for Minority in Sciences, (GS-LSAMP) Academic Coordinator
desrochesd@wpunj.edu (973) 720-2329

GS-LSAMP STUDENTS FUNDED : SUMMER 2018 - RESEARCH TOPICS

18 FUNDESD/NSF GRANT (20HRS/WEEK)

Name	Department	Mentor
1. GALLOZA, SABRINA	BIOLOGY	DR. MARTIN
Detecting Differences in the gut microbiome of adult and larval Honeybees		
2. ANGARITA, SHARON	BIOLOGY	DR. MARTIN
Pseudogymnoascus Destructans detection in bat cave samples		
3. POLETTI, LAUREN	BIOLOGY	DR. GILLEY
Airborne Transmission of the waggle-dance Pheromone		
4. HOPKINS, TERRENCE	CHEMISTRY	DR. CHAUHAN
Synthesis and characterization of nanoscale materials		
5. ABREU, SAUL	BIOLOGY	DR. BIERBOWER
Neuroprotection through modification of potassium channels with acute and chronic alcohol consumption		
6. ROMAN, JONATHAN ANDREW	CHEMISTRY	DR. FOLEY
Conducting computational methods to design Solar thermovoltaics		
7. EVRA. EMMANUEL	BIOLOGY	DR.SPAGNA
Spider survey of High Mountain Reserve		
8. BUENDIA, DARA	BIOLOGY	DR.LEE
Neuroanatomical examination of nociceptive system in brains of autistic BTBR mice		
9. LOUIS, JENNIFER	BIOLOGY	DR. MARTIN
Quantification of fecal Akkermansia muciniphila		
10. BARRERA, GIOVANNI	CHEMISTRY	DR. KAUR
Synthesis of Manganese Terpyridine Basal Systems		
11. MUNOZ , JOSE	BIOLOGY	DR. BIERBOWER
Neuronal Recovery with chronic exposure to alcohol after traumatic brain injury		
12. INOA, JOAN	CHEMISTRY	DR.XING
Sol-gel polymer catalyzed Halo-functionalization of Alkynes		
13. CALALPA, BRENDA	CHEMISTRY	DR. KAUR
$NiBr_2$ catalyzed oxidative esterification		
14. MURRAY, KEIMAR	BIOLOGY	DR. MARTIN
Quantification of fecal Akkermansia muciniphilia		
15. ARRIETA, ROSEMARY	BIOLOGY	DR. MONROE
Molecular biology and secondary metabolisms of the dinoflagellate Karenia brevis		
16. CLARKE CHELESEA	EVS	DR. BECKER
Extinction of otodus megalodon, through habitat, evolutionary and physiological changes		
17. GORDON, ASHANAE	BIOLOGY	DR. SPAGNA
Local spider survey and behavioral study		
18. MEJIA, NELSON	BIOLOGY	DR. ARNONE
A targeted suppressor screen to uncover Genetics links extending life-span in autophagy and respiration deficient mutants		

SEC FUNDED (20 HRS/WEEK)

1. ANGELUCCI, MARISSA	BIOLOGY	DR. MARTIN
Gut microbiome in mice, pain in relation to the gut microbiome		
2. ABBOUD, ALAN	BIOLOGY	DR.MONROE
Effect of high light intensity on Polyketide Synthase Expression and toxicity of Karenia brevis		
3. HOLGANZA, MARIA KATRINA	BIOLOGY	DR. ARNONE
Testing the effects of a daumone precursor on the lifespan of S. cerevisiae		
4. HOLGANZA, VERONICA	BIOLOGY	DR. MENON
Investigating the effects of atmospheric plasma pressure on X. Laevis tadpole limb regeneration		

PROVOST FUNDED (20 HRS/WEEK)

Name	Department	Mentor
1. MOALLEM, ELIKA	BIOLOGY	DR. BIERBOWER
Neuroprotective effects of acute moderate alcohol after traumatic brain injury		
2. QUIAMBAO, LAURICE	CHEMISTRY	DR.KAUR
Non-precious metal catalysis for oxidative esterification		
3. BEGUM, JANNAT A	BIOLOGY	DR. MONROE
Brevetoxin-producing Karenia brevis		
4. DE SOUZA MACEDO	BIOLOGY	DR, BIERBOWER
TBI on mice and ovariectomies on mice		
5. TRIGOURA, LESLIE	CHEMISTRY	DR. XING
Total synthesis and biological activity study of natural products		
6. ST.AMANT, CHIARA	CHEMISTRY	DR. XING
Anti-aging activity: Daumone synthesis and Analogs		
7. ALMOUALLEM, BELAL	BIOLOGY	DR. MONROE
Effect of high light intensity on both toxic and non-toxic strains of Karenia brevis		
8. NAKAMURA, OLIVIA	BIOLOGY	DR. GILLEY
Continuing pollen collection to study the trends of food sources of bees throughout the season and the impact on colony health		

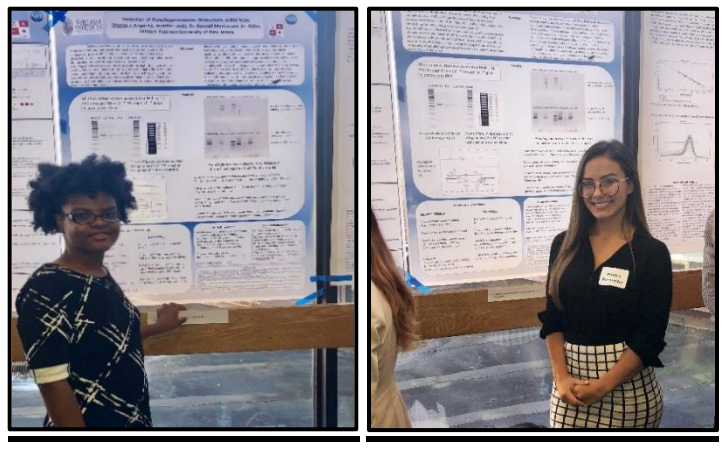
DEAN COSH FUNDED (20 HRS/WEEK)

1. BARRETT, RACHEL	BIOLOGY	DR. BIERBOWER
Investigating effects of alcohol pre- and post TBI		
2. LEWIN, DYLAN	BIOLOGY	DR. SPAGNA
Spider Fauna around William Paterson campus		
3. HAPATSHA, TATIANA	CHEMISTRY	DR. KAUR
Non-precious metals catalysis		
4. NEUMANN, ALLISON	EVS	DR.GRIFFITH
Studying the cause of extinction of Otodus megalodon through physiologic, evolutionary, and habitat changes		
5. PATEL, ANJALI	CHEMISTRY	DR. XING
Visible light induced Alkyne functionalization		
6. HAYEK, KRISTINA	EVS	DR. BECKER
Identifying osteichthyan teeth and skeletal elements		
7. ABU HARDAN, AHMAD	BIOLOGY	DR.ARNONE
Testing the enhancer-promotor hypothesis in Saccharomyces cerevisiae		
8. NIXON, TROY	EVS	DR.BECKER
Recovery of an assemblage of Paleocene epoch shark teeth for taxonomic and geochemical analysis		
9. RECTOR, GABRIELLA	BIOLOGY	DR.WALDBURGER
Investigating bacteria colonies associated with culture of both toxic and non-toxic *Karenia brevis*		
10. VARNER FRANK, JAMES	CHEMISTRY	DR. FOLEY
Virtual design of novel nanostructured selective absorbers for STPV application		

Research Internships Abstracts

William Paterson University, Biology Department

Detection of *Pseudogymnoascus destructans* in Bat Feces



Sharon Angarita, Jennifer Louis, Dr. Kendall Martin (mentor), Lance Risley (collaborator)

White Nose Syndrome continues to be a threat to the vast majority of bat populations in the northeast of the country. Detection of *Pseudogymnoascus destructans* is possible through the diagnostic use of PCR. Nested PCR was used to improve sensitivity by re-amplifying a longer PCR fungal-universal sequence with second round PCR using *P. destructans* specific primers. Since the fungus is classified as a level-three biohazard, the samples have to be sterilized prior to extraction. We adopted an approach recently approved by the National Forest Service, to decontaminate the samples with 60% ethanol upon collection. Previously, autoclaving was the method used to decontaminate the samples, which damaged the viability of the DNA. The present focus of the study is to determine whether collecting the samples in 60% ethanol would preserve DNA more effectively, allow for a more sensitive detection, and potentially allow for the quantification of the fungus in the fecal samples collected. Current results have shown presence of *P. destructans* using the new collection method.

Detecting Differences Between Honey Bee Gut Microbiomes in a Quick, Economical Assay.

Sabrina Galloza, *Dr. Kendall Martin, Dr. David Gilley*.

The honeybee gut microbiome may provide a powerful tool for determining the health of bees and the effects stressors may have on those bees. The gut community of the adult honeybee is relatively simple, containing only nine bacterial species clusters. Previous studies have shown that the gut microbiome of honey bees has an effect on the host's health by means of nutrition, immune function and pathogen resistance. In addition, it has been shown that perturbation of the microbiome can affect the ability of the honey bee to maintain good health. Because of this, we are developing a simple and economical molecular method for microbiome analysis.

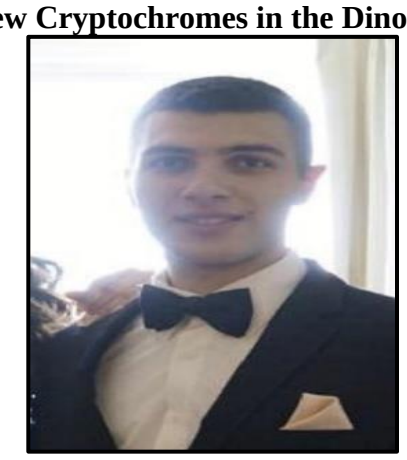
We characterized a subset of the taxonomic groups with a quantitative, nested-PCR approach. The relative abundance of the bacterial species was then used to detect for possible differences between-gut microbiomes between and within hives. The relative abundance of the bacterial taxon Bifidobacteria, showed more of the variation in Bee-gut microbiomes within a hive than did total bacteria. The variation in total bacteria and Bifidobacteria was greater within the spring-sampled hive than fall-sampled hives. The spring-sampled hive had lower total bacteria per bee. This proof-of-concept indicates we should be able to distinguish hives with a simple assay that could potentially characterize responses to stressors in longer-term investigations of bee colony health.

NEUROPROTECTIVE EFFECTS OF KCNQ POTASSIUM CHANNELS AFTER TRAUMATIC BRAIN INJURY WITH ACUTE AND CHRONIC ALCOHOL USE

<u>Jose Munoz,</u> Saul Abreu, Rachel Barrett, Rebeca De Souza Macedo, Elika Moallem, Sonya M. Bierbower (mentor).

Traumatic Brain Injury (TBI) affects millions of people each year. Characterization of TBI is defined as a direct injury to the brain followed by inflammation. Moderate-to-severe TBIs can trigger a range of symptoms over a period of years/decades. Post-TBI recovery is often associated with negative changes in behavior, specifically, alcohol dependence. Studies have shown that alcohol slows down and impedes brain injury recovery. While acute alcohol usage has been suggested to have a neuroprotective effect, chronic usage may have the opposite effect with repeated use. In neurons, "M-type" K^+ channels, play dominant roles in control over excitability, and thus are implicated in myriad neurological and psychiatric disorders. Recently, M-channel "openers" such as retigabine (RTG) are novel anti-convulsive and anti-nociceptive compounds. Retigabine has been shown to be neuroprotective against cell death, deleterious inflammation and motor impairment after a stroke. Previous data indicates that M-channel openers represent a novel and powerful therapy after a TBI through reducing electrical excitability, inflammation and cell edema which are linked to irreversible brain damage. Thus, this study aims to test the therapeutic target of M-channel activation in combination with acute and chronic alcohol use to reduce the damage of the secondary injury after a severe TBI.

Characterization of New Cryptochromes in the Dinoflagellate *Karenia brevis*

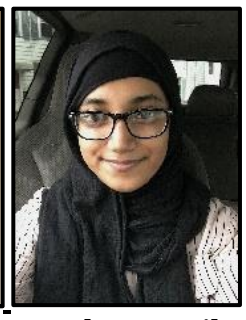


<u>Alan Abboud</u> and Dr. Emily A. Monroe (mentor)

Karenia brevis is a photosynthetic dinoflagellate responsible for the annual red tides in the Gulf of Mexico causing extensive marine life mortalities and human illnesses. Rhythmic cellular processes in *K. brevis* such as photosynthesis, carbon fixation, vertical migration, and phased cell division suggest a strong response to light. Cryptochrome DASH (KB CRY DASH) is the only known photoreceptor found in *Karenia brevis* to date. However, with *K. brevis'* newly expanded EST library we identified additional cryptochrome candidates. Using *K. brevis'* CRY DASH amino acid sequence as a query, 54 protein sequences were identified with E-values less than $1.0x10^{-5}$ that are homologous to other CRY DASH sequences, cryptochromes 1 and 2 (CRY 1 & 2), photolyases and other hypothetical proteins. Candidates were analyzed for the presence of conserved residues and narrowed down to eleven CRY DASH and seven CRY 1 & 2 candidates. Phylogenetic analyses provided additional evidence for having a distinct CRY 1 & 2 group from the CRY DASH candidates. This data provides evidence for the presence of new cryptochromes in *K. brevis* which will be further investigated. Characterizing new photoreceptor proteins will help in understanding *K. brevis'* cell cycle and possible control mechanisms of bloom proliferation.

Identification of Multi-Domain PKS sequences in a Non-Toxic Strain of *Karenia brevis*

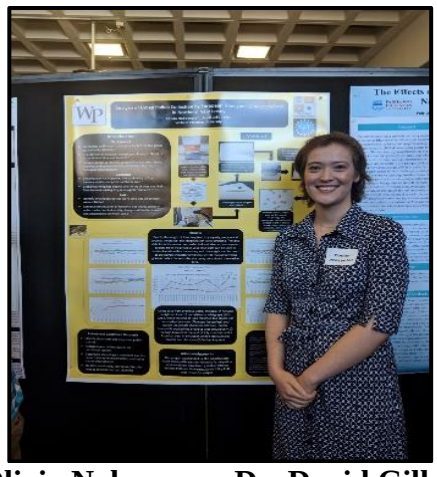




Belal Almouallem, Rosemary Arrieta, Jannat Begum, and Dr. Emily A. Monroe

Karenia brevis is a dinoflagellate that causes negative marine and human health impacts through its production of brevetoxins (PbTx), which are potent neurotoxins. Brevetoxins are produced by polyketide synthase (PKS) enzymes. PKSs require several catalytic domains, including the ketosynthase (KS), acyl transferase (AT), and acyl carrier protein (ACP) domains, which subsequently form multi-domain and multi-modular structured PKS enzymes. The objective of this study was to characterize newly identified multi-domain PKSs in a non-toxic (NT-KB) strain of *K. brevis.* Using cDNA from a toxic strain (GB) known to have these multi-domain PKSs, PCR conditions such as annealing temperature and extension time were optimized. At a 67°C annealing temperature and a 45 second extension, amplicons produced using NT-KB cDNA were consistent with both the amplicons from GB cDNA and the published sizes of the multi-domain PKSs for three of the contigs examined, 114143, 113789, and 134145. These results suggest the multi-domain PKSs are present in NT-KB, and future work will determine if there are any mutations in the NT-KB PKSs.

Analysis of Urban Pollen Collection by *Apis mellifera* (European Honeybee) in Northern New Jersey



Olivia Nakamura, Dr. David Gilley

Honeybees are generalist pollinators which forage from a variety of plants throughout their active season. Observing the plants utilized in an urban setting can help to understand how urbanization impacts hives. This study observed trends in pollen collection and variation of weekly pollen sources. Pollen traps were attached to the hives and turned on once a week for twenty-four hours. Collected pollen pellets were archived with 100 random pellets color-sorted, weighed, washed with acid, and identified under a microscope using morphological characteristics. The weight, temperature, and humidity of the hives were tracked to assess hive health and better understand trends in pollen collection. Results are part of an ongoing, three-year study. Expected results are for the largest pollen collections to be in late spring and early autumn with higher diversity in autumn as hives grow and prepare for winter respectively. Future studies could identify the best short-term and long-term pollen sources by comparing nutritional values.

Adaptive Response to Plasma Exposure: Faster regeneration versus delayed metamorphosis in tadpoles, *X. laevis*

Ma. Veronica Holganza, Kevin Martus and Jaishri Menon

Atmospheric pressure plasma treatment has emerged as a new form of regenerative medicine, with therapeutic applications involve wound healing and tissue regeneration. Reactive oxygen species (ROS) signaling, a requirement for wound healing and tail regeneration of the tadpoles, was higher in concentration in plasma treated tadpoles compared to control (Rivie et al., 2017).

In this study, we have focused on the role of Calcium (Ca^{2+}), mitochondrial permeability transition pore (mPTP) and peroxisomes during wound healing and blastema formation following tail amputation and atmospheric pressure plasma exposure of X. laevis tadpoles. Ca^{2+} sequestration and release into and out of the cytoplasm functions as a signal for many cellular processes such as growth and cell death. Calcium signaling pathways interacts with other cellular signaling systems including ROS. Peroxisomes are also known play a role in Ca^{2+} homeostasis and antioxidant defense. mPTP is a voltage and Ca^{2+}-dependent channel and prolonged opening of these mitochondrial pores lead to massive release of matrix Ca^{2+}, and swelling of mitochondria.

Tadpoles were maintained in aquaria and fed a tadpole diet. Tail amputation was carried out by removing 40% of the tail and the amputated region was immediately exposed to helium plasma for 40 seconds. Tail tissue was harvested at 24 hour and 5 day time points from experimental and control animals.

Our results show that metamorphic events have slowed down resulting in delay of metamorphosis. All the parameters for *in situ* staining (calcium, mPTP and peroxisomes) were increased in plasma exposed tadpoles compared to control. In conclusion, a) an increase in calcium resulting from exocytosis of calcium from its stores (mitochondria and peroxisomes leads to cell death of damaged cells, b) *increased mPTP staining is probably associated with mitophagy of damaged mitochondria and c) increased mitochondrial staining indicates fission required for normal cell metabolism and to prevent damage from mitochondrial ROS.*

Differential effect of plasma on tail regeneration versus metamorphosis appears to be the manifestation of an adaptive process. Metabolic cost for faster regeneration (Rivie et al., 2017) under oxidative stress could divert resources away from metamorphic events, which are slowed down. This strategy supports a plastic response involving physiological alterations, as well as an increase in survival and fitness of these tadpoles.

Reference:
A. Rivie, K. Martus, J. Menon. 2017. https://doi.org/10.1140/epjst/e2016-60243-3

Potential Antibiotic Resistance Observed in Non-Axenic Cultures of *Karenia brevis*

***Gabriella Rector*, Dr. Carey Waldburger (mentor)**

Red tide has environmental repercussions (Pierce & Henry, 2008). *Karenia brevis*, the cause of red tide, is a dinoflagellate that produces neurotoxins called brevetoxins. In an attempt to create a bacteria-free (axenic) culture of *K. brevis*, the Waldburger laboratory previously treated laboratory cultures with a variety of antibiotics (Tahir & Waldburger 2017), and this led to the death of all *K. brevis* cells in the laboratory cultures. The objective of this study was to determine the maximum allowable dose at which these antibiotics could be used without killing *K. brevis*. In the current study, we found that the same concentrations previously studied to have led to complete cell death allowed *K. brevis* growth. The survival could be due to *K. brevis* or a critical bacterial species necessary for *K. brevis* growth acquiring resistance to these antibiotics, or intrinsic inconsistencies in the growth patterns of *K. brevis* in the lab. If the prior is the case, future research will be directed at identifying the species that has acquired resistance and if the latter is the case, then we will move forward with our attempts at producing an axenic culture of *K. brevis*.

Involvement of hypothalamic neuropeptides in the expression of Autism spectrum disorder like phenotypes in BTBR mice

***Dara Buendia*, Dr. Jeung Woon Lee (mentor)**

The autism spectrum disorder (ASD) is known as a developmental disorder, but it is uncertain at which age ASD emerges in an individual. In this study, BTBR mice were used as an autistic model because they display autism-like behaviors such as repetitive grooming, asocial tendencies, and lack of vocalization. They also have a larger body mass index and greater pain tolerance in comparison to our C57/6J mice (wild type). Our lab reported that lack of pain sensitivity seen in BTBRs may be due to the hyperactivity of hypothalamic beta-endorphins and neuropeptide-Y (NPY). Statistically, BTBRs have higher levels of these proteins at 3 months of age compared to the age-matched C57 (control), but it is unknown at which stage of development these protein levels begin to rise in their blood plasma. Beta-endorphins were not present in the brain at the embryonic stage of mouse development, so in this experiment, I analyzed protein concentrations of NPY in brain samples from 17 BTBR and 17 C57/6J mice at three developmental stages: prenatal (embryonic age: E12, E16, E18), postnatal (P5, P11), and adulthood (3 months of age). Results showed that NPY was present in the brains of both strains as early as E12 and rose postnatally before maximizing at adulthood. Overall, the autistic BTBR mice had higher density of NPY protein expressed during embryonic age compared to control. Such difference was not observed at postnatal ages (P5 and P11). This study showed that NPY may play a critical role during the embryonic developmental stages of ASD. We will continue to examine the pathology of the autistic brain using immunohistochemical staining procedures.

Airborne Transmission of the Honeybee Waggle-Dance Pheromone

***Lauren Poletti*, Dr. Gilley (mentor)**

Foraging honeybees pollinate the majority of crops around the globe. The waggle-dance pheromone is a mixture of four hydrocarbons emitted by waggle-dancing foragers to promote foraging behavior. The traits of known chemical communication in honeybees led me to hypothesize that direct contact is not necessary for the waggle-dance pheromone to produce a behavioral response. To test our hypothesis, foragers were observed during trials where they could not physically touch the pheromone. The initial number of waggle-runs was compared to the number of waggle-runs after the pheromone was introduced. The observed increase in waggle-runs, primarily from nectar foragers, after the introduction of the pheromone supports the hypothesis that contact is not necessary for a behavioral response and suggests that nectar foragers respond more strongly to the pheromone than pollen foragers. These results provide important context to further study how foragers detect the pheromone and to use the pheromone to promote agricultural efforts.

Spider biodiversity in the High Mountain Reserve

***Ashanae Gordon*, Dr. Joseph Spagna**

The goal of this research was to quantify the biodiversity of High Mountain Reserve focusing on the arachnids, particularly the spiders. We asked how many different types of spiders are there, and what types of methods are most useful for capturing them? In June and July, I hiked to High Mountain Reserve Wayne, New Jersey every Wednesday to find and collect arachnids that were present. The collected specimen of that day was then identified and curated by storing them in alcohol in labeled vials. I found two different orders of arachnids- Araneae, or spiders and Opiliones, commonly called harvestmen or daddy-longlegs. Four families of spiders were identified were Thomisidae (Crab spiders), with three species, Araneidae (Orb-weavers), with seven species, Salticidae (Jumping spiders), with three species and one Atypidae (Purse spider). Among the Opiliones, there were fifteen individuals. In total there were four spider families. Spider collecting was most abundant by the trees, but specifically on the trunk and the crevices of the branches. Most of the spiders that were captured roaming, only a few were on their webs or making one. Opiliones, on the other hand, do not have silk glands thus they cannot build webs. This is the first year of a multi-year arthropod survey. This sample was limited by time, and could be improved by collected in late summer or fall when more spiders are mature and easier to identify. We will be collecting data that will be tracking the spider diversity over time to see if there are changes in biodiversity and improve our understanding of how to best sample spiders in the habitats around William Paterson University.

Insect biodiversity in the High Mountain Reserve in Summer, 2018

***Evra Emmanuel,* Dr. Joseph Spagna**

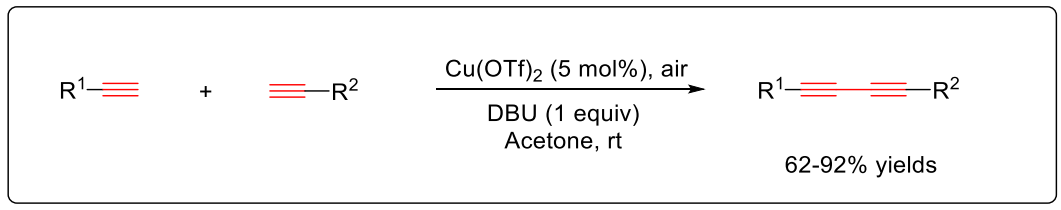
With over a million species identified, and many still undiscovered, insects are a major portion of life on Earth, and are crucial in all land ecosystems. Insects are important because of their ecological role, and their influence on agriculture. They work to pollinate plants, disperse seeds, fertilize the soil, recycle nutrients back into the Earth, and much more. The purpose of this project is to identify and estimate the insect biodiversity at High Mountain Reservation in Wayne New Jersey. I captured insects throughout the Reserve with four different methods. I used aerial nets and sweep nets to sample the insect diversity of High Mountain Reserve, along with a beating sheet to trap insects that fall from trees and bushes. The beating sheet is placed under a tree branch while the branch is shook to capture and falling insects. It may also be placed inside a bush for the same result. The fourth capturing method was the kill jar, which is a glass jar about 1 pint in size. Underneath the sealed lid of the jar contained a paper towel damped with ethyl acetate. The purpose of the ethyl acetate is to essentially knock out and kill the specimen as quickly as possible because it is poison to insects. I then brought the specimens to lab for curation, including pinning, labeling and identification. I accumulated and identified 43 families of insects with 59 morpho-species categorized within seven orders. In total I was able to collect and identify 81 insects. With this collection data I was able to develop a species-area curve to estimate whether I had collected most of the species present, based on how many new findings I've collected during each sampling session. From my species accumulation curve I was able to determine that with my methods and timing I would only be able to find around 60-65 total families of insects in the Reserve. I also compared this year's insect data to similar data from last year to assess similarities and differences. This data can also be applied to future studies in determining how insect diversity changes as a result of climate change and other human impacts on the environment.

William Paterson University, Chemistry Department

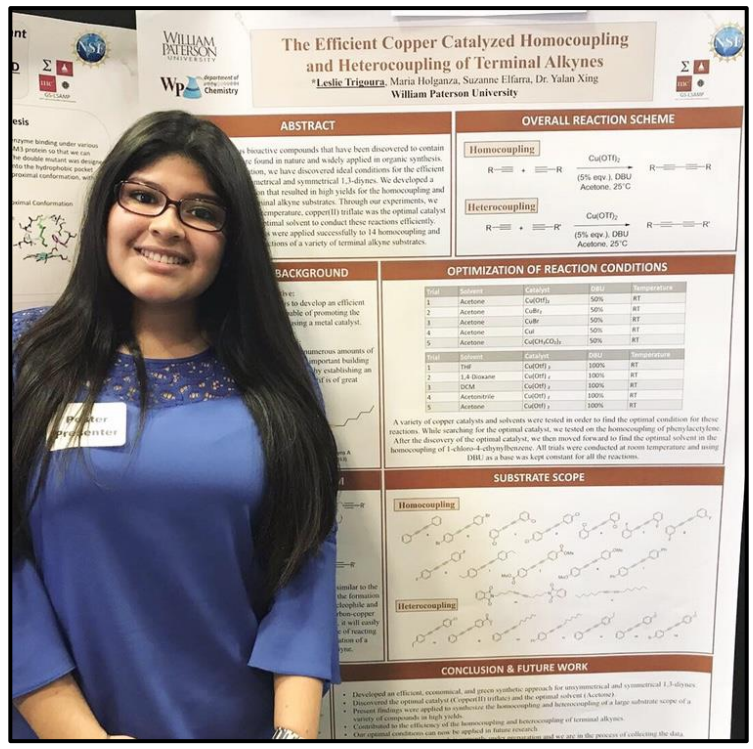
Efficient Copper Catalyzed Homocoupling and Heterocoupling of Terminal Alkynes

***Leslie Trigoura*, Maria Holganza, Yoona Seo, Dr. Yalan Xing**

There are numerous bioactive compounds that have been discovered to contain 1,3-diynes, which are found in nature and widely applied in organic synthesis. Through experimentation, we have discovered the efficient synthesis of unsymmetrical and symmetrical 1,3-diynes. We have developed an efficient copper (II) triflate catalyzed homocoupling and heterocoupling reactions of a variety of terminal alkyne substrates in high yields under mild conditions. These optimal conditions were applied successfully to 14 homocoupling and 6 heterocoupling reactions of a variety of terminal alkyne substrates, an overall scope of 20 substrates.



- Mild conditions
- Open to air
- Excellent functional group compatibility



Tatiana Hapatsha*, *Laurice Quiambao*, *Parminder Kaur (mentor)

Ni-catalyzed oxidative esterification of allylic sp^3-carbon followed by *in-situ* reduction

The oxidative and dehydrogenative coupling reactions have been an area of great interest in the past few years. They have emerged as one of the most important strategies for the development of new and greener synthetic methodologies in organic synthesis in recent years. Several precious metals such as palladium, platinum and ruthenium were previously used to carry out these reactions. However, the use of non-precious metals such as cobalt, manganeses and nickel is still limited. In this current study, we would like to report the successful use of nickel metal as catalysts for oxidative esterification of cyclohexene and its derivative with various carboxylic acids followed by *insitu* reduction. In our attempts to carry out the reaction by reacting benzoic acid with cyclohexene in presence of $NiBr_2$ (5 mol%) and Di tert-butylperoxide (as oxidant), moderate to good yields of the product was obtained.

Mn-Terpyridine catalyzed dehydrogenative acceptorless coupling of amines and alcohols to give aldimine

Giovanni Berrera*, *Parminder Kaur (mentor)

Despite the fact that manganese is the third most abundant metal on earth, only next to Fe and Ti, its use in cross-dehydrogenative coupling reactions is still very limited. The transition metal complexes coordinated to terpy and terpy based ligands has been used in literature to carry out reactions such as water oxidation, and hydrosilylation of alkenes but they have never been used for the dehydrogenative coupling of amines and alcohols. In this work, we are reporting the use of Mn as metal center with ter-pyridine derivatives as coordinating ligand as an efficient catalytic system for the cross-dehydrogenative coupling of amine and alcohol to give the corresponding imines. The reaction was carried out in presence of 5 mol% of the Mn salt and 10 mol% of the Ter-py ligand in toluene for 48 h at 100 ºC. Moderate to high yields of the products were obtained.

Green Chemistry: Benzylic Functionalization via Visible-light induced photo redox catalysis

Joan Inoa*, *Anjali Patel*, *Mansi Patel*, *Dr. Yalan Xing

Visible-light photo-redox catalysis offers a promising synthetic technology which replaces traditional methods due to its mildness and high compatibility with functional groups. Visible light is considered as clean energy because of its high abundance, greenness, benign environmental impact, and sustainability. We developed a visible-light induced photo-redox catalysis for the efficient functionalization of benzylic/allylic C-H bonds with peroxides. This research was primarily conducted to functionalize various substrates at the benzylic position by the addition of a peroxide group. An organic dye, Eosin Y, is used as a non-expensive photocatalyst and the blue LED light was employed as the light visible light source. Various benzylic peroxides were synthesized under our optimal conditions in good to excellent yields. This reaction takes advantage of a Hydrogen Atom Transfer mechanism and features mild conditions, high functional group compatibility, and broad substrate scopes.

Proline derived ligands for the titanium-catalyzed enantioselective synthesis of propargyl alcohols in presence of diethylzinc

***Brenda Calalpa* and Parminder Kaur**

A novel titanium/proline-derived catalyst system is reported for the enantioselective synthesis of propargyl alcohols. The reaction proceeded smoothly under mild conditions with efficient reaction times. A series of proline and proline-based ligands including *L*-proline, *L*-prolinol, *trans*-hydroxy-*L*-prolinol, and substituted *trans*-hydroxy-*L*-proline derivatives were used to have a better stereocontrol on the reaction. Initially, lithium acetylide was employed to carry out the nucleophilic addition reaction, however poor reaction profile was achieved with poor enantioselectivities. When diethylzinc was used instead, high product yields (>85%) and moderate to high enantioselectivities were achieved (68-82%). Three different alkynes, aromatic as well as aliphatic, phenylacetylene, *n*-hexyne and *3,3*-diethoxy-prop-*1*-yne were used to carry out the reaction with a series of different aromatic and heterocyclic aldehydes. Better reaction profiles were achieved with aromatic alkynes than with aliphatic ones.

Catalytic Activity of a New Generation of Platinum Nanoparticles

Terrence Hopkins*, *Gurjeet Longia and Dr. Bhanu P. S. Chauhan

Generation of hybrid polymers are an interesting field of study in that they can interact with both organic and inorganic functional groups. Our lab used a hybrid nano-material containing platinum nanoparticles and polymethylhydrosiloxane (PMHS), as a catalyst. The catalyst was made utilizing a general procedure that first used 0.1 mmol of potassium hexachloroplatinate and 6 molecular equivalents of PMHS, as a reducing and stabilizing agent. The reaction fostered a black gel. The same reaction was performed using cis-diamminedichloroplatinum, once again fostering a black gel. These catalysts were then used in the polymerization reaction of n-butylsilane.

Synthesis of the catalyst were observed using UV-vis which displayed a flat, featureless spectra. The catalyst was characterized using FT-IR revealing a disappearance of functional groups, previously present in the platinum precursor, and presence of peaks associated with PMHS. Afterwards catalytic activity of the product was tested, 10 mg of catalyst was added to 0.1 mmol of n-butylsilane in organic solvent at room temperature for 24 hours. The resulting solution was a viscous liquid that was characterized using H-NMR and revealed the presence of n-butylsilane polymer.

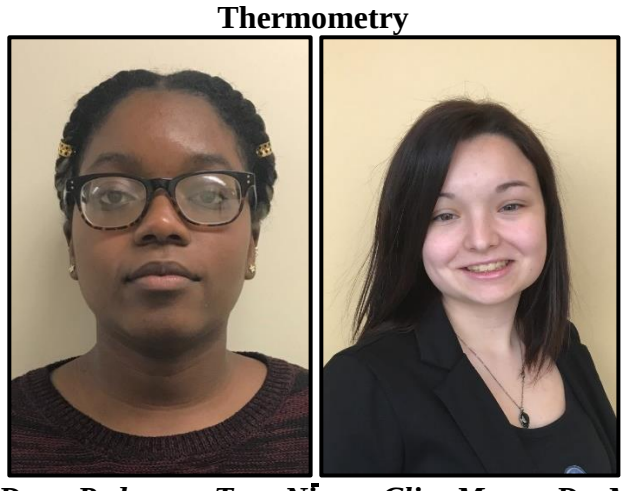
William Paterson University, Environmental Studies Department

Enchodus from the Arkadelphia Formation-Midway Group Contact (K-Pg), Hot Spring County, Malvern, Arkansas: Implications for the effects of the K-Pg Mass Extinction Event on a Piscivorous Food Web

***Kristina Hayek*, Dr. Martin Becker, Harry Maisch and Christopher Gocklin**

The contact between the Arkadelphia Formation-Midway Group (K-Pg) near Malvern, Arkansas contains an abundant assemblage belonging to the well-known Late Cretaceous teleost *Enchodus*. This assemblage consists of teeth and skeletal elements including *Enchodus ferox*, *E. petrosus*, and *E. gladiolus* preserved within a coquina lag deposit. This lag deposit also contains piscivorous chondrichthyans and reptiles that likely utilized *Enchodus* as a primary food source. Taphonomic conditions indicate that *Enchodus* along with other vertebrates within this lag were concentrated as the result of major changes in sea level across the K-Pg boundary as well as the influence of tsunamis from the Chicxulub Impact ~1500km to the south. The abundance of *Enchodus* in the Malvern lag deposit and the absence of these taxa from overlying Paleocene units in the Malvern region attests to the devastating effects of the K-Pg mass extinction and faunal turnover that resulted in the same demise of dinosaurs in equivalent terrestrial sections.

The Extinction of Iconic Megatoothed Shark *Otodus megalodon*: Preliminary Evidence from 'Clumped' Isotope Thermometry



***Chelesia Clarke*, *Allison Neumann*, Drew Pedersen, Troy Nixon, Clint Mautz, Dr. Michael Griffiths, Dr. Martin Becker, William Paterson University; Dr. Kenshu Shimada, DePaul University; Dr. Sora Kim, University of California Merced; Dr. Robert Eagle, University of California Los Angeles; Harry Maisch IV, The City University of New York.**

The largest and most iconic extinct shark to have ever lived is *Otodus megalodon*. The cause for the extinction of *O. megalodon* is unknown, however it is hypothesized that the ability to thermoregulate played a role. In this study, shark teeth were drilled into a fine powder, acid washed, and sent to UCLA to be tested using Clumped Isotope Thermometry (CIT). CIT is a technique which relies on the thermodynamic preference of C^{13} and O^{18} to form bonds in the carbonate mineral lattice. These values can be used to determine the temperature of the animal while it was living and ultimately their thermoregulation. Preliminary results from several clumped isotope measurements conducted on aquarium-reared and wild-caught shark teeth provide encouraging results that are consistent with expected temperatures.

2018-2019 GS-LSAMP MONTHLY MEETINGS-
STUDENTS PRESENTATIONS AND GUEST SPEAKERS

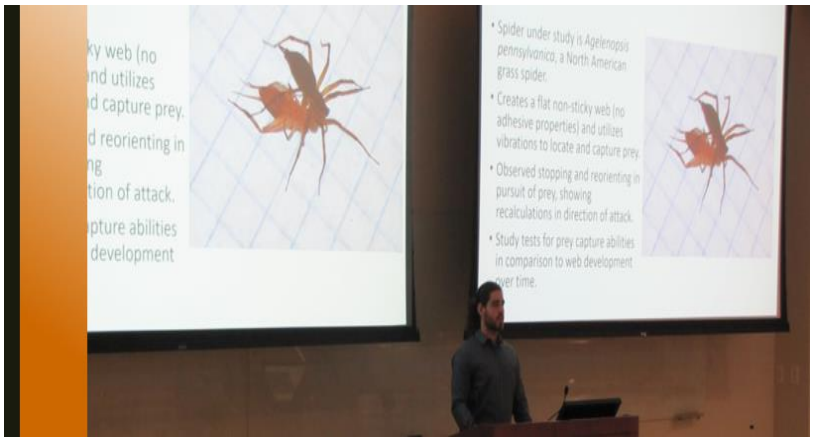
PHOTOGRAPHS OF MONTHLY MEETINGS


FALL 2018
OCTOBER 25
Autism Spectrum Disorder
Estimated Autism Prevalence 2018
• ASD: a developmental disorder
• Average age of diagnosis: 53 months
• NJ = 1 in 34 occurence
WILLIAM PATERSON UNIVERSITY


FALL 2018
NOVEMBER 15
WILLIAM PATERSON UNIVERSITY


WILLIAM


FALL 2018
DECEMBER 6
From Left to Right: Control treatment (no drug administered) and treatment with Ampicillin at 50 ug/mL
From left to right: Treatment with 50 ug/ml of Neomycin and Control Treatment (no drug administered)
WILLIAM PATERSON UNIVERSITY


ky web (no
nd utilizes
d capture prey.
d reorienting in
ng
tion of attack.
pture abilities
development
• Spider under study is Agelenopsis pennsylvanica, a North American grass spider.
• Creates a flat non-sticky web (no adhesive properties) and utilizes vibrations to locate and capture prey.
• Observed stopping and reorienting in pursuit of prey, showing recalculations in direction of attack.
• Study tests for prey capture abilities in comparison to web development over time.


THE WILLIAM PATERSON UNIVERSITY OF NEW JERSEY
COMMITMENT TO EXCELLENCE
1855
WAYNE
WPUNJ
GS-LSAMP
Spring 2019
January 31
GS-LSAMP
WP


Au
What are Nanoparticles?
Au
What are Nanoparticles?
Spider biodiversity in the High Mountain Reserve
Asharae Gordon
Mentor Dr. Joseph Spagna
Spider biodiversity in the High Mountain Reserve
WILLIAM PATERSON

WPUNJ
GS-LSAMP

Spring 2019
February 28


OASIS
EXCELL
The Distinctive
Personal Essay!
EXCELL

WPUNJ GS-LSAMP

Spring 2019
March 28

WPUNJ GS-LSAMP

Spring 2019
April 25

GS-LSAMP WPUNJ SCHOLAR

CERTIFICATE OF EXCELLENCE

For Achieving a High GPA in Science, Fall 2018

Rutgers University 10th Annual GS-LSAMP STEM Research Conference - October 2018

DR. SPAGNA, BIOLOGY IN THE BUS

33+ ABSTRACTS AND POSTERS SUBMITTED

WPUNJ
AWARD WINNERS
10TH ANNUAL GS-LSAMP CONFERENCE, RUTGERS UNIVERSITY 2018

KRISTINA HAYEK, Environmental Sciences, Dr. M.Becker, Mentor
VERONICA HOLGANZA, Biology, Dr. J, Menon, Mentor
LESLIE TRIGOURA, Chemistry , Dr. Y. Xing, Mentor
MARIA KATRINA HOLGANZA, Biology, Dr. J. Arnone and Dr. Y. Xing, Mentors

Garden State Organization Highlights Students' Scientific Research

Christie Dix, News Editor
February 5, 2019
Filed under News

13th Annual Undergraduate Research Symposium in Biological Sciences

Saturday, April 6, 2019

Department of Biology/Chemistry,
William Paterson University of New Jersey
List of WPU Awardees

Morning session

Physiology & Toxicology

1st Place: Ma Veronica Holganza, WPUNJ

2nd Place: Elika Moallem, WPUNJ

Nanochemistry

1st Place: Elijah Cook, WPU

2nd Place: Terrence Hopkins, WPUNJ

Organic Chemistry

1st: Leslie Trigoura, WPUNJ

2nd: Zena Salem, WPUNJ

Afternoon Session

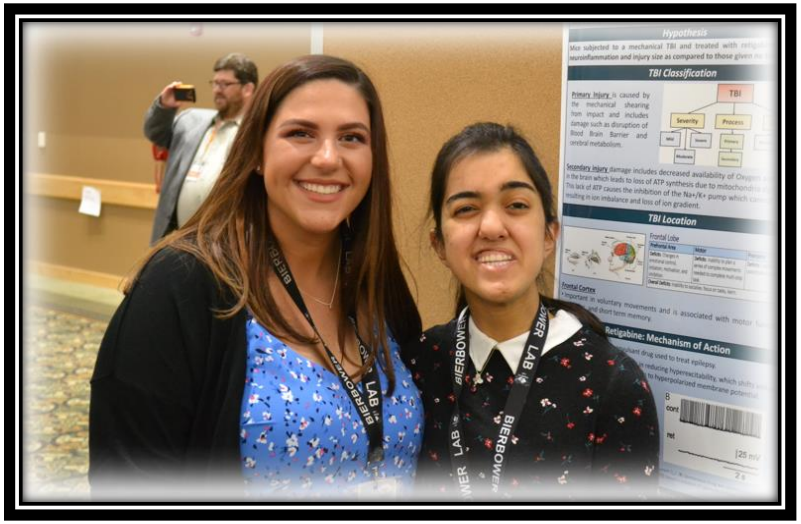
Genomics & Bioinformatics

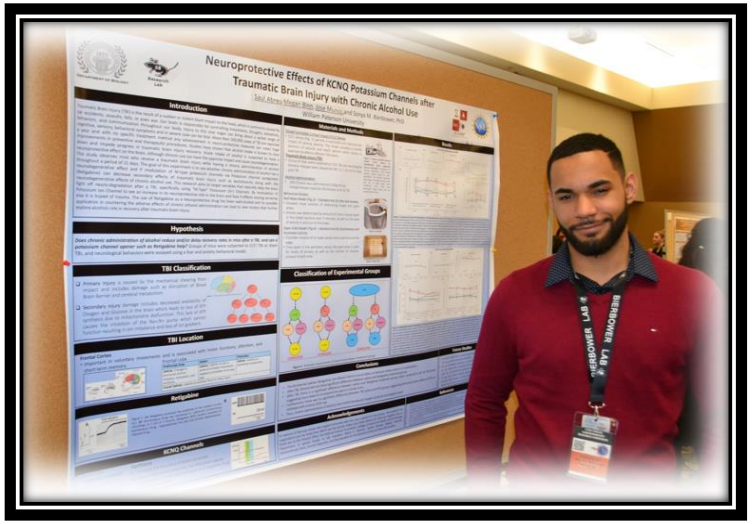
1st Alan Abboud, WPUNJ

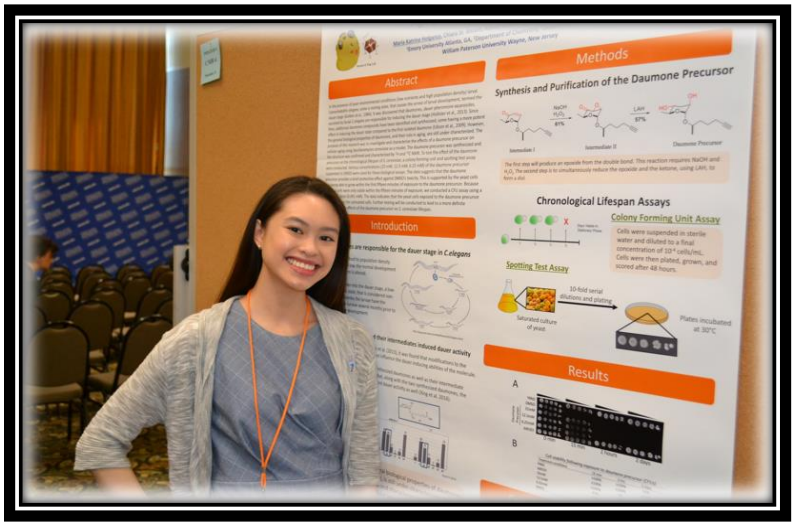
Theoretical and Physical Chemistry

2nd: James Varner, WPUNJ

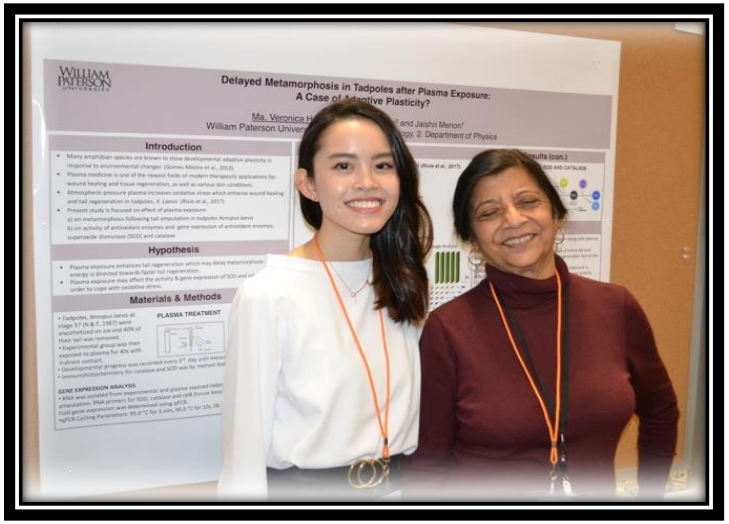

EXIT


Hypothesis
TBI Classification
TBI Location
Retigabine: Mechanism of Action


Neuroprotective Effects of KCNQ Potassium Channels after Traumatic Brain Injury with Chronic Alcohol Use
Introduction
Hypothesis
TBI Classification
TBI Location
Retigabine
KCNQ Channels
Classification of Experimental Groups
Conclusion


Abstract
Introduction
Methods
Synthesis and Purification of the Daumone Precursor
Chronological Lifespan Assays
Colony Forming Unit Assay
Spotting Test Assay
Results


EXIT


Delayed Metamorphosis in Tadpoles after Plasma Exposure:
Introduction
Hypothesis
Materials & Methods


WILLIAM PATERSON UNIVERSITY
wpunj.edu


WILLIAM PATERSON UNIVERSITY
wpunj.edu


WILLIAM PATERSON UNIVERSITY
wpunj.edu


WILLIAM PATERSON UNIVERSITY
wpunj.edu


WILLIAM PATERSON UNIVERSITY
wpunj.edu


WILLIAM PATERSON UNIVERSITY
wpunj.edu


WILLIAM PATERSON UNIVERSITY
wpunj.edu

WILLIAM PATERSON UNIVERSITY OF NEW JERSEY

WP

GS LSAMP

GS-LSAMP IS FUNDED BY A GRANT FROM THE NATIONAL SCIENCE FOUNDATION TO RUTGERS, THE STATE UNIVERSITY FOR THE ALLIANCE