SIGMA XI

THE SCIENTIFIC RESEARCH SOCIETY

FAIRFIELD UNIVERSITY CHAPTER

15TH ANNUAL POSTER SESSION

Thursday | April 23, 2015

Barone Campus Center

3:00 p.m. to 5:00 p.m.

Fairfield UNIVERSITY

Sigma Xi acknowledges additional support by the Office of Academic Engagement

BIOLOGY

Akosua Adzenyah
Alexa Annunziata
Robert Blaisdell
Allison Beattie
Kristen Beckwith
Sabraé Boisvert
Lauren Brodeur
Bryan Bystrianyk
Christian Cardillo
Samantha Cooper
Matt Decaprio
Cathryn Duemmler
Margeaux Dupuy
Brendan Freeman
Maria Galluzzo
Megan Kirkpatrick
Brendan Lang
Megan Lewis
Christopher Lopez
Francis Mastriano
Michael Mauro
Kerri McIntosh
Kerri McPhail
Kelsey Murphy
Dave Neubauer
Jillian Ottombrino
Danielle Pepi
Amanda Rielly
Jessica Romeo
Kristen Rothdeutsch
Dominic Schioppo
Riley Smith
Philip Strang
Farah Themistocle
Michael Therrien
Sean Thomas
Nicolette Tiernan
Kayla Urbanowski
Meghan Warchol
Bennett Wood

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Akosua Adzenyah

CLASS YEAR: 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Examination of the Stress Response Transcription Factor NF-kB in MCF-7 Breast Cancer Cells.

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Shelley Phelan

DATE OF PROGRAM: Fall 2014- Spring 2015

SPONSOR:

DESCRIPTION OF WORK (Short Abstract):

NF-kB is an important mammalian transcription factor that regulates the cellular response to a variety of stresses, including inflammation and infection. It has been implicated in a number of diseases including cancer. Bay-11-7085 is cell-permeable chemical inhibitors of NF-kB which can be used block its function in cell culture. We hypothesized that the inhibition of NF-kB may be toxic to cells, and may regulate the production of the Peroxiredoxin proteins. Peroxiredoxins are antioxidant proteins that protect cells from oxidative stress, and are over produced in many cancer cells. To determine NF-kB activity, we used the TransAm NF-kB transcription factor assay kit, which measures levels of active NF-kB in samples by the amount of binding to its cognate DNA binding sequence. We first tested and optimized the kit using positive and negative control lysates. We then treated human MCF-7 breast cancer cells with 50 μM (high treatments) and 10 μM (low treatments) of Bay 11 for 4 and 24 hours. Protein was extracted from the cells and used for both NF-kB activity assay and the generation of western blots. These experiments will tell us the levels of NF-kB in untreated and treated cells, as well as its effect on Peroxiredoxin levels in these cells.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Alexa Annunziata (2015), Allison Beattie[3] (2015), Cathryn Duemmler (2016), and Meghan Warchol[1,2] (2016)

CLASS YEAR: See above

MAJOR: Biology, [1] History

TITLE OF RESEARCH PROJECT:

Growth Inhibiting Effect of Ribbed Mussel (Geukensia demissa) Pallial Fluid on Gram negative and Gram positive bacteria.

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Brousseau and Dr. Braun

DATE OF PROGRAM: Fall 2014 to Spring 2015

SPONSOR: Fairfield University: [2]Lawrence, [3]Hardiman Research Award

DESCRIPTION OF WORK (Short Abstract):

The purpose of this study was to investigate bactericidal activity of the pallial fluid from the salt marsh mussel, *Geukensia demissa*. These experiments tested the hypothesis that *G. demissa* pallial fluid has a growth inhibiting effect on both gram-negative and gram-positive bacteria. Preliminary experiments tested two gram positive (*Staphylococcus aureus* and *Bacillus subtilis*) and two gram negative (*Vibrio parahaemolyticus* and *Escherichia coli*) bacteria. Results from these experiments revealed a greater growth inhibitory effect on *S. aureus* and *E.coli*, leading to further experimentation with these two bacteria specifically. Pallial fluid inhibited gram negative growth by an average of 73% in gram negative bacteria and by 40.5% in gram positives. The results of a non-parametric test of the equality of distributions showed $p<0.05$ for all experiments indicating a significant difference in growth when the cultures were exposed to pallial fluids. After enumerating the number of control and treated colonies after the 24-hour growth period, colony size was also measured using the NIH Cell Profiler software. Results indicated that the pallial fluids significantly decreased the growth area of the treated colonies when compared to the controls. Our results determined that the pallial fluid of *G. demissa* has antimicrobial properties which may act as the first line of defense against infection from various pathogenic microorganisms found in the environment.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHERS: Alexa Annunziata and Michael Therrien

CLASS YEAR: *2015*

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Development of Ready-to-load PCR Samples Simulating Sickle Cell Anemia Alleles

HOST UNIVERSITY OR INSTITUTION: Fairfield University Biology Department

NAME OF FACULTY RESEARCH SUPERVISOR: Lenka Biardi, M.S.

DATE OF PROGRAM: Spring 2015

SPONSOR: Fairfield University

DESCRIPTION OF WORK:

The purpose of this project was to develop ready to load samples representing simulated sickle cell anemia alleles. These alleles would represent individuals that were homozygous for normal alpha-globin (HbA), individuals homozygous for the sickle cell alpha-globin (HbS), or a heterozygous individual (HbA/HbS).

Three different PCR master mixes were used, one containing an Upstream and Downstream I primer pair (HbS allele), second containing Upstream and Downstream II primer pair (HbA), and the last containing Upstream primer and both Downstream I and II primers in equal amounts. PCR products from the three reactions were analyzed by agarose gel electrophoresis in order to determine the success of the experiment. The PCR successfully produced simulated alleles representing homozygous and heterozygous individuals.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Kristen Beckwith and Kayla Urbanowski

CLASS YEAR: Kristen: 2016 Kayla: 2017

MAJOR: Kristen: Biology
Kayla: Biology and Environmental Studies

TITLE OF RESEARCH PROJECT:

Do you think I'm sexy?: An Observational Study on the Breeding Suitability of Two Rare Amur Leopards

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ashley Byun

DATE OF PROGRAM: Spring 2015 Semester

SPONSOR: Fairfield University and the Beardsley Zoo, Bridgeport, CT

DESCRIPTION OF WORK (Short Abstract):

The Amur Leopard (*Panthera pardus orientalis*) is one of the most critically endangered species, with about 50 individuals living in the Primorye Province of southeastern Russia, and about 200 in zoos around the world. Rehabilitation of the wild population, suffering from low genetic diversity, may require establishment of a second population with reintroduced captive individuals. The Beardsley Zoo of Bridgeport, Connecticut, currently houses a sibling pair of sexually mature male and female Amur Leopards as part of the Species Survival Program (SSP) The SSP is a worldwide endeavor to preserve and breed the planet's most critically endangered species. To establish the suitability of these leopards for the SSP, we ran an observational study of these leopards from February to April for noninvasive evidence of breeding suitability. Evidence was in the form of mating behaviors, vocalizations, and fecal hormone monitoring in the female. We present our results to this date and our preliminary conclusions.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Robert Blaisdell

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT: Reducing medical costs of carpal tunnel syndrome at Sikorsky Aircraft Corporation

HOST UNIVERSITY OR INSTITUTION: Sikorsky Aircraft Corporation

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Brian Walker

DATE OF PROGRAM: June 2014 – August 2014

SPONSOR: Jude Ade PA-C

DESCRIPTION OF WORK (Short Abstract):

Incidence of carpal tunnel syndrome (CTS) at Sikorsky Aircraft Corporation was investigated in order to decrease the prevalence and cost liabilities of the injury to workers' compensation. This analysis included examining employee medical records, workers' compensation claims, and employee workplace activity. Results showed that 25 employees were diagnosed with work related carpal tunnel syndrome in 2013 costing Sikorsky Aircraft approximately $425,000. Per person, this represents approximately $67,000 in costs. An exercise program was implemented to Sikorsky's 16,000 employees in order to help minimize the number of CTS cases. Moreover, modifications to worker's tools were made in attempt to decrease the number of cases. Future data will be compared to determine the efficacy of the treatment plan.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Sabraé Boisvert

CLASS YEAR: 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT: The Effectiveness and Accuracy of Using Thermal Data to Measure Heat Loss in Native House Sparrows

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Brian Walker

DATE OF PROGRAM: Spring 2014-Spring 2015

SPONSOR: N/A

DESCRIPTION OF WORK (Short Abstract): Thermal imaging is a relatively new way to measure heat loss in animals. This experiment was designed to measure the accuracy, effectiveness, and correctness of using thermal data to measure heat loss in captive House Sparrows (*Passer domesticus*). By using a computer program along with the thermal camera, thermal images were created with three different body locations to measure heat loss: the eye, the lores and beak of the bird. These measurements were taken in four successive readings while the birds were being held in the hand during a stress-physiology experiment. By creating a protocol specific to these regions on the bird for our computer program, different techniques were created to measure the heat loss in the most accurate and correct ways. This analysis sought to examine consistency of collecting thermal data by four different researchers, and to further compare how the three regions examined varied. Our initial results indicate that the protocol and techniques should be useful in collecting thermal data in House sparrows to be used as indicators of physiological condition of the birds.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Lauren Brodeur, Matt DeCaprio, Dave Neubauer

CLASS YEAR: 2015, 2015, 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT:
Jaw muscle activation in batoids (stingrays)

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Shannon Gerry

DATE OF PROGRAM: April 23rd

SPONSOR: Fairfield University Faculty Research Grant and
Fairfield University Science Institute Grant
Hardiman Scholarship
Lawrence Scholarship

DESCRIPTION OF WORK (Short Abstract):
Batoids (skates and rays) have specialized jaws that can function independently due to their cartilaginous skeleton, a lack of a ligamentous connection between the jaws and skull, and the presence of a highly flexible symphysis at the center of both the upper and lower jaws. Bilateral implantation of the jaw muscles has lead to a greater understanding of the activity occurring on the left and right sides of the jaw during feeding events. A previous study has shown that skates activate their jaw muscles unilaterally without any activation of the contralateral side when processing complex prey. Therefore, the goal of our study was to investigate pairwise activation of the jaw muscles in two stingrays *Dasyatis sabina* and *Potamotrygon motoro* when feeding on different sized prey in order to determine if unilateral activation is a characteristic of batoid feeding mechanisms. We hypothesized that these rays would use synchronous activation when feeding on small prey and unilateral activation to process large prey. Electrodes were implanted bilaterally into two jaw adductors, a hyoid depressor and hyoid levator and the rays were fed squid pieces standardized to mouth size. Two asynchrony indices were used to quantify the duration of muscle activation and the lag, or degree by which muscles are activated out of phase. Contrary to our hypothesis, both species show that muscle pairs are activated synchronously for all prey types: there is no difference in duration or lag indices ($P > 0.05$). Future studies will investigate two additional stingrays (one basal, one derived) to elucidate the evolution of jaw muscle activation patterns within the batoids.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Bryan Bystrianyk and Dominic Schioppo

CLASS YEAR: 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT:
Lynx Canadensi Mating Behaviors and Pregnancy Predictions

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Ashley Byun

DATE OF PROGRAM: January 2015 – April 2015

SPONSOR: Fairfield University

DESCRIPTION OF WORK (Short Abstract):

Are We Ready For Our First Cub?
Lynx Canadensi Mating Behaviors and Pregnancy Predictions

The Species Survival Plan (SSP) is a program developed by the Association of Zoos and Aquariums (AZA) to help ensure the survival of threatened or endangered animals around the world. The Canadian Lynx (*Lynx canadensi)* is a threatened species, which is currently being managed by the SSP. During the spring semester of 2015, we engaged in an observational study of the social and nonsocial behavior of a pair of Canadian Lynx at the Connecticut Beardsley Zoo in the hopes of establishing the occurrence of copulation and subsequent pregnancy in a non-invasive way. Multiple different style cameras were used to capture images of the female once a week. We also used biometric measurements to assess whether the female lynx was successfully impregnated, by measuring the proportions of her stomach throughout the study using the captured photographs. Based on our data, we conclude that although the pair did engage in multiple copulations, the female is currently not pregnant.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Christian Cardillo

CLASS YEAR: 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT: Changes in thermal output of house sparrows in response to varying blood-glucocorticoids levels

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Brian Walker

DATE OF PROGRAM: 4/23/15

SPONSOR: Hardiman Scholars Program

DESCRIPTION OF WORK (Short Abstract): We wanted to determine if there was a relationship between blood glucocorticoid levels (Corticosterone) and thermal output in passerine physiology (*Passer domesticus*). Thermal videos of house sparrows were taken directly after drawing blood at four intervals over the course of an hour (time 0, 15, 30, 60 min). Thermal imaging software was used to measure temperatures directly from the infrared videos at three locations on the passerine body (eye, lores, and beak). Body temperatures were compared to glucocorticoid levels in the blood to determine if any correlation existed. We found that there was a significant relationship between temperatures of unfeathered areas on the bird's body and corticosterone levels.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Brendan Freeman

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

The Role of NF-kB in Peroxiredoxin Regulation in Breast Cancer and Chemoresistance

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Shelley Phelan

DATE OF PROGRAM: April 23, 2015

SPONSOR: Connecticut Breast Health Initiative

DESCRIPTION OF WORK (Short Abstract):

Peroxiredoxin (Prdx) proteins are thiol-specific antioxidants that protect cells from oxidative stress in various normal and disease states. There are six different Prdx proteins expressed in mammals, each possessing a characteristic tissue and subcellular distribution. Recent studies have revealed elevated Prdx levels in many cancers, suggesting a protective role for these proteins in cancer cell survival. In the present study, we examined the expression of three important transcription factors that could be regulating Prdx in the MCF-7 human breast cancer cell line: (1) NF-κB, (2) C-Jun, and (3) Nrf2. Using Western Blot Analysis, we showed that NF-κB expression is high in MCF-7 cells, and is significantly down-regulated after two-week treatment with 0.1 μM doxorubicin--a potent chemotherapy agent. NF-kB is a key transcription factor that mediates the cellular stress response. To address the role of NF-κB in Prdx regulation, we attempted to suppress NF-kB in MCF-7 cells using transient siRNA transfections in order to examine the effect on Prdx levels. We also treated MCF-7 cells with either 0.1 μM or 0.5 μM doxorubicin for two weeks to determine if doxorubicin resistance is associated with changes in expression of peroxiredoxins and their candidate transcriptional regulators. These experiments are currently underway. Together, we hope to determine if NF-kB is playing a role in peroxiredoxin regulation in breast cancer and chemoresistance.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Maria Galluzzo

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Can We Use Fluorescence Data From Lake Lillinonah
to Indicate the Presence of Harmful Algae

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Klug

DATE OF PROGRAM: April 23, 2015

SPONSOR: Friends of the Lake

DESCRIPTION OF WORK (Short Abstract):

Algal blooms, which release potentially harmful toxins and impede recreational activities, are an increasing problem worldwide. These algal blooms are made up of cyanobacteria and come about when nutrient levels are high, the temperature of the water is high, and there is a high stability of the water column. Algal blooms are a common summer phenomenon in Lake Lillinonah, an impoundment on the Housatonic River in northwestern CT. A number of species of cyanobacteria in Lake Lillinonah have the potential to produce a toxin called microcystin. Microcystin is a hepatatoxin that can cause acute and chronic health problems at high exposures. Managing public exposure to microcystin requires understanding of the variability in cyanobacteria population dynamics and toxin production. In this project, we studied whether pigment fluorescence measurements can give us an indication of algal community dynamics and toxin concentrations. Specifically, by comparing algal biomass calculated from manual samples to the chlorophyll fluorescence measured by automated sensors we can determine if sensor data can be used as a reliable indicator of total photosynthetic activity. We can also compare cyanobacteria biovolume to sensor-measured phycocyanin fluorescence to see if phycocyanin fluorescence is a good gauge for the presence of these organisms. Lastly we can measure the level of toxins in a lake on any given day by running an ELISA assay to determine if days with high levels of microcystin toxin correlate to high levels of phycocyanin. Our results show that phycocyanin measured by the buoy could be a reliable way to estimate cyanobacteria biomass, however, it does not look like a consistent way to determine if toxins are actually being produced during an cyanobacteria bloom.

2014/2015 STUDENT RESEARCH IN Biology

STUDENT RESEARCHER(S): Alex Johnson

CLASS YEAR: 2015

MAJOR: Sociology and Anthropology

TITLE OF RESEARCH PROJECT: Maintaining Lake Lillinonah as a Viable Recreational Source

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Klug

DATE OF PROGRAM: Fall 2014-Spring 2015

SPONSOR: Friends of the Lake, Fairfield University Biology Department

DESCRIPTION OF WORK (Short Abstract):

Lake Lillinonah is located in southwestern CT and was formed in 1955 by impounding the Housatonic River. Friends of the Lake is a non-profit group whose goal is to improve Lake Lillinonah's water quality and improve the experiences of those who use the lake. Algal blooms, which release potentially harmful toxins and impede recreational activities, often affect Lake Lillinonah. To improve the recreation potential of the lake, FOTL seeks ways to better understand and protect Lake Lillinonah's environment.

A partnership between Friends of the Lake and Fairfield University has led to the development of project CLEO (Citizen-Led Environmental Observatory) in order to monitor spatial and temporal variability in water quality. To monitor the lakes environment, citizens who use and live on the lake are asked to take various readings (e.g. secchi depth) during what is deemed the "recreational period" of Lake Lillinonah, which is from Memorial Day to Labor Day. I used the data taken by these citizen-scientists to analyze the changes in water quality over time. Lake Lillinonah undergoes yearly changes which impact the recreational potential and use by the public.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Brendan Lang

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Development of an efficient method for PCR amplification of protease inhibitor genes in squirrels

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. James Biardi

DATE OF PROGRAM: Spring 2015

SPONSOR: Lawrence Family Scholarship

DESCRIPTION OF WORK (Short Abstract):

Previous studies have documented that the California ground squirrel (*Otospermophilus beecheyi*) demonstrates distinct resistance to rattlesnake venom, which contains a number of enzymes, polypeptides, and other bioactive molecules. One mechanism of resistance appears to be the active inhibition of proteases that are often found in rattlesnake venoms. Though protective proteins have been isolated and identified, there is a notable lack of genetic data for these protease inhibitors in the California ground squirrel. The purpose of this independent research was to develop an efficient method to amplify and study protease inhibitor gene loci likely to be involved in venom resistance. Four separate gene loci were studied: alpha-1-microglobulin/bikunin precursor (AMBP), alpha-1-antitrypsin (A1AT), and tissue inhibitor of metalloproteinase 1 (TIMP1) and 2 (TIMP2). We obtained tissue samples from local Eastern grey squirrels (*Spermophilus carolinensis*) and isolated genomic DNA. Using genomic DNA, the four loci were amplified via polymerase chain reaction using primers designed through multiple sequence alignment of related species or primers previously published in primary literature. We predicted success of amplification and fragment sizes via *in silico* PCR simulations using the UCSC Genome Browser. To determine successful amplification of the candidate loci, the fragments were analyzed by agarose gel electrophoresis and subsequently sequenced via Sanger dideoxy sequencing. With successful amplification, this nucleotide sequence information can be used to determine the ratio of non-synonymous to synonymous substitutions, which can indicate positive selection on regions within the protease inhibitors. This study will ultimately provide insight into the broader story of the coevolution of rattlesnakes and the California ground squirrel.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Megan Lewis, Jessica Romeo, Philip Strang

CLASS YEAR: 2015, 2017, 2017

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Who Am I?

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ashley Byun

DATE OF PROGRAM: Spring 2015

SPONSOR: Department of Biology Fairfield University and CT Beardsley Zoo

DESCRIPTION OF WORK (Short Abstract):

It is generally well accepted by the zoo community that captive animals are capable of identifying zoo staff and individual keepers. Although animal recognition of humans is largely acknowledged to occur, to this date, no systematic study has ever been conducted to establish exactly what feature of the caretaker-animal relationship has led to this cognitive association. This study attempts to determine what cues three distinct zoological exhibits, herbivores, carnivores, and domestic animals are being recognized. Over the spring semester of 2015, we began an observation study of three different groups of animals. For all groups, we conducted a series of auditory and visual tests. We were able to conclude that within the herbivore exhibit, the American Bison and White-tailed Deer recognize auditory signatures in order to differentiate between caretakers. The predatory Amur Leopards tend to utilize broad visual cues to distinguish between those that interact with them while domesticated animals have a sense of their feeding schedule and do not seem to use auditory or visual cues recognize individual keepers. These observations suggest that animal recognition is highly variable between these groups of animals in both degree and recognizable cues.

2014/2015 STUDENT RESEARCH IN MOLECULAR BIOLOGY

STUDENT RESEARCHER(S): Christopher Lopez

CLASS YEAR: 2015

MAJOR: Molecular Biology

TITLE OF RESEARCH PROJECT:

CRISPR/Cas9-enhanced Gene Targeting by VelociGene Methods for Large Genome Modifications, including Humanizations

HOST UNIVERSITY OR INSTITUTION: Regeneron Pharmaceuticals

NAME OF RESEARCH SUPERVISOR: Senior Staff Scientist-Dr. Jean Siao

DATE OF PROGRAM: Summer 2014

SPONSOR: Transgenic Tech Intern in VelociGene Division of Regeneron Pharm.

DESCRIPTION OF WORK (Abstract):

Recently the CRISPR/Cas9 system has come to the forefront as the premier method for creating directed mutations in eukaryotic cells. Most of the mutations, however, are small deletions or insertions, limiting the potential of the technology. In VelociGene we use large BAC-based vectors (BacVecs) with long homology arms – often with greater than 100kb of total homology to the target – to create very large, precise genome modifications, such as complete deletions of large mouse genes (>100 kb) and replacement with their human homologs. To expand and improve VelociGene technology, we have incorporated CRISPR/Cas9 technology both in vivo and in vitro. We have created CRISPR/Cas9-directed mutations in mouse embryos and produced mutant mice derived from them. In mouse and rat ES cells we have combined CRISPR/Cas9 with VelociGene targeting methods to enhance targeting efficiency (up to 90%). In mouse embryos we achieved bi-allelic mutations. In rat ES cells, for the first time we have achieved homozygous gene targeting in a single step. We have also been able to create targeted mutations in human iPS cells that reproduced human genetic disease mutations associated with type-2 diabetes. At the front end of our VelociGene pipeline, we have used CRISPR/Cas9 to accelerate large targeting vector construction for humanizations. Prior to the development of the CRISPR/Cas9 technology, we had already achieved significant improvements in VelociGene gene targeting by combination with other nuclease systems. We now want to extend and improve these results with the CRISPR/Cas9 system.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Olivia Marola

CLASS YEAR: 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT: Non-invasive Measurement of Red Wolves (*Canis rufus*)

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ashley Byun

DATE OF PROGRAM: Spring 2015

SPONSOR: Connecticut's Beardsley Zoo

DESCRIPTION OF WORK (Short Abstract):

The goal of my research was to gain information on the growth changes of the male and female red wolves (*Canis rufus*) at the Connecticut Beardsley Zoo in Bridgeport, CT. Growth in the abdominal region of the wolves indicates general health and successful integration of the wolves into their new enclosure, and in the female, abdominal growth can indicate pregnancy. On the contrary, a diminishing abdominal size can indicate malnourishment. By using Image J digital imagery software and a standard measurement within the wolves' enclosure to compare with, I was able to roughly measure both wolves for signs of healthy growth over time and, in the female's case, a potential developing pregnancy. Using a thermal imaging camera, changes in heat distribution can also be a potential indicator of health and even pregnancy in the female wolf. This information is vitally important to the Beardsley Zoo staff, as the reproduction of the red wolves is a key aspect of the Species Survival Plan, a program to help preserve and protect threatened and endangered species around the world.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Francis Mastriano

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:
The Effects of Hypolimnetic Oxygen Deficiency on Fish

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Klug

DATE OF PROGRAM: April 23, 2015

SPONSOR: Friends of the Lake

DESCRIPTION OF WORK (Short Abstract):

Abstract – In order for any living organism to survive, specific environmental conditions must be met. With respect to fish, water temperature and dissolved oxygen concentration are variables that determine how well a fish can survive. During the summer, warm lake water temperature and low oxygen content can create stressful conditions for fish. The low oxygen concentrations are attributed to the metabolic activities of organisms that use oxygen through respiration. Although photosynthetic organisms produce oxygen in surface water, the oxygen is unable to reach the lower portions of the water column without a mixing event. A mixing event can be characterized as an outside force, such as rain from a storm or inflow of water that causes the water from the top of the water column to be mixed with the water from the bottom. In this project, we were interested in how often conditions in Lake Lillinonah were stressful for two different groups of fish (warm water vs. cool water species). To do this, we looked at data collected in the summers of 2013 and 2014. By comparing specific species requirements to the conditions in the lake, we show that there were many portions of the summer where the fish experienced a stressful environment. On some days in mid-summer, the fish would either experience temperature stress, oxygen stress, or both. On these particular days, there were few places in this region of the lake in which the fish could find refuge from either of these stressful factors. Our results suggest that mixing events caused by storms are important for relieving oxygen stress and that further lake warming due to climate change will increase stressful conditions for both types of fish.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Michael Mauro

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Unmasking the domains of the protein MEL-28 in the nematode worm *C. elegans*

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Anita Fernandez

DATE OF PROGRAM: April 23rd, 2015

SPONSOR: N/A

DESCRIPTION OF WORK (Short Abstract):

MEL-28 is an essential, conserved protein that is required for successful embryogenesis in the nematode worm *C. elegans* and in vertebrates (ELYS). MEL-28 has multiple roles including chromosome segregation, rebuilding of the post-mitotic nuclear pore, and maintaining the integrity of the interphase nuclear envelope. Consistent with these roles, the MEL-28 protein shuttles dynamically between the nuclear envelope and the kinetochore during cell division. Clearly MEL-28 is critical for proper embryogenesis, yet very little is known about which domains correlate to its different functions. What is known is that MEL-28 contains four types of domains: a beta propeller, an alpha helix, a coiled coil domain and 2 AT-hooks. To better characterize the domains of the protein, a variety of constructs were built containing different segments of the *mel-28* gene fused to *gfp*. Each construct contains a different segment of the *mel-28* gene that corresponds to a specific region of the protein. Each segment is also fused to *gfp*, which is critical for observing the localization pattern of the protein in live embryos. After generating worms containing such fusions, we first studied their localization in live embryos by analyzing GFP fluorescence. Then we tested them for *mel-28* gene function by determining if they rescue the embryonic lethality exhibited by *mel-28* null mutants. To date various constructs have been created and studied, including ones that correspond to amino acids 392-1784 of MEL-28 (lacking N terminal region and destroying most of the β-propeller domain) and also amino acids 1-1745 of MEL-28 (lacking the last AT hook). With the removal of the N terminus a loss nuclear rim localization was observed. In addition, this truncated version of MEL-28 failed to rescue the *mel-28* mutant; suggesting localization to the nuclear rim is required for MEL-28 function. Removal of the last AT hook caused a partial reduction of MEL-28 function, suggesting that both AT Hooks are required for full MEL-28 activity.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Kelsey Murphy and Maria Galluzzo

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:
Bacterial Biofilm Inhibition by P1 Peptide

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ansari

DATE OF PROGRAM: April 23, 2015

SPONSOR: Yale University

DESCRIPTION OF WORK (Short Abstract):

Biofilms are communities of bacterial cells that are attached to each other or another surface. The cells in a biofilm are located within an extracellular matrix composed of polysaccharides, proteins, and/or DNA. Dental cavities are a common disease in which biofilms play a key role. Preventing biofilm formation by bacteria such as *Streptococcus mutans*, one of the primary microbes that causes cavities, can reduce formation of dental plaque on teeth. In our research, we tested the ability of a peptide P1, derived from a tick antifreeze protein (IAFGP), to inhibit biofilm formation by different bacterial strains. Three replicate experiments of a microplate assay were performed for various Gram positive and Gram negative bacteria. We determined that P1 peptide significantly inhibited biofilm formation by the Gram positive bacteria, including a dramatic 80% reduction of biofilm biomass in *Streptococcus mutans.* However, the P1 peptide did not significantly inhibit biofilm formation by Gram negative bacteria, with the exception of two marine sponge isolates in the genus *Phaeobacter*. Future experiments will help determine the mode of action of peptide P1, and explore whether its anti-biofilm activity is more pronounced against Gram positive bacteria due to the extracellular matrix composition. This research may lead to novel strategies for preventing dental cavities and other biofilm-related diseases.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Danielle Pepi

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Fluorometric and gel phase analysis of proteolytic digestion by metalloproteases from rattlesnake venom

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: James Biardi

DATE OF PROGRAM: Spring 2015

SPONSOR: Fairfield University Biology Department

DESCRIPTION OF WORK (Short Abstract):

Venomous snakes rely on their venom as part of a necessary feeding strategy and adaptation in order to digest small prey. This venom contains a number of metalloproteases, which acts as a toxin to facilitate blood loss of their prey. The purpose of this research study was to measure the proteolytic activity of these metalloproteases of three Northern Pacific rattlesnakes (*Crotalus oreganus oreganus*) and determine which necessary proteins are present in each of the venoms. Samples were previously obtained using standard collection methods. To determine the activity of the proteins, a fluorogenic DQ Gelatin Assay was performed to determine the level of digestion of each venom. As a positive control for enzymatic activity, *Clostridium* collagenase was used. A protein gel was performed to separate the proteins present in each of the three venoms tested. Subsequently, a zymogram gel was also performed to detect the metalloprotease digestion and protease activity.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Amanda Rielly, Kerri McIntosh, and Jillian Ottombrino

CLASS YEAR: 2015, 2014, 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:
Initial Survey of a Captive Black-Tailed Prairie Dog [*Cynomys ludovicianus*] Colony

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ashley Byun

DATE OF PROGRAM: Spring 2014

SPONSOR: Fairfield University's Department of Biology, Connecticut Beardsley Zoo, Center for Faith and Public Life.

DESCRIPTION OF WORK (Short Abstract):

Over the past three years, the Department of Biology at Fairfield University and the Connecticut Beardsley Zoo in Bridgeport, CT have been engaged in a unique partnership. This partnership was originally developed as a service-learning project associated with the course Vertebrate Zoology. The philosophy of service learning is to provide students with the opportunity to gain practical, hands on experience and knowledge while at the same time benefit community partners that are often in need of additional resources and labor. Over the past few years, we have developed projects that have enabled the Beardsley Zoo to gain insights into the behaviors of some of their captive animals and even to implement changes in such things as feeding strategies and enrichment. At the same time, the students engaged in this work gain valuable experience in designing, carrying out, and analyzing data. What began as optional service learning project, eventually grew into an official lab course due to the overwhelmingly positive response from the students and its popularity. Here we outline the strategies we implemented, outline some of the projects that we conducted, and discuss the research potential for such mutually beneficial partnerships between academic institutions and zoos and aquariums.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Kristen Rothdeutsch, Margeaux Dupuy, Bennett Wood

CLASS YEAR: 2017 (Kristen) and 2016 (Margeaux and Bennett)

MAJOR: Biology

TITLE OF RESEARCH PROJECT:
Surveying the Land: A Glimpse into Animal Biodiversity Among the Residents of Connecticut's Beardsley Zoo

HOST UNIVERSITY OR INSTITUTION: Fairfield University and The Beardsley Zoo

NAME OF FACULTY RESEARCH SUPERVISOR: Ashley Byun

DATE OF PROGRAM: Jan. 20th 2015- April 30th 2015

SPONSOR: Fairfield University and The Beardsley Zoo

DESCRIPTION OF WORK (Short Abstract):

The Connecticut Beardsley Zoo is located in Bridgeport CT surrounded by over 100 acres of hilly parkland. The zoo consists of a variety of exhibit animals including Amur Leopards, Red Wolves, Red Wolves, Longhorns, Prairie Dogs, and Snowy Owls. It is known that a number of wild animals inhabit the zoo grounds and may interact with the zoo animals by stealing food and even hunting them as potential prey. While there have been periodical observations of various wild species, to date, there has been no systematic process to document these sightings. To assist the Beardsley Zoo in protecting their exhibit animals, during the spring semester of 2015 we engaged in a survey of the zoo grounds looking for burrows, animal tracks, and setting up camera traps in various key locations. We documented the presence of a number of different vertebrate species including, but not limited to, raccoons, skunks, opossums, woodchucks, a fox, and possibly a coyote. Here we present the locations of all documented sightings and burrows. The data suggest that there are a large number of burrows behind the prairie dogs and behind the condor exhibits down the hill from the gift shop.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Riley Smith and Samantha Cooper

CLASS YEAR: 2017

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Monkey See Monkey Do

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ashley Byun

DATE OF PROGRAM: Spring 2015

SPONSOR: Biology Department + Beardsley Zoo

DESCRIPTION OF WORK (Short Abstract):

Howler monkeys (*Alouatta caraya*) are a species of New World monkey found in South America. At the Connecticut Beardsley Zoo in Bridgeport CT there are two howler monkeys, one female named Zula and one male named Rosario. Rosario and Zula live at the rainforest enclosure along with two Saki monkeys, and are under the care of a small but dedicated group of keepers. It is generally accepted that zoo animals, like howler monkeys, are capable of recognizing zoo staff, particularly keepers with whom they interact with on a regular basis. However, to date, no study has even been undertaken to determine exactly what cues howler monkeys are using to identify individual staff members. During the spring semester of 2015, e engaged a series of observations and tests to provide some insight into what these key cues might be. By using vocal cues, visual aids, and disguises we collected data that suggests that the howler monkeys are capable of identifying individual humans using both auditory and visual cues.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Farah Themistocle

CLASS YEAR: 2015

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

Modulating Growth Factor Delivery of FGF-2 by Thiolated-Hyaluronan Crosslinking of a Layer-by-Layer Polyelectrolyte Delivery System

HOST UNIVERSITY OR INSTITUTION: University of Connecticut Health

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Liisa T. Kuhn, PhD

DATE OF PROGRAM: Summer 2014

SPONSOR: University of Connecticut Health, Department of Health Career Opportunity Programs, Research funded by the NIH NIDCR R01DE021103-01 grant

DESCRIPTION OF WORK (Short Abstract):

Bone regeneration is decreased with aging. Clinically, Bone Morphogenenetic Protein (BMP-2) is an agent used for bone regeneration but high doses have been known to cause unwanted side effects. Past studies have shown that low doses of Fibroblast Growth Factor 2 (FGF-2) and BMP-2 have increased bone mineralization in cell cultures from elderly mice and humans. The best results occurred when the two growth factors were delivered sequentially. This study sought to test a Polyelectrolyte Multilayer (PEM) drug delivery system made up of Poly-L-Lysine (PLL), Poly-L-Glutamic Acid(PLGA), and thiolated-Hyaluronan (Glycosil, GLy) for the ability to block Mouse Calvarial (MC3T3-E1) access to the growth factors. If MC3T3-E1 Cell access to FGF-2 is dependent on the diffusion of growth factors through a PEM layer, then crosslinking thiolated-Hyaluronan in the the PEM layers should reduce diffusion of the FGF-2 enough to prevent the proliferative response of cells to FGF-2. A Quartz Crystal Microbalance and Alamar Blue assay was used to characterize the PEM as well as yield proliferative results. It was found that PEM coatings were better for cell growth than the Tissue Culture Plastic (TCP) used for cultivating cells. Lastly it was found that a single layer of Glycosil was not successful in blocking FGF-2.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Sean Thomas, Megan Kirkpatrick

CLASS YEAR: 2017

MAJOR: Biology

TITLE OF RESEARCH PROJECT:

The Coterie Conundrum: The Development of Prairie Dog Coteries in a Captive Environment

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Ashley Byun

DATE OF PROGRAM: Spring 2015

SPONSOR: Fairfield University Biology Department + Connecticut's Beardsley Zoo

DESCRIPTION OF WORK (Short Abstract):

Black-tailed Prairie Dogs (Cynomys ludovicianus) are known for establishing tight familial bonds known as coteries. In the wild, coterie formation hardly depends on space, but rather on hierarchical behavior, resource availability, and population density. However, the colony of black-tailed prairie dogs at Connecticut's Beardsley Zoo faces different obstacles: space is likely the most critical limitation on their social development. Being surrounded on all sides by impenetrable concrete barriers places significant limitations on population density in this captive population. We hypothesized that space restrictions might hasten coterie formation – and as such – amplify aggression within the colony as individuals from different coteries fight for resources. To test our hypothesis, we spent 8 hours observing prairie dog behavior and employed an automated fog machine to elucidate underground burrow connections. Based on a reconstruction of underground connections and observational data, we conclude that the captive population does consist of two perhaps three separate coteries rather than a single cohesive colony.

2014/2015 STUDENT RESEARCH IN BIOLOGY

STUDENT RESEARCHER(S): Nicolette Tiernan, Kerri McPhail

CLASS YEAR: 2016

MAJOR: Biology

TITLE OF RESEARCH PROJECT: Glucocorticoid response to acute stress in male and female house sparrows with differing history of disturbance in captivity

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Brian Walker

DATE OF PROGRAM: April 23, 2015

SPONSOR: Fairfield University

DESCRIPTION OF WORK (Short Abstract):

Corticosterone is the primary avian adrenocorticoid and when released into the bloodstream facilitates in many physiological processes, especially those in response to external stressors. Previous studies have shown that baseline sample corticosterone levels were significantly elevated after capture.

We studied the effects of stress on corticosterone levels in House Sparrows. Birds were placed in captivity where artificial living conditions were simulated to relate to the natural environment. After exposing the subjects to stress, we took blood samples at specific time intervals and measured corticosterone levels. We used ANOVA T-tests to compare the differences between corticosterone levels in different chambers and sex. We also took into account the effects of habituation on hormone release over an extended period of time.

2014/2015 STUDENT RESEARCH IN (BIOLOGY)

STUDENT RESEARCHER(S): Wathone

CLASS YEAR: 2017

MAJOR: Biology

TITLE OF RESEARCH PROJECT: Aurora Kinases: How Did We Get From One to Many?

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ashley Byun

DATE OF PROGRAM: Spring 2015

SPONSOR: Dr. Ashley Byun.

DESCRIPTION OF WORK (Short Abstract):

Aurora kinases play an important role in cell division. As such, there has been tremendous interest in these genes and their potential role in development of some forms of cancer. Up until now, most research on aurora kinases has focused on higher metazoans such as vertebrates. However, aurora kinases have been found in all known metazoans such as arthropods, nematodes., and echinoderms. One of the simplest animals, the sponges, has only one gene copy for aurora kinase whereas more complex animals such as the nematode, *C. elegans* and insects have at least two copies. We are investigating the origin of aurora kinase genes and the evolution of their roles in regulating cell division by establishing their distribution and their functions at the most basal level of the animal kingdom.

CHEMISTRY & BIOCHEMISTRY

Kilee Bayne
Nicholas Bernier
Lily Etemad
Camille Gomes
Victoria Jedson
George Naclerio
Cassie Nedved
Elizabeth Pacer
Matthew Rotondaro
Margaret Siu
Christopher Van Akin
Adalgisa Varuolo
Michael Vessicchio

2014/2015 STUDENT RESEARCH IN CHEMISTRY

STUDENT RESEARCHER(S): Nicholas Bernier

CLASS YEAR: 2016

MAJOR: Chemistry

TITLE OF RESEARCH PROJECT:

Synthesis and characterization of water soluble zinc (II) model complexes for liver alcohol dehydrogenase

HOST UNIVERSITY OR INSTITUTION: Fairfield University

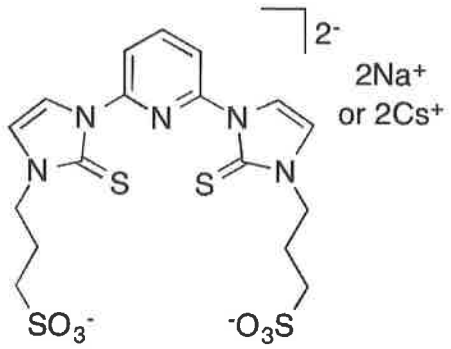
NAME OF FACULTY RESEARCH SUPERVISOR: Dr. John Miecznikowski

DATE OF PROGRAM: June 2014 to present

SPONSOR: The Department of Chemistry & Biochemistry at Fairfield University

DESCRIPTION OF WORK (Short Abstract):

Liver alcohol dehydrogenase (LADH) is a zinc metalloenzyme that catalyzes the oxidation of alcohols to aldehydes and ketones and the reduction of a ketone or an aldehyde to an alcohol. The resting enzyme has a zinc(II) metal center which is pseudo-tetrahedrally ligated with one N-histidine side chain, two S-cysteine side chains, and one water molecule. Our work involves the syntheses as well as NMR spectroscopic characterizations of novel water-soluble tridentate pincer ligand precursors. Our work also involves the syntheses, NMR spectroscopy, and electrospray mass spectrometry characterizations of potential functional models of the zinc active site in LADH. We model the zinc active site using a family of tridentate pincer ligands coordinating S,N,S donor atoms. A detailed description of the syntheses and characterization of the ligand precursors and model complexes will be presented.



2014/2015 STUDENT RESEARCH IN CHEMISTRY

STUDENT RESEARCHER(S); Lily Etemad, Cassie Nedved

CLASS YEAR: 2015

MAJOR: Chemistry

TITLE OF RESEARCH PROJECT:

Comparing the Bitter Acid Content of Half-Full Brewery's Bright Ale to Pursuit IPA using HPLC and UV-Visible Spectroscopy

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Amanda Harper-Leatherman

DATE OF PROGRAM: Spring 2015

SPONSOR: Fairfield University Department of Chemistry

DESCRIPTION OF WORK (Short Abstract):

In this research project, UV-Visible (UV-Vis) spectroscopy and High Performance Liquid Chromatography (HPLC) were used to analyze the iso-α-acids in Bright Ale and Pursuit IPA from Half-Full Brewery. UV-Vis spectroscopy provided quantitative information about the content of iso-α-acids in the beer, while HPLC provided qualitative information. The iso-α-acids in beer were extracted with isooctane using liquid-liquid extract (LLE) methodology, for both UV-Vis and HPLC analysis. For UV-Vis spectroscopy the absorbance at 275nm of the isooctane extracted iso-α-acids was measured. The average International Bitterness Unit (IBU) for the Bright Ale was found to be 21±3. The average IBU for the Pursuit IPA was found to be 36±2. For HPLC the chromatogram of Bright Ale and Pursuit IPA was compared to the chromatogram of the ICS-I3 standard obtained from the American Society of Brewing Chemists (ASBC). This allowed for qualitative analysis of isohumulone, isocohumulone, and isoadhumulone in Bright Ale and Pursuit IPA. Pursuit IPA displayed greater intensities than Bright Ale for each iso-α-acid and although the IBU could not be determined, this would lead to a higher IBU in Pursuit IPA.

2014/2015 STUDENT RESEARCH IN CHEMISTRY AND BIOCHEMISTRY

STUDENT RESEARCHER(S): Lily Etemad (2015), Michael Vessicchio (2016), George Naclerio (2016), Victoria Jedson (2017)

CLASS YEAR: See above

MAJOR: Chemistry and Biochemistry

TITLE OF RESEARCH PROJECT:
Design and Synthesis of Capture-Tag-Release (CTR) Probes for Protein Labeling

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Aaron Van Dyke

DATE OF PROGRAM: Spring 2015

SPONSOR: Fairfield University Department of Chemistry and Biochemistry

DESCRIPTION OF WORK (Short Abstract):

Proteins are involved in essentially all biochemical processes. Protein misregulation can lead to human diseases and thus tools are needed to visualize proteins. We propose the synthesis of a chemical probe that will capture a protein, tag it with an imaging label, and release the tagged protein into the cell. Consequently, we have termed this tool a capture-tag-release (CTR) probe. The protein beta-galactosidase will serve as a model system for testing our CTR probe. This protein was chosen because it is a well-characterized enzyme with a selective small molecule inhibitor. To date, we have developed a general synthetic route for preparing CTR probes. Key in this design is the ability to vary the length of the CTR probe, to optimize crosslinking efficiency in the capture step. The ability of CTR probes to inhibit beta-galactosidase as well as preliminary testing of the capture and tag components will also be presented.

2014/2015 STUDENT RESEARCH IN BIOCHEMISTRY

STUDENT RESEARCHER(S): Elizabeth Pacer

CLASS YEAR: 2016

MAJOR: Biochemistry

TITLE OF RESEARCH PROJECT:

Zinc and copper analysis of ribbed mussel (*Geukensia demissa*) pallial cavity fluid

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Amanda Harper-Leatherman, Diane Brousseau, and Phyllis Braun

DATE OF PROGRAM: Spring 2015

SPONSOR: Chemistry and Biochemistry Department and Biology Department

DESCRIPTION OF WORK (Short Abstract):

The fluid that surrounds the mantle, or pallial cavity fluid, of molluscan filter feeders such as oysters and mussels has long been associated with lubrication and particle capture. However, the role of the pallial cavity fluid in defense is less well-studied. Recent research showed that the zinc and copper concentrations in the pallial cavity fluid of the *Crassostrea virginica* (Gmelin) eastern oyster from a polluted area of Long Island Sound were significant and likely serve an important role in the oyster's defense since lysozyme levels alone could not account for the observed antimicrobial activity. We are currently studying the zinc and copper concentrations in the pallial cavity fluid of the *Geukensia demissa* ribbed mussel from the same area of Long Island Sound to determine if these metals in pallial cavity fluid play a similar role in the defense system of this animal. We will report on zinc and copper inductively coupled plasma mass spectrometry results from ribbed mussel pallial cavity fluid collected each month for over a year noting any seasonal variations and comparing the results to lysozyme levels.

2014/2015 STUDENT RESEARCH IN CHEMISTRY

STUDENT RESEARCHER(S): Margaret Siu*, Kilee Bayne, and Camille Gomes

CLASS YEAR: 2015

MAJOR: Biochemistry

TITLE OF RESEARCH PROJECT:
"Synthesis and Characterization of SNS Zinc (II), Copper (I) and Copper (II) Complexes"

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. John Miecznikowski

DATE OF PROGRAM: June 2014 - present

SPONSOR: E. Gerald Corrigan Scholarship

DESCRIPTION OF WORK (Short Abstract):

A series of tridentate pincer ligands, possessing two sulfur- and one nitrogen-donor functionalities (SNS) have been synthesized. Based on bis-triazole precursors, the tridentate SNS ligands incorporate thione-substituted triazole functionalities. Employing starting material 2,6-(dibromomethyl)pyridine, a methylene linker was introduced between a pyrimidine and azole rings. Using sodium-1,2,4-triazolide, azole nitrogen atoms assume 1,2,4 positions on pincer ligands (Figure 1a). Zinc(II) chloride and copper(II) chloride were used to metallate these ligand precursors to form zinc(II), copper(I) and (II) complexes (1b and 1c). A detailed description of the syntheses and characterization (NMR, Mass, and UV-Vis spectroscopy) of SNS zinc(II), copper(I) and (II) complex will be presented.

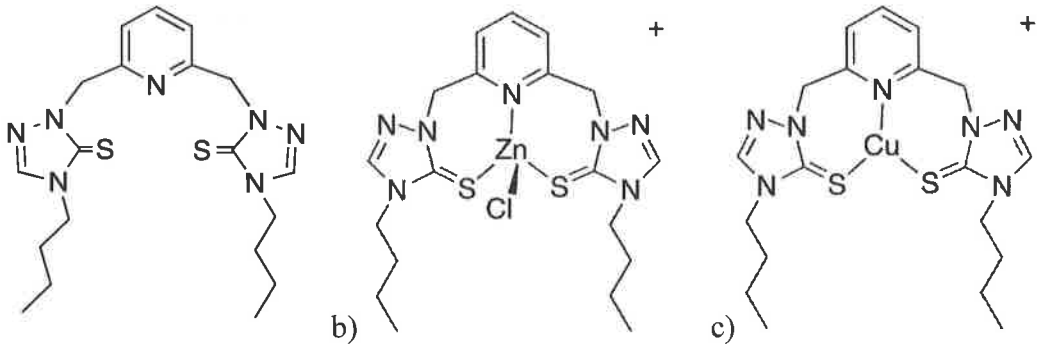


Figure 1: Structure of a) SNS tridentate pincer ligand, b) four coordinate zinc(II) complex, and c)three coordinate copper(I) complex.

2014/2015 STUDENT RESEARCH IN CHEMISTRY

STUDENT RESEARCHER(S): Christopher Van Akin

CLASS YEAR: Class of 2016

MAJOR: Biochemistry

TITLE OF RESEARCH PROJECT:
Synthesis and characterization of asymmetric water soluble zinc(II) model complexes for liver alcohol dehydrogenase

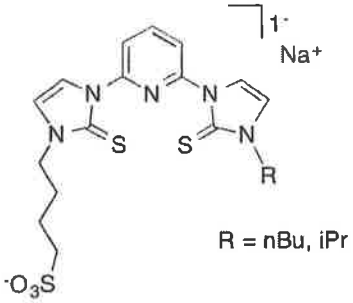
HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Professor John R. Miecznikowski

DATE OF PROGRAM: Sept. 2014 to Present

SPONSOR: Dept. of Chemistry & Biochemistry at Fairfield University

DESCRIPTION OF WORK (Short Abstract):
Liver alcohol dehydrogenase (LADH) is a zinc metalloenzyme that catalyzes the oxidation of alcohols to aldehydes and ketones and the reduction of a ketone or an aldehyde to an alcohol. The resting enzyme has a zinc(II) metal center which is pseudo-tetrahedrally ligated with one N-histidine side chain, two S-cysteine side chains, and one water molecule. We previously prepared and characterized zinc(II) model complexes for liver alcohol dehydrogenase that contained two of the same alkyl wingtip groups on the tridentate ligand precursor. Our current work involves the syntheses as well as NMR spectroscopic characterizations of novel, asymmetric water-soluble tridentate pincer ligand precursors. These ligand precursors differ from those previously synthesized because the asymmetric ligand precursors contain two different wingtips (one on each side of the ligand precursor). This difference is expected to affect the solubility of the model complex. The ligand precursors consist of a family of tridentate ligand precursors that contain sulfur, nitrogen, and sulfur donor atoms which could potentially coordinate to a metal center. A detailed description of the syntheses and characterization of the ligand precursors will be presented.



2014/2015 STUDENT RESEARCH IN CHEMISTRY

STUDENT RESEARCHER(S): Adalgisa Varuolo

CLASS YEAR: 2015

MAJOR: Chemistry

TITLE OF RESEARCH PROJECT:
Synthesis and Characterization of Palladium(II) Complexes which are Potential Precatalysts for the Suzuki Reaction.

HOST UNIVERSITY OR INSTITUTION: Fairfield University

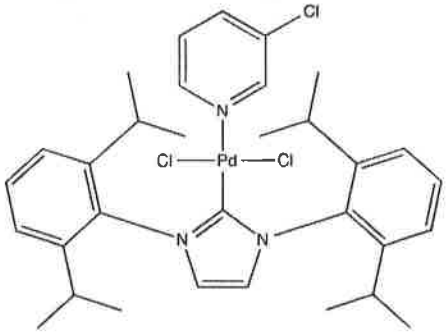
NAME OF FACULTY RESEARCH SUPERVISOR: Prof. John Miecznikowski

DATE OF PROGRAM: January 2015 to present

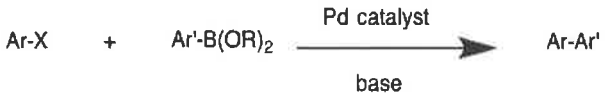
SPONSOR: Chemistry Department

DESCRIPTION OF WORK (Short Abstract):

The work involves the synthesis and NMR characterization of ligand precursors, which were metallated with palladium(II) chloride to form a palladium(II) complex. The yellow palladium complex was characterized using ^{1}H, ^{13}C, and HSQC NMR Spectroscopy. The palladium complex was then screened for catalytic reactivity for the Suzuki reaction. The Suzuki reaction involves the formation of a carbon-carbon bond between an aromatic compound, usually an aryl halide, and another aryl, vinyl, or alkynyl compound. We optimized the reaction conditions for all of the reactions. We performed the Suzuki reaction using the Discover CEM Microwave instrument. Temperature and time were manipulated to find optimal conditions for the catalytic reaction.



Palladium Precatalyst



Suzuki Reaction

2014/2015 STUDENT RESEARCH IN CHEMISTRY

STUDENT RESEARCHER(S): Ada Varuolo and Matthew Rotondaro

CLASS YEAR: 2015 (AV) 2016 (MR)

MAJOR: Chemistry

TITLE OF RESEARCH PROJECT:
Microwave-assisted synthesis of oligomers of alpha-aminoisobutyric acid.

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Matthew A. Kubasik

DATE OF PROGRAM: 2014

SPONSOR: Department of Chemistry and Biochemistry

DESCRIPTION OF WORK :

Peptide oligomers of α-aminoisobutyric acid exhibit a strong propensity to adopt helical structures in solution and the solid state. The known conformational imperatives of peptide oligomers of Aib, and peptides containing the Aib residue, suggest that these peptides may offer reliable scaffolding for nano- technological devices and molecular machinery. Additionally, the Aib residue is found naturally in the class of antibiotics known as peptaibols. Developing efficient means of synthetic incorporation of the Aib unit, and other α,α-dialkylated residues, may stimulate their use in peptide-based pharmaceuticals. Unfortunately, peptide bond formation between sterically hindered α,α-dialkyalted residues such as Aib is difficult. Standard solid phase peptide synthesis protocols provide poor yields and peptides with deletion sequences. Alternative strategies developed for the preparation of Aib oligomers include acid fluoride activation, elevated reaction temperatures, extended reaction time, incorporation of "masked" Aib units via dimethyl azirine and azidoisobutyryl chloride, and microwave methods. We have investigated the use of microwave heating for the acceleration of Aib oligomer chemistry developed in the 1960's by R.C. Sheppard and co-workers. Although it is common for peptide couplings to be performed at slightly elevated temperatures (e.g. ~80°C) for 10-96 hrs, we have found that microwave assisted reactions offer good yields in an hour. Results for microwave-assisted Aib oligomer syntheses for Aib homo-oligomers peptides originally prepared by Sheppard and later by Titlestad and Toniolo and co-workers will be presented.

2014/2015 STUDENT RESEARCH IN Biochemistry

STUDENT RESEARCHER(S): Michael Vessicchio and Kyle Douglas

CLASS YEAR: Michael Vessicchio (2016) and Kyle Douglas (2015)

MAJOR: Biochemistry

TITLE OF RESEARCH PROJECT: Studying the volatile compounds in Half Full Brewery's Bright Ale and Pursuit IPA in response to storage time and storage temperature using solid phase microextraction with gas chromatography-mass spectrometry

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Amanda S. Harper-Leatherman

DATE OF PROGRAM: Fall 2014

SPONSOR: Chemistry & Biochemistry Department

DESCRIPTION OF WORK (Short Abstract):

A GCMS-QP 2010 Plus Gas Chromatography Mass Spectrometer was used to study the volatile compounds in Bright Ale and IPA beer samples canned from July 7 – October 28 provided by the Half Full Brewery. Factors such a canning date and storage temperature were taken into account. Hexanoic acid, ethyl ester was found in all samples with the exceptions of 10/27 Hot IPA, 7/7 Cold Heated Bright Ale, and 10/27 Cold Heated IPA. Heptanoic acid was only found in 7/7 Cold Heated Bright Ale and 10/27 Cold Heated IPA. Octanoic acid, ethyl ester was found in all samples with the exception of 10/27 Hot IPA. Decanoic acid, ethyl ester was found in all samples. Diethyl phthalate was found in only four samples: 9/17 Room Temp Bright Ale, 10/27 Cold IPA, 10/27 Room Temp IPA and 10/27 Hot IPA. Pyridine,3-(1-methyl-1H-pyrrol-2-yl) was found in only three samples: 9/17 Room Temp Bright Ale, 10/27 Room Temp IPA, 10/27 Hot IPA. Neither canning date nor the temperature that the beers were stored at had an effect on the ester compounds. Heating the samples to 80°C did produce the appearance of the undesirable compound heptanoic acid.

ENGINEERING

Samantha Canosa
Alex Carrio
Diana Casique
Tyler Conley
George Dibble
James Dubay
Martin Gallagher
Jeremy Hogan
Brielle Hoth
Eric Lannaccone
Sean McGuinness
Stephen Neugebauer
Aaron Nezvesky
Chris O'Farrell
Richard Park
Cody Pereira
Robert Phillip
Katherine Pitz
Yenny Rua
Kyle Scherer
Nick Spears
Melissa Sulciner
John Sullivan
Kevin Wilson
Justin Wimer

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): Samantha Canosa (ME), Richard Park (ME), Robert Phillip (ME), John Sullivan (ME)

CLASS YEAR: 2015

MAJOR: Mechanical Engineering

TITLE OF RESEARCH PROJECT:
Laparoscopic Surgery Wound Closure Device

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Michael Zabinski

DATE OF PROGRAM: April 23, 2015

SPONSOR: CooperSurgical

DESCRIPTION OF WORK (Short Abstract):

Laparoscopic surgery involves the operation of small incisions in the abdominal cavity to allow for the passage of specialized instruments that can perform various procedures. These procedures are minimally invasive; they do not require large incisions. Laparoscopic surgery results in less pain, fewer complications and a quicker recovery time. Upon completion of the procedure, one challenge is to properly close the incisions. Closure can be accomplished in various ways such as through manual suture or with specialized instruments.

There are several companies that make such specialized instruments. CooperSurgical manufactures and sells the Carter-Thomason II Port Closure System. The Carter-Thomason II is a surgical tool that enables precise, repeatable port site closure in varying sized patients. The device allows the wound closure procedure to be completed in just a few minutes compared to the manual method that may take up to twenty minutes. The Carter Thomason II contains three separate pieces including the 10/12mm Suture Guide, 15mm Suture Guide and the Suture Passer.

The goal of this project is to design a new device based on the Carter Thomason II for closing these incisions that covers a broader range of incision diameters and abdominal wall thicknesses, maintains a low cost to the surgeon, is simple to use, and further reduces the low-risk safety profile. This project integrates the design of multiple diameter sleeves that can be attached to the 10/12mm suture guide in replacement of using separate suture guides for larger diameter incisions. This design incorporates the original 10/12mm device as the base guide with having an attachable sleeve of 15mm and 18mm interchangeably. Therefore, this project involves creating a universal device with interchangeable diameters of 10/12, 15 and 18mm.

2014/2015 STUDENT RESEARCH IN ENGINEERING

STUDENT RESEARCHER(S): Alex Carrio, Sean McGuinness, Chris O'Farrell

CLASS YEAR: 2015

MAJOR: Physics (SM); Mechanical Engineering (CO); Electrical Engineering (AC)

TITLE OF RESEARCH PROJECT:

Development of Advanced Transparent Coating

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Jonathan Stott, Dr. David Winn

DATE OF PROGRAM:

SPONSOR: National Science Foundation

DESCRIPTION OF WORK (Short Abstract):

We seek to develop a process which will combine the mature technologies of vapor deposition of metallic aluminum on glass or plastic substrates and anodizing aluminum to completely anodize an aluminum sample. Anodized aluminum (Al2O3) is extremely durable and scratch resistant, and is almost transparent (index of refraction < 1.2). In addition, the index of refraction can be precisely controlled, making it possible to create hard, transparent, index-matched coatings of aluminum oxide on top of an insulating substrate. This process will have a number of practical applications, from high numerical aperture, high light density optical fibers, to extremely scratch-resistant plastic coatings, to possible novel photonic materials.

We designed and built an anodizing cell to allow the anodization process to occur very slowly. This allows the sample to anodize without the formation of a complete surface barrier, which would prevent the interior of the sample from anodizing further. The primary components of the cell are a power supply and a DC motor, both of which can be finely controlled. By varying the anodizing current and the sample's insertion speed, we are able to control the rate of anodization with a high degree of precision, allowing us to set parameters like the index of refraction very precisely.

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): Tyler Conley, Stephen Neugebauer, Cody Pereira

CLASS YEAR: 2015

MAJOR: Mechanical Engineering

TITLE OF RESEARCH PROJECT:

Design and Development of 3D Nickel Micro Foams for Effective Energy Utilization

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Srinivas Sundarram

DATE OF PROGRAM: Fall 2014 –Spring 2015

SPONSOR: N/A

DESCRIPTION OF WORK (Short Abstract):

Micro/nano-structured materials possess exclusive thermal, electrical, mechanical, and surface properties that are crucial for many important applications, such as thermal management, electrochemical energy storage and conversion, high-strength and lightweight structures, sensors, and drug delivery carriers. In order to effectively utilize these materials, advanced methods need to be developed for large-scale fabrication and integration with meso/macro scale systems. In this project, fabrication of bulk open celled nickel micro foams with high porosity using polymer templates will be studied. Majority of the techniques to fabricate metal foams use a polymer template because the template offers direct control over resulting pore size and porosity. Even though there exist techniques to fabricate micro and nano pore sized metal foams, they suffer from the shortcoming that they result in either thin films or structures with thickness on the order of a few millimeters. We aim to fabricate a bulk 3D nickel metal foam with pore size around 25 μm and thickness on the order of 15 - 20 mm using a polymer sphere template process that is cost effective, scalable and short in duration. The polymer sphere templates are initially assembled using a suction pump with filter setup or alternatively using a centrifuge with filter setup. These polymer sphere templates are then converted into micro metal foams using electroless plating. These metal foams with pore sizes on the order of tens of microns could be used as highly efficient electrodes for batteries due to their high conductivity and also their large surface area would not only enable better electrolyte wetting but also provide pathways for electrons and ions. It is expected that the metal micro foams will result in electrodes that would have better performance than the carbon electrodes due to their inherently high conductivity. The development of this scalable and cost-effective manufacturing process would aid in generating new solutions to the critical issue of effective energy utilization.

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): George Dibble, James Dubay, Nick Spears, and Justin Wimer

CLASS YEAR: 2015

MAJOR: Mechanical Engineering

TITLE OF RESEARCH PROJECT:
Design, Analysis, and Development of a Compact & Efficient Soil Steam Fumigation

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Professor Etemad

DATE OF PROGRAM: Fall 2014 - Spring 2015

SPONSOR: Precision Combustion Inc.

DESCRIPTION OF WORK (Short Abstract):

The purpose of this collaborative project is to research and develop a soil steaming fumigation method in order to disinfect farmer's soil from insects, weeds, diseases, and other unwanted abnormalities. Precision Combustion Incorporated, along with help from the Fairfield University School of Engineering, will work together to build and remodel a prototype soil steaming machine. Various farms across the United States, most notably in California, will assist with the testing.

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): Martin Gallagher, Katherine Pitz, Yenny Rua, Melissa Sulciner

CLASS YEAR: 2015, 2015, 2016, 2015

MAJOR: Mechanical Engineering

TITLE OF RESEARCH PROJECT: SpinLeaf

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Reckinger

DATE OF PROGRAM: September 2014- present

SPONSOR:

DESCRIPTION OF WORK (Short Abstract):

The post-harvest process for loose-leaf greens involves rinsing and subsequent drying. The drying process is of particular importance as it prevents wilting and lengthens the shelf life of the produce. Drying is typically achieved by a process of spinning the leaves such that water is forced off through centripetal force in combination with evaporation which is enhanced with convection. These spinners can vary in size from 5 to 20 gallons in capacity. Currently, there is a lack of affordable industrial grade salad spinners on the market. As a result, most farmers have built their own or rigged washing machines to satisfy their need. This work describes the design and fabrication of a 42 gallon electric salad spinner. It is comprised of a vertically aligned right cylinder with a perforated surface contained in a larger cylinder. The ideal spin rate is 300 rpm, which is similar to that of a washing machine. The design of the spinners includes off the shelf parts not only to make replacements easy and inexpensive, but also to drive the cost of manufacturing down. This work will be completed with the cooperation of the Brooklyn Grange roof top garden in New York.

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): A. Grasso (ME), J. Heilweil (EE), J. King (ME) and J. McGlew (ME)

CLASS YEAR: 2015

MAJOR: MECHANICAL ENGINEERING

TITLE OF RESEARCH PROJECT: FERROFLUID IMMERSED WINDMILL

HOST UNIVERSITY OR INSTITUTION: FAIRFIELD UNIVERSITY

NAME OF FACULTY RESEARCH SUPERVISOR: Prof. Judge

DATE OF PROGRAM: 4/10/2015

SPONSOR: LAWRENCE SCHOLARS PROGRAM

DESCRIPTION OF WORK (Short Abstract):

This project consists of integrating ferrofluid into a windmill generator, including the design, analysis, build, and test of a proof of concept system. Ferrofluid is a fluid containing nanoscale ferromagnetic particles; a high magnetic permeability liquid that becomes strongly magnetized in the presence of a magnetic field. For a ferrofluid immersed generator, the fluid's magnetic properties are expected to reduce the speed required to get to a regulated voltage, lowering the "cut in speed" - the lowest wind speed in which a windmill generator produces regulated electrical power. For high speed conditions, the fluid's viscous properties are expected to act as a "passive brake" protecting the system from high speed conditions, raising the "cut out speed" – the maximum speed in which a windmill generator can safely operate. This would extend the working range of wind conditions where a wind turbine produces electrical power, allowing greater potential for the system's applications in green energy production.

2014/2015 STUDENT RESEARCH IN ENGINEERING

STUDENT RESEARCHER(S): Brielle Hoth, Kyle Scherer, Diana Casique, Jeremy Hogan

CLASS YEAR: 2015

MAJOR: Hoth (ME), Scherer (SE), Casique (EE), Hogan (EE)

TITLE OF RESEARCH PROJECT:
Control System For Quadcopter Targeting

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Ryan Munden

DATE OF PROGRAM: September 2014-May 2015

SPONSOR: Dr. Shahrokh Etemad

DESCRIPTION OF WORK (Short Abstract):

The goal for our Senior Design Project is to expand upon the existing design of a quadcopter, revising the original design and adding new functionality. Such a quadcopter could be used for military, agricultural or domestic applications and could perform tasks pertaining to surveillance, transportation of lightweight items, or to simplify tasks where a full-scale helicopter would be too cumbersome. One such proposed application is the spraying of a wasp's nest from a peristaltic pump. To implement such functionality, we would need to design a new fluid dispensing mechanism, a target acquisition system, and an advanced control system to account for environmental factors and the forces generated by the dispensing mechanism. There are two main requirements for the design of such a quadcopter. The first is that the quadcopter must be lightweight and small in size, allowing for maximum portability while being used in real-life scenarios. Such a design would also allow for a maximum achievable flight time through conserving battery power. Of primary importance is the quadcopter's ability to perform tasks in an effective and cost efficient manner, and such a lightweight design would act in accordance with this goal. The second requirement is that the copter should maintain stability during flight. This is important to any real-life application, as it would allow an attachment, such as a camera or a spray, to remain steady and on-target during flight. One overarching theme upon which we have constructed our design is that of modularity. Creating such a copter with reusable, removable and easily transferrable parts allows for an ultimately more robust design. This emphasis on modularity allows us to extend our copter and control system to extend itself to a number of applications. While our proposed intention is that of a peristaltic pump, the quadcopter's possibilities extend far beyond that.

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): George Kostakis, Timothy McCabe, Anthony DiMauro, Richard Barrone (Electrical Engineer)

CLASS YEAR: 2015

MAJOR: Mechanical Engineering (3) & Electrical Engineering (1)

TITLE OF RESEARCH PROJECT: Design and Development of Automated Robotic Production Assembly

HOST UNIVERSITY OR INSTITUTION: Fairfield University: School of Engineering

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Shahrokh Etemad

DATE OF PROGRAM: September 2014 – May 2015

SPONSOR: Northeast Laser & Electropolish

DESCRIPTION OF WORK (Short Abstract):

In modern day production, one of the most important and sought after ways to cut costs is by shortening production time. In close collaboration with Northeast Laser and Electropolish, our team is creating an automated system to cut down on production time and costs. Our team was given a programmable robotic arm and a digital camera capable of communicating with the robot and was assigned to create an autonomous system.

Our team designed three physical fixtures to secure the camera for orientation, secure the object for laser etching, and grasp the object during transportation and orientation. The majority of our designs will be using pneumatic or physical contact to ensure stability and accuracy. The robot's motions will be programmed using a coordinate system that will allow it to be mapped to any production environment. It will then be integrated with a photo-recognition system to ensure repeatability and a product that meets quality requirements.

2014/2015 STUDENT RESEARCH IN ENGINEERING

STUDENT RESEARCHER(S): Eric Lannaccone, Aaron Nezvesky, Kevin Wilson

CLASS YEAR: 2015

MAJOR: Software Engineering, Mechanical Engineering, Computer Engineering

TITLE OF RESEARCH PROJECT: Micromouse

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Uma Balaji

DATE OF PROGRAM: Spring 2015

SPONSOR: Fairfield University

DESCRIPTION OF WORK (Short Abstract):

The micromouse is an autonomous robot that navigates the fastest route through a maze. Mechanical, electrical, and computer programming skills are needed to assemble the robot. Motors, infrared sensors, and ultrasonic sensors are wired and assembled together with a microcontroller to control the robot. The microcontroller works as the brain, remembering the layout of the maze and orchestrating the robot's movement.

2014/2015 STUDENT RESEARCH IN MECHANICAL ENGINEERING

STUDENT RESEARCHER(S): Yenny Rua

CLASS YEAR: 2016

MAJOR: Mechanical Engineering and Mathematics

TITLE OF RESEARCH PROJECT:
Determining Suction Feeding Efficiency in the Bowfin Fish (Amia) Using Particle Image Velocimetry and Computational Fluid Dynamics

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Reckinger

DATE OF PROGRAM: June 2014-November 2014

SPONSOR:

DESCRIPTION OF WORK (Short Abstract):

Suction feeding is the most common form of prey capture in aquatic vertebrates. During the early evolution of fishes there was a major change in shape of the mouth, from a wedge shaped mouth opening in more primitive fishes to a more circular and planar mouth. This change in shape resulted from increased mobility of a key upper jaw bone, the maxilla. It has been suggested that this change in shape dramatically increased suction feeding efficiency. This study examines the hydrodynamic effects of these two mouth shapes in the same animal, the bowfin fish (Amia calva). 2D Particle Image Velocimetry (PIV) is used to analyze suction feeding events. Post-processing algorithms have been developed to determine the flow rate of water into the mouth of the fish; the area of fluid, the velocity of fluid and the volume of fluid affected by the fish; the velocity of the fluid at the mouth, as well as the velocity of the fluid as a function of the distance from the mouth, finally the force exerted on the fluid by the fish is also determined. Lastly, a numerical model has been developed for comparison using a non-uniform mesh, which adapts dynamically in space and time to the fish feeding event. The realistic geometry of the fish's head is modeled in CAD.

ENVIRONEMENTAL SCIENCE

Niki Cohen

2014/2015 STUDENT RESEARCH IN ENVIRONMENTAL SCIENCE

STUDENT RESEARCHER(S): Niki Cohen

CLASS YEAR: 2015

MAJOR: Environmental Science

TITLE OF RESEARCH PROJECT:

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: None

DATE OF PROGRAM: Fall 2014 Spring 2015

SPONSOR: Yale University School of Medicine Department of Dermatology Occupational and Environmental Dermatology Unit

DESCRIPTION OF WORK (Short Abstract):
Introduction: Allergic contact dermatitis is a common disease of humans and is the result of delayed type hypersensitivity reactions to chemicals in the environment. Common allergens include metals, fragrances, preservatives and surfactant. Patch testing is the medical test used to detect allergy to specific chemicals and is essential in diagnosing the allergy and the resulting treatment of avoidance of the allergen. Patch testing can be limited in scope or very expanded. It is hypothesized that more expanded testing will diagnose more patient than simple limited testing and result in more accurate diagnosis. The additional testing may change previous diagnoses based on the limited test.

Method: Charts from **800** patients from the Yale University School of Medicine Department of Dermatology Occupational and Environmental Dermatology Unit were screened and 217 patients met the criteria for study. Patients who were previously tested with limited testing and then were tested to more expanded tests were analyzed.

Results: Far more patients with expanded patch tests had a diagnosis of allergic contact dermatitis and that diagnosis was changed after the more expanded testing. Women represented the majority of tested individuals and the face and hands were affected most commonly on the body.

Conclusion: Expanded and comprehensive patch testing to a large variety of environmental chemicals is a more accurate method of diagnosing patient with suspected allergy than a simple limited screening test.

MATHEMATICS

Kaitlin Maciejewski

2014/2015 STUDENT RESEARCH IN MATHEMATICS

STUDENT RESEARCHER(S): Kaitlin Maciejewski

CLASS YEAR: 2015

MAJOR: Mathematics

TITLE OF RESEARCH PROJECT:
Historical and Mathematical Overview of Einstein's General Relativity

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Shawn Rafalski

DATE OF PROGRAM:

SPONSOR:

DESCRIPTION OF WORK (Short Abstract):

Newton's physics was the widely accepted way to interpret movement of bodies, and the action of gravitational force. However, observations showed that his model was flawed. His model claimed that gravity was the result of attractive forces between objects, but this was not the case, and was especially flawed for large-scale computations. Einstein had previously conceptualized the theory of special relativity, which described the relationship between space and time, and described motion in terms of inertial frames of reference. He was able to make corrections to Newton's theory, and a more accurate model of motion when it approaches light speed. This was still a simplified model of reality. In general relativity, Einstein takes gravity into account and shows how gravitational action is actually the warping of space and time caused by massive objects. Einstein used Riemannian and differential geometry to develop his field equations, which describe the theory of general relativity. His theory helps to describe the motion of planetary bodies, black holes, time dilation, and is very important for modern astrophysics.

This work will present the motivation for general relativity and one of the solutions; the Schwarzschild solution for the path of a photon in the presence of a single massive object.

NURSING

Julie Czapkowski
Stephanie Piccolo

2014/2015 STUDENT RESEARCH IN NURSING AND HEALTH SCIENCE

STUDENT RESEARCHER(S): Julie Czapkowski, Stephanie Piccolo

CLASS YEAR: 2017

MAJOR: Nursing

TITLE OF RESEARCH PROJECT:
Measuring Communication among Cognitively Impaired Nursing Home Residents

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Alison Kris & Linda Henkel

DATE OF PROGRAM: 2013-2015

SPONSOR:
Integrated Nursing and Health Sciences Project, McInerney Health Sciences Grant

DESCRIPTION OF WORK (Short Abstract):

Problems with nurse-patient communication contribute to poor quality care across health care settings. Barriers to effective communication are greater among patients who are cognitively impaired. While it is believed that communication problems among nursing assistants and cognitively impaired nursing home residents are pervasive, they can be difficult to capture and quantify. The Verbal-Non-Verbal Interaction Scale is a tool designed to measure verbal and non-verbal communication between nursing home residents and their caregivers. As part of a larger study, nursing assistant-resident dyads were observed and audio recorded during 10 minute care episodes. Verbal and Non-verbal communication was scored and documented in one minute intervals and validated by teams of research assistants. Initial attempts at data collection revealed several factors influencing the ability to accurately collect nursing assistant-resident communication including a) level of resident independence with care b) Hawthorne effect c) logistical barriers. Factors which contributed to the collection of data included the use of gift cards, and substantial flexibility on the part of research assistants.

PHYSICS

Robert Davis
Joseph Dowling
John Hummel
Benjamin Maloney
Sean McGuinness
Michael Reilly

2014/2015 STUDENT RESEARCH IN PHYSICS

STUDENT RESEARCHER(S): Robert Davis, Joseph Dowling, John Hummel, Sean McGuinness

CLASS YEAR: 2015, 2016, 2017

MAJOR: Physics

TITLE OF RESEARCH PROJECT:

Long Stokes-Shift Wavelength Shifting Optical Fibers with High Radiation Damage Resistance for the CMS Experiment at the CERN Large Hadron Collider

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. David Winn

DATE OF PROGRAM:

SPONSOR: US Department of Energy

DESCRIPTION OF WORK (Short Abstract):

We have fabricated novel quartz capillary tubes (0.325mm OD, 0.125mm ID) filled with 3HF (3-hydroxyflavone) of 20 cm length. The 3HF absorbs near UV (90% within 340-410 nm) and emits in the green (490nm peak), with the absorption and emission bands well separated by the Stokes shift. The resulting wavelength shifting (WLS) optical fiber absorbs UV-blue scintillation light in an total absorption ionizing radiation energy calorimeter and re-emits it in the green. Because of the capture of the light in the capillary walls and the long pathlength for re-absorption in the 3HF, the light is efficiently piped out to photodetectors, thus forming an optical signal proportional to high energy particles resulting from collisions in the Collider. The properties of 3HF have been shown to remain unchanged after a large irradiation of 100 MRad of 60Co, and the purified quartz capillary is rad-hard to above 1 GRad. Measurements of performance in test beams at FermiLab and at CERN are presented.

2014/2015 STUDENT RESEARCH IN PHYSICS

STUDENT RESEARCHER(S): Joseph Dowling, Sean McGuinness

CLASS YEAR: 2015

MAJOR: Physics

TITLE OF RESEARCH PROJECT:
Atmospheric Whistlers and Sferics

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Jonathan Stott

DATE OF PROGRAM:

SPONSOR: Department of Physics

DESCRIPTION OF WORK (Short Abstract):

The goal of our project is to study the properties of Earth's ionosphere by recording and analyzing low-frequency radio whistlers and sferics. To survey and identify radio quiet zones accessible to us, we designed a small receiver powered by a nine-volt battery and used a laptop to record the data. This is a fairly simple design consisting of an antenna and a multi-stage amplifier. The full-scale receiver consists of handmade filters and amplifiers, and a scaled-up version of the antenna. With this setup, we have recorded Earth's natural radio emissions and analyzed them to infer the properties of the ionosphere. Permanently mounted, our receiver could also be used to detect solar flares and other anomalous electromagnetic events.

2014/2015 STUDENT RESEARCH IN PHYSICS

STUDENT RESEARCHER(S): Benjamin Maloney, Michael Reilly

CLASS YEAR: 2015

MAJOR: Physics

TITLE OF RESEARCH PROJECT:
PHOTONIC METHODS FOR DISTINGUISHING AGGRESSIVE AND NON-AGGRESSIVE CANCERS

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Min Xu

DATE OF PROGRAM: April 23, 2015

SPONSOR: Lawrence Scholars Program, Magis Scholars Grant

DESCRIPTION OF WORK (Short Abstract):

A major challenge in modern medicine is differentiating between aggressive and indolent cancers in order to optimize therapy, avoiding unnecessary surgery, providing proper treatment, and enhancing the overall life quality of the patient. This project aims to use photonic methods to assess the aggressiveness of cancer. Specifically, this project aims to use photothermal and phase microscopies to identify the optical fingerprint of aggressive prostate cancer vs indolent ones. The central research question is: since cancerous cells fragment as they develop into higher grades of cancer, will the higher grade and the more aggressive cancers dissipate heat at a slower rate due to the air pockets holding the heat in longer? This project will use the optical method of photothermal microscopy. The basic idea behind this is there will be a microscope system with two lasers. A pumping beam is used in order to heat a prostate cancer sample at the nucleus of a cancerous cell. A second beam will be used as a probing beam. This beam will be used to illuminate the sample so that an image can be taken at a certain delay. Once these images are taken at a number of different delay times for each sample, the way that the heat dissipates from the nucleus can be mapped using computer software. Our conclusions are that cancerous nuclei dissipate heat at a slower rate than indolent nuclei. The significance of our results are that they determine a more reliable method for determining the aggressiveness than is current available. Our method also provides an objective grading of the cancer where currently used methods are very subjective.

PSYCHOLOGY

Katherine (Katie) Brundage

Jessica Caputo

Michelle Cusumano

Mallory Del Mauro

Kevin Figueroa

Jason Gorski

Janice Herbert

Hannah Horvath

Melissa Muroski

Lauren Savery

Elizabeth Sheerin

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Katherine (Katie) Brundage

CLASS YEAR: 2015

MAJOR: Psychology (Bachelors of Science)

TITLE OF RESEARCH PROJECT:
Temperamental and Cognitive Risk Factors for Anxiety

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Margaret McClure

DATE OF PROGRAM: January 2015-April 2015

SPONSOR: Hardiman Scholars Program

DESCRIPTION OF WORK (Short Abstract):

Background: Previous research has found that temperamental vulnerabilities and cognitive biases may exacerbate feelings of stress and anxiety among college student in the early years of college. Anxiety is a prevalent and troubling issue in society, especially in college-age populations as the transition to college life may pose a unique stressor that could fuel feelings of anxiety. Major shifts like the transition to college represent a dramatic environmental shift for late adolescence, and generate new demands for autonomous social, behavioral and cognitive functioning. We are interested in understanding factors that impact stress to the point of making the stress detrimental. Some variables that we are examining are behavioral inhibition, anxiety sensitivity, judgment biases and anxiety outcomes.
Method: Participants were given a series of computer-based questionnaires that assess judgment bias, behavioral inhibition, anxiety sensitivity, and anxiety outcomes. Participants were given research credit for their General Psychology courses in exchange for participation.
Hypothesis: We predicted that high trait anxiety would be related to high judgment bias, high anxiety sensitivity and high behavioral inhibition.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Jessica Caputo, Melissa Muroski, Hannah Horvath

CLASS YEAR: 2015, 2015, 2014

MAJOR: Behavioral Neuroscience, Psychology, Psychology

TITLE OF RESEARCH PROJECT:
The effects of acute prenatal exposure to valproic acid and environmental enrichment on anxiety and sociosexual behaviors in male rats

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Shannon Harding

DATE OF PROGRAM: Spring/Summer/Fall 2014

SPONSOR: Earl and Hilda Brinkman Family Foundation via Ellie Brinkman

DESCRIPTION OF WORK (Short Abstract):
Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder more common in boys that is characterized by social impairments and deficits in communication. Recent research in rodents suggests that acute exposure to valproic acid (VPA) during development can induce ASD-like behavioral changes in males, including anxiety and heightened sensitivity to sensory stimulation. These effects appear to be dose-dependent, and to date, studies examining social effects have primarily focused on same-sex interactions. The present study was conducted to characterize the effects of an acute dose of VPA administered prenatally on (1) general anxiety and (2) social behaviors with opposite sex peers (sociosexual behaviors) measured with reproductive tests in adulthood. We were also curious if environmental enrichment (EE) after weaning could prevent aberrant phenotypes. Pregnant Long Evans female rats were injected i.p. with a moderate dose of VPA (350mg/kg; n=2) or saline (n=2) on gestational day 12.5. Pups were assigned to two housing conditions from postnatal day (P) 22-P36: EE or standard housing, resulting in four mixed-sex groups: VPA-enriched (n=11), VPA-standard (n=11), Saline-enriched (n=13) and Saline-standard (n=10). After P36, males were pair-housed in standard conditions. Anxiety was assessed with the elevated plus maze and the emergence test, and reproductive behaviors were assessed with tests for copulation, partner preference and ultrasonic vocalizations. Preliminary data analysis suggests that prenatal exposure to this moderate dose of VPA increases anxiety in males, and that EE may rescue this abnormal phenotype. Contrary to predictions, neither VPA exposure nor EE had long-lasting impacts on interactions with sexual partners in copulation tests or partner preference tests. However, EE may increase the frequency of ultrasonic vocalizations for mates, regardless of prenatal conditions. These findings suggest that while moderate doses of VPA during development may be sufficient to induce anxiety in male rats, this does not translate to social anxiety or impairments with sexual partners. These findings may have important implications for the development of animal models for ASD. Additionally, the ability of EE to rescue anxiety may support the role of early intervention in children with ASD.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Michelle Cusumano

CLASS YEAR: 2015

MAJOR: Psychology

TITLE OF RESEARCH PROJECT:

The Influence of Secure and Insecure Relational Thoughtson Intensity of Social Anxiety in a Nonclinical Sample

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Michael Andreychik, Ph.D.

DATE OF PROGRAM: January 2015 – May 2015

SPONSOR: Fairfield University

DESCRIPTION OF WORK (Short Abstract):

Past research has established that insecure attachment is a risk factor for social anxiety disorder. Our research adopted an experimental approach to this issue by priming secure and insecure attachments in a nonclinical sample and recording changes in anxiety levels. Results indicated that both dispositional levels of attachment and experimentally-induced, situational attachment independently predicted explicit socially anxious responding. Additionally, we found that the secure attachment prime had an anxiety-reducing effect for all participants, regardless of their preexisting anxiety levels. Our findings have implications for therapeutic interventions for social anxiety.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Mallory Del Mauro & Kevin Figueroa

CLASS YEAR: 2015

MAJOR: Psychology

TITLE OF RESEARCH PROJECT:

Protestant Work Ethic and Locus of Control in College Students' Revisited

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dorothea. Braginsky, Ph.D.

DATE OF PROGRAM: Spring 2015

SPONSOR: Dorothea. Braginsky, Ph.D.

DESCRIPTION OF WORK (Short Abstract):

The increased uncertainty and instability of the of the global and national economy has had a profound social psychological impact on workers as well as those about to enter the workplace. In earlier studies Braginsky, et al. demonstrated that the workaday world is reflected in college students' perceptions of Locus of Control over their lives and their endorsement of the Protestant Work Ethic. This study will compare current college students' perceptions and reactions with those covering a 20-year time span.

To this end, surveys were administered that included the Protestant Work Ethic and Locus of Control in addition to demographic information designed to measure the participants' view of the current workplace and their own expectations regarding employment after graduation. The anonymous surveys were given in a classroom setting to nearly 100 students. Though exploratory, we expect to find that the Protestant Work Ethic and the Locus of Control scores will differ from those students who were assessed over the past 20 years. More specifically, the locus of control over their future should show that they expect that external factors rather than internal ones will have a more significant impact on their lives,and there will be an erosion of their Protestant work ethic.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Jason Gorski

CLASS YEAR: 2015

MAJOR: Psychology

TITLE OF RESEARCH PROJECT:

Attachment Style of College Students as a Predictor of Responses to Romantic Relationship Conflicts that Differ in Sexual Orientation

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Judy Primavera

DATE OF PROGRAM: Spring 2015

SPONSOR: N/A

DESCRIPTION OF WORK (Short Abstract):

The study being conducted currently is built on a basis of research about attachment theory and its many implications. Past research has shown that attachment theory is a strong predictor for how people experience relationships and how they view them. A great amount of research is understood about relationship conflict, resolution and failure. This study looks at how college aged adults respond to romantic relationship conflicts and how their attachment style may influence this view. The measures used consisted of an attachment survey (Hazan & Shaver, 1987) and another survey that presented three relationship conflicts then asked for the participants' opinions about the conflicts and what they predict will happen to the couple. All of the surveys given presented the same vignettes, however the names are changed in three different variable groups (male-female, male-male, and female-female). This study is attempting to understand how people respond to relationship conflicts not only based on their attachment style, but also based on the sexual orientations of the couples. We predict that those with secure attachment styles will respond more positively and will be more hopeful the couples will resolve their issues in a positive manner than those with insecure attachment styles. In addition, we predict that overall people will respond more negatively toward gay couples than they will a heterosexual couple. This study has collected data from 163 participants from classes in various disciplines, however data analysis is not complete and results have not been found yet.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Janice Herbert

CLASS YEAR: 2015

MAJOR: Psychology

TITLE OF RESEARCH PROJECT:
Mental Health Issues of Women of Color at Predominantly White Institutions

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Margaret McClure

SPONSOR: Lawrence Scholars Program

DESCRIPTION OF WORK (Short Abstract):

The number of Women of Color who choose to attend predominantly White Institutions (PWIs) are continuing to be on the rise; however, understanding of the factors related to their mental health at these institutions is not well researched. The experiences of these young adults are rooted in the relationship between racial factors in addition to their adjustment to college. Using the lens of intersectionality we see that racial-gender identity, micro aggressions and support services are vital to the mental health development of these students. I offer suggestions for how PWIs can better support the mental health of Women of Color through an intervention program that can provide support throughout their four years.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S): Lauren Savery

CLASS YEAR: 2015

MAJOR: *Psychology*

TITLE OF RESEARCH PROJECT:

Childhood Trauma and Adult Attachment as Factors in Dating Violence Among College Students

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Dr. Margaret McClure

DATE OF PROGRAM: 04/23/2015

SPONSOR:

DESCRIPTION OF WORK (Short Abstract):

Background. Dating violence has become increasingly common amongst college students. This form of violence occurs between two intimate partners and can range from verbal or emotional abuse to physical or sexual abuse; males and females can be found as either a perpetrator or a victim. Previous research noted dating violence being associated with various risk factors such as childhood trauma depression, anxiety, and other psychological disorders. We wanted to understand if there is a relationship between childhood trauma as a risk factor and adult attachment as a protective factor with dating violence perpetration and victimization amongst college students. **Method.** We recruited 91 participants enrolled in General Psychology at Fairfield University. The Conflict in Adolescent Relationships Inventory (CADRI; Wolfe, Scott, Reitzel-Jaffe, Wekerle, Grasley, & Pittman, 2001), the Childhood Trauma Questionnaire (CTQ; Bernstein, Fink, Handelsman, Foote, Lovejoy, Wenzel, Sapereto, & Ruggerio, 1994), and the Adult Attachment Scale (AAS; Collins & Read, 1990), were given to participants. A demographic sheet was also given in order to determine gender, age, ethnicity, grade, religion, and if the participant is in a relationship and for how long, and if not, was he/she in a relationship in the past year and how long did it last. **Results.** We found that CADRI perpetrator and CADRI recipient scores were significantly correlated ($p<.01$). CADRI perpetrator scores were significantly correlated with CTQ subscales of emotional abuse and emotional neglect ($ps<.01$). Likewise, CADRI recipient scores were also significantly correlated with CTQ subscales of emotional abuse and neglect ($ps<.01$). **Conclusions.** These results suggest that CTQ subscales such as childhood emotional abuse and emotional neglect may influence CADRI perpetrator scores and victim scores. Our results, which are consistent with previous research, also confirm that dating violence is prevalent in society and especially among college students.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

STUDENT RESEARCHER(S) : Elizabeth Sheerin

CLASS YEAR : 2015

MAJOR: Psychology

TITLE OF RESEARCH PROJECT:

Will you empathize with me?:
Attachment styles in relation to positive and negative empathy

HOST UNIVERSITY OR INSTITUTION: Fairfield University

NAME OF FACULTY RESEARCH SUPERVISOR: Michael Andreychik, Ph.D.

DATE OF PROGRAM: January 2015 – May 2015

SPONSOR: Fairfield University

DESCRIPTION OF WORK (Short Abstract):

Existing research has shown that individuals' attachment styles predict differences in a variety of personality traits, including empathy (Mikulincer, 2001). But, the work linking attachment security to empathy has focused exclusively on empathy for others' negative painful or aversive emotions (i.e., negative empathy), and has not examined relationships between attachment security and empathy for others' positive emotions (i.e., positive empathy; Andreychik & Migliaccio, 2014). The current project examined relations between attachment security, negative empathy, and positive empathy. Correlational data showed a relationship between the attachment style of an individual and their levels of both negative and positive empathy (Andreychik & Cusumano, 2015). A second, experimental study, examined the effects of priming different types of attachment security on empathizing with others' negative and positive emotions.

2014/2015 STUDENT RESEARCH IN PSYCHOLOGY

Student Researcher: Stephanie Ziegler

Class Year: 2016

Major: Psychology B.A.

Title of Research Project:

Childhood Trauma influence on Intimate Partner Violence in College Dating Relationships.

Host University or Institution: Fairfield University

Name of Faculty Research Supervisor: Margaret McClure

Date of Program: Spring 2015

Sponsor:

Description of Work (Short Abstract):

Intimate partner violence in college dating relationships is a relevant on many college campuses. As research shows intimate partner violence has numerous predictors. This study is focused on childhood trauma as a factor that would affect intimate partner violence in college dating relationships. Students signed up to take the survey for credit for their general psychology class. Students took a survey assessing their experiences of childhood trauma and their intimate relationship conflict style in order to determine if there was a possible relationship between childhood trauma and intimate partner violence. These results could possibly help identify students at risk with intimate partner violence and could potentially help in the creation of programs for assistance.