



URSA

Undergraduate, Research,
Scholarship and Arts.
Benedictine University

2016 Poster Session Program

April 7, 2016 ❖ 12:00-5:30 pm ❖ Goodwin Hall atrium

Mahmoud Abdel, Amanda Charicki, Harsh Sharma

“Environmentally Benign Synthesis of Potential Antimalarial Drugs”

One of the major frontline treatments for malaria is the endoperoxide-containing drug artemisinin. Its limited availability in underdeveloped countries and the potential for resistance by malarial parasites has created a demand for sustainable and economical syntheses of novel antimalarial drugs. 1,2,4-dioxazinanes, containing an endoperoxide, were synthesized in high yields and high diastereoselectivity starting from aldehydes, amines, and peroxyquinols. The new reaction conditions were optimized to limit environmental impact and improve efficiency by reducing the equivalents of imine, eliminating solvents and catalysts, and minimizing the number of purification steps. The proposed mechanism for this one-pot cascade reaction includes a catalyst-free intramolecular aza-Michael reaction as the key step. A small library of fifteen 1,2,4-dioxazinanes was synthesized for biological testing and initial results show that the dioxazinanes are cytotoxic to cancer cells.

Faculty sponsor: David Rubush

Veronica Adamiak-Duncan, Rena Ranallo

“Effects on Intracellular Calcium Flux in Osteoblastic Cells”

Calcium flux is a major signaling pathway in cells. Calcium levels in the cytoplasm of non-stimulated cells are at micromolar levels and can increase 100-1000 fold to induce processes such as apoptosis, exocytosis, and contraction. Our project investigated calcium signaling in osteoblasts in response to agents known to affect osteoblastic function. We observed and measured calcium fluxes in single cells using a microspectrofluorometer. This was facilitated by loading cells with a dye that fluoresced when bound to calcium. Calcium release from endoplasmic reticulum stores could also be distinguished from calcium entering the cell through calcium channels from the extracellular fluid. 7F2 cells, an osteoblastic cell line derived from mice, was used as a model system for investigating calcium signaling in bone.

Faculty sponsor: Allison Wilson

Ahmad Ahmad, Zaed Hussain, Maseera Moin

“Earth-Abundant Mixed-Metal Oxides for Water Oxidation Electrocatalysis”

The scarcity and effects of fossil fuels has led to global energy concerns that have provoked scientists to find viable alternative fuels that are both environmentally benign and abundant. One strategy is to split water into hydrogen and oxygen and use the hydrogen as a fuel. Our research is focused on finding suitable catalysts for the water oxidation half-reaction that are based on metals that are affordable and earth abundant. Specifically, we have studied the chemical stability and the activity of mixed-metal oxides containing different nickel, iron, and bismuth ratios at neutral and basic pH. Cyclic voltammetry and controlled potential electrolysis experiments were used to assess these catalysts, and through this testing, we were able to determine which of these catalysts are the most promising for the splitting of water.

Faculty sponsor: Sarah Shaner

Afreen Ahmed**“Ontogeny of Brain Growth and Cranial Base Flexion in Human and Non-Human Primates”**

In contrast to other primates, the human basicranium flexes during development, a process thought to be related to the size of the brain relative to basicranial length. In order to test this hypothesis, we looked at the relationship between basicranial flexion and relative brain size in x-rays of juvenile and adult orangutans (*Pongo pygmaeus*), gorillas (*Gorilla gorilla*), and chimpanzees (*Pan troglodytes*), and found that differential growth of the brain and basicranium in humans and non-human primates helps to explain the differing degrees of basicranial flexion in these species.

Faculty sponsor: Robert McCarthy

Safa Ahmed**“The Relationship Between High Levels of Particulate Matter in the Environment and Dementia”**

Air pollution is a widespread and persistent environmental problem with serious health implications. Within air pollution, the particle pollution, known as particulate matter, has been correlated with cognitive impairment, specifically dementia. Studies have been conducted in different locations, for example Mexico City, where the pollution index is high, in order to determine the relationship between particulate matter and cognitive impairment. The results of these studies show that particulate matter can lead to brain inflammation and white matter aging, both associated with the onset of dementia. I propose to perform a series of cognitive tests on residents in a different location with a similar pollution index to Mexico City. The purpose is to confirm these results in a society more closely related to the United States in order to see more personal results. I hypothesize that the results will confirm that particulate matter exposure can lead to dementia.

Faculty sponsor: Jean-Marie Kauth

Jay Ahuja**“3D-Printing of Human Fossils Originating from Africa”**

The purpose of this research project is to print ancient human fossils using a MakerBot Replicator three-dimensional (3D) printer. These fossils will be used in support of human evolutionary research and teaching at Benedictine University. Files of these fossils are available at Morphosource (<http://morphosource.org>), African Fossils (<http://africanfossils.org>), and a few other freely-available online resources. After downloading the files, I converted them into file-types the 3D printer can use and adjusted the position of each object on a printing application. The print itself requires a substantial amount of time, but the general process of 3D printing is minimally complicated, cheap, and useful, particularly as these fossils would only otherwise be available for study in person at museums in Africa, Asia, and Europe. Dr. McCarthy and I are currently working to create classroom resources to enhance human evolution teaching at Benedictine University that incorporate these 3D-printed fossils.

Faculty sponsors: Robert McCarthy, Andrew Wig

Omar Ali**“Mitigating Greenhouse Gas Emissions from Cattle Farming”**

Cattle farming, which consists of beef and dairy production, is a significant contributor to today’s greenhouse gas (GHG) emissions. Studies estimating greenhouse gas emissions from cattle farming generally indicate that it is one of the most significant contributors to the global greenhouse gas (GHG) footprint. The causes of the high contribution are enteric fermentation, which produces methane, and the denitrification of cattle manure to produce nitrous oxide. As greenhouse gases will continue to accumulate in the atmosphere and cattle production will rise to meet the nutritional demands of a growing population, mitigation efforts need to be addressed. A comprehensive literary research was conducted to compile the best mitigation strategies. Based on recent literature, effective mitigation measures that should be utilized include, but are not limited to: specific dietary supplementation, the use of cattle manure via denitrification inhibitors, the utilization of cattle with higher production capabilities, and the use of anaerobic digesters. A policy advising the farmers and the government about these mitigation efforts shall be addressed.

Faculty sponsor: Jean-Marie Kauth

Fatjona Aliaj, Dana Cairns

“To Explode or Not To Explode: Investigating the Role of LCA in Worm Intestinal Fluid Regulation”

Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) and bile acids are implicated in contributing to pathophysiological states such as diarrhea and inflammatory bowel disease. CFTR is an ABC transporter on the apical surface of intestinal cells which functions in intestinal fluid regulation. We are using *Caenorhabditis elegans* as a model organism to study the effect of secondary bile acids on CFTR-dependent intestinal fluid regulation. Worms express *pgp-3*, a CFTR homolog, in intestinal cells. We are generating an RNAi feeding strain to knockdown *pgp-3* expression in worms (*pgp-3*(RNAi)). The regulatory effects of lithocholic acid (LCA), a monohydroxy bile acid, on worm fluid secretion will be studied in wild type, *pgp-3*(RNAi) and *pgp-3*(pk18) deletion mutant worms using an osmotic stress assay.

Faculty sponsors: Tanya Crum, Jayashree Sarathy

Ibrahim Alwan

“The Effects of Lithium Ion Batteries in E-waste on the Frequency and Severity of Abnormalities in the Human Thyroid”

E-waste is a growing problem that affects both humans and the environment. Lithium is found in lithium-ion batteries in e-waste which is not biodegradable. When recycled, lithium-ion batteries do not decompose; rather, the lithium leeches out into the environment and atmosphere, potentially causing abnormalities in human thyroid function. This research aims to find the direct effects of lithium on the frequency and severity of abnormalities in the human thyroid. We will use patients with and without thyroid abnormalities located in different areas with low, medium, and high amounts of lithium present in the environment. We will measure the amounts of lithium in patients by taking blood samples and comparing that to the amount of lithium found in nearby environment. We will observe for symptoms specific to the development and severity of thyroid abnormalities. This data will allow us to determine the frequency and severity of abnormalities in the human thyroid due to ingestion of lithium.

Faculty sponsors: Anne Marie Smith, Kari Stone

Alexandra Arrich

“Bee-coming Aware of How Varroa Mites Affect Colony Collapse Disorder”

Colony Collapse Disorder (CCD) is a crisis that has arisen this past decade and accounts for the random disappearance of worker honeybees. It has been linked to pesticide usage, climate change, poor nutrition, and different parasites and viruses. One parasite involved in the occurrence of CCD is the Varroa mite; however, it has not yet been established whether the Varroa mites themselves cause CCD or if the viruses they transmit to honeybees are the actual culprits. My research proposal aims to determine which of these two factors is actually responsible for the occurrence of CCD. Ultimately, three groups of honeybees will be monitored every month for three years. The first group will be infected solely with Varroa mites, the second group will only be infected with various viruses that are commonly transmitted to bees from Varroa mites, and the third group will be a control group. These bees will be grown in captivity and kept secluded from additional factors that would otherwise affect the data.

Faculty sponsor: Jean-Marie Kauth

Andrew Athens, Chris Dziagwa, Joshua Rudolph

“Detection of Infrared Absorbance Profiles Using Photothermal Cantilever Deflection Spectroscopy”

Photothermal cantilever deflection spectroscopy (PCDS) presents a highly sensitive method for obtaining infrared (IR) absorbance spectra using trace amounts of a substance. This method utilizes the asymmetric thermal expansion of bi-material microcantilevers to detect the absorption of IR radiation at varying wavelengths. By monitoring the displacement of a laser reflected by the cantilever, nano-scale deflections and resonant frequencies can be detected. This data is then processed to analyze adsorbed molecules through a multi-modal approach. To investigate and optimize these methods, a PCDS system was constructed using electronic and optical components. Various methods of data acquisition and signal processing were implemented, including the use of both physical devices and computer programs. The response of the PCDS system to external variables such as vibration and electrical noise was studied, and methods

of combatting these disturbances were developed.

Faculty sponsor: Andrew Wig

Jonathan Bell, Margaret Julien, Kelsey Zimmermann

“One HEK of a Model to Study the Role of CFTR in Bile Acid Action”

Bile acids regulate epithelial cell function, altering cell death, ion secretion and inducing fluid loss in patients with inflammatory bowel diseases. In the colon, cystic fibrosis transmembrane conductance regulation (CFTR) regulates chloride secretion and plays a vital role in fluid balance. We are investigating the role of CFTR in bile-acid induced diarrhea using human embryonic kidney (HEK) cells. HEK cells are easy to genetically manipulate and do not express CFTR. Hence we studied the effects of bile acids, CDCA and LCA, using wild type HEK (HEK-WT) and eGFP-CFTR transfected (HEK-CFTR) cells on i) cell death and apoptosis, and ii) calcium $[Ca_2^+]_i$. We determined that CDCA alone did not alter cell death or apoptosis. However, LCA and CDCA+ LCA caused a decrease in cell death and apoptosis. HEK cells express muscarinic receptor M3 and its agonist, carbachol, caused a transient increase in $[Ca_2^+]_i$, while CDCA and LCA caused a small sustained increase in calcium in both HEK-WT and HEK-CFTR cells. Hence, we have confirmed that HEK-CFTR cells are a good model to study the cellular effects of bile acid and will be used in future to study the role of CFTR in bile acid diarrhea.

Faculty sponsors: Tanya Crum, Jayashree Sarathy

Krishna Bhatia

“Attitudes Towards Vegetarian Diets and How Willing People are Towards Changing their Diets”

The way we produce animal protein is not a sustainable method because it uses a lot of resources that are nonrenewable. The effects on the environment from producing animal protein are quite larger than the effects of producing plant based protein. Past attitude surveys have shown that people in certain areas, such as Brazil, are not very willing to change their diets and prefer a meat based diet over a plant based one. Our research would be focused on surveying the attitudes of people in the United States to see how willing they are to change their diet. The next step would be to educate them on the impact that meat production has on the environment, and then complete the study by conducting a follow-up survey of attitudes after the participants have been educated. The results would then show how we could approach the problem, and what we can do to help reduce the impact of meat production on the environment.

Faculty sponsor: Jean-Marie Kauth

Jeremy Bingen, Joseph Cruz, Nate Kulhmann

“Role of PGP-3 involvement in CDCA-induced fluid secretion in *C. elegans*”

Excess bile acids and Cystic Fibrosis Transmembrane Conductance Regulator (CFTR), an apical Cl⁻ channel in the ABC-superfamily, are implicated in inducing inflammatory bowel disease-associated diarrhea. Our research project utilizes the model organism *Caenorhabditis elegans* to study the role of P-glycoprotein-3 (PGP-3), a CFTR homolog, in bile acid-induced fluid secretion. pgp-3 is expressed in the intestinal apical membrane of *C. elegans*. We are generating an RNAi feeding strain transformed to express pgp-3 dsRNA with the goal of knocking down pgp-3 expression in wild type worms (pgp-3(RNAi)). pgp-3(RNAi) and pgp-3(pk18) deletion mutant worms were treated with the bile acid chenodeoxycholic acid (CDCA) and osmotic stress assays were performed. Results of the assays will determine if PGP-3 plays a role in CDCA-induced intestinal fluid secretion.

Faculty sponsor: Tanya Crum, Jayashree Sarathy

Claire Boyle, Zainab Fiaz, Bayan Ghanem, Jahaven Haye, Miranda Hiemer, Paolo Speciale, Baily Weber

“Using SketchUp Software to Generate a Three Dimensional View of the Benedictine University Campus in Lisle”

This is the most recent version of the 3D map of the Benedictine University campus produced in GEOG 106 (Geography and Cartography). Previous groups of students also contributed buildings to this map.

Faculty sponsor: Jonathan Lewis

Stefano Chiaradonna

“How Differential Salinity Due to Climate Change Affects the Rate of the Atlantic Meridional Overturning Circulation”

The Great Ocean Conveyor Belt consists of the Atlantic Meridional Overturning Circulation (AMOC) that distributes heat and salinity from the equator to the Atlantic, including to North America and to Europe. Agriculture, international trade, international economies, and the global environment depend on the AMOC rate; therefore, AMOC has been researched recently in the past twenty years. Recent studies have shown variegated results that consist of three categories concerning the rate of the AMOC: decreasing, oscillating, or static. The methods that recent researchers have used consist of monitoring the surface temperature via satellites, computer simulation, and simulation modeling. Often, methods have their own limitations and still indicate differing results. Through this research, we will use topical data from a variety of sites within the Atlantic and analyze the salinity by using spectroscopy and conductivity testing. Using the data from the results, numerous, simulated models will be created to best mimic the actual AMOC dynamics; the models will be perturbed by altering the salt content. This will finally predict and determine the rate of the AMOC.

Faculty sponsors: Anne Marie Smith, Kari Stone

Joseph Cruz, Ladan Haery, Morgan Schumacher

“Creating a Drug for McCune-Albright Syndrome by Reducing cAMP Levels in Cells with Mutant Gs α ”

McCune-Albright syndrome (MAS) is a mosaic, genetic disorder that results from an overactive cAMP-regulating protein—Gs. Gs is a protein that acts as an on/off switch inside the cell allowing a response to extracellular chemical signals by regulating cellular cAMP levels. The work we are doing is directed at reducing the levels of cAMP in HEK cells transfected with the mutant form of Gs α . Two molecules have had inhibitory effects on the production of cAMP in the cells: 6-oxo-N-[(2-pyrrolidin-1-yl-4-pyridyl)methyl]-1H-pyridazine-3-carboxamide, and 2-[2-(3,4-dihydro-2H-quinolin-1-yl)-2-oxoethyl]sulfanyl-1H-pyrimidin-6-one. To determine if the compounds are acting directly on Gs, we measured the effects of the compounds on adenylyl cyclase activity by treating cells with forskolin with and without our test compounds. In parallel, we are using a trypsin digest assay to determine if the compounds affect if Gs adopts an active conformation. Currently, we can demonstrate that the active, wild-type Gs is protected from degradation and inactive Gs is degraded. In the future, we will repeat the trypsin digest with the MAS mutant where we expect to see protection from protein degradation.

Faculty sponsor: Robin Rylaarsdam

Sharyn Doden

“Electrografting of Boronic Acids onto Glassy Carbon Surfaces”

Boronic acids have properties that should make them appropriate electrografting precursors. Three boronic acids: 4-nitrophenylboronic acid, p-tolylboronic acid, and 4-tert-butylphenylboronic acid, are examined for the modification of glassy carbon electrodes. An irreversible oxidation feature was observed in the CVs of these boronic acids. This oxidation peak disappears upon repeated potential cycling, which is consistent with film formation on the electrode surface. Electrografting conditions are presented, as well as studies of the electrochemical characterization of the films.

Faculty sponsor: Sarah Shaner

Meagan Donner

“Imagining a New Future: The Global Water Crisis and the Creation of Clean and Sustainable Water Resources”

For my project, I have chosen to raise funds and awareness concerning our global water crisis. My goal is to raise money to help provide access to clean water around the world. I am working with water.org, which is an organization that provides innovative solutions to fund the infrastructure required for clean, safe water and sanitation in various countries around the world. So far for my project, I have raised over \$500. With the money and awareness that my project raises, I hope to make a positive difference in the lives of others by contributing to an effort that works to create a bright future possible for all by ending the cycle of poverty and providing others with access to safe and clean water and sanitation.

Faculty sponsor: Joan Henehan

Jermeen El-Zabet, Ann Pendergast, Katie Vittal, Rachel Warren

“A Survey of Pollinators in Four Urban Areas of China”

Given global concerns of pollinator abundance and diversity, there is a pressing need for data to measure and track the levels of naturally occurring pollinators globally. With outside funding, a team of five students and two faculty from Benedictine University traveled to China in the summer of 2014 and surveyed a variety of sites in urban areas of four different provinces for the quantity and diversity of insect pollinators. Areas sampled include Liaoning, Sichuan, and Shaanxi provinces and the Beijing municipality. In 2015, a team of six students continued the survey with sites in Liaoning province and Beijing Municipality. In 2014, researchers found that in Liaoning, Shaanxi, and Beijing, a higher diversity of flies was observed than bees or butterflies. At all sites, true bugs and butterflies were seen in much lower numbers than bees, wasps, or flies. Highest visitation rates in 2014 were recorded in an agricultural field in Xi’an, in the Shaanxi province and in sites in Liaoning province with hives. Similar rates were seen in the other sites. In 2015, the highest visitation rates were seen in Liaoning province, with rates higher than those seen in 2014. In addition, the highest number of functional species across both years were seen on the SJZU campus in 2015, which also had the highest number of observations.

Faculty sponsors: Steven Day, Cheryl Heinz

Jermeen El-Zabet, Mudassir Yahya

“Protein homology networks for the viral proteome universe”

Networks are an increasingly popular means of visualizing and studying processes that involve contagion in complex systems. Here, we study the network structure of protein homology networks (PHNs) for the viral proteome universe. We extracted data from UniProt and generated network models wherein nodes represent viral proteins, and weighted edges represent the amino acid sequence alignment similarity. In the past, the PHN for the human proteome was constructed. However, many of the studies have not determined if there is statistically significant structure for PHNs. Here, we use power-law analysis to test for the pattern of relationship in the PHN.

Faculty sponsor: Preston R. Aldrich

Mohammed Farhan

“Science In the City: Encouraging students from inner-city schools to to pursue their passion for science”

For my project I worked with Kenwood Academy’s science teacher to go in and make models of the various organs in the human body. The models of the heart, lungs, and kidneys were made by the students and they were able to understand the anatomy of the organs and well as their physiological functions.

Faculty sponsor: Joan Henehan

Fernando Filho, Aimee Ford

“Arthur J Schmitt Future Leaders Project: Gateway to Laughter”

We created a not-for profit project called Gateway to Laughter. The project is driven by students from Benedictine University who partnered with RTA and other community partners to address an important community need. Our goal is to install a safe and accessible playground for families with disabilities at John Gates Elementary school in the East Aurora Public District 131. This central location for our playground will have an optimal community impact as we provide a place where the physically challenged can play with their families. The community is diverse both in terms of ethnicity and in terms of those who will benefit from the public park (seniors, families , veterans with disabilities). This project will allow our socially responsible community to come together and create a place of joy. Students partnered with local businesses to schedule and host a variety of fund raising events, solicit donations, and request sponsors. The project scope will be determined by results prior to build spring 2016. We believe laughter is a powerful medicine, helping families heal together.

Faculty sponsors: Joan Henehan, Sandra Gill

Saif Ghaus, Huzaifa Haider, Andrew Koshy

“Questioning the Generality of Cope’s Rule in Common Marine Invertebrates”

A frequently invoked evolutionary pattern is Cope’s rule, which claims that lineages tend to increase in body size over evolution. To test the generality of this pattern, we gathered body-size data of three common marine classes—cephalopods, trilobites, and brachiopods—using calipers to measure figured specimens in the *Treatise on Invertebrate Paleontology*. It was evident that cephalopods and brachiopods, but less so trilobites, generally display an increase in body size over evolutionary time. Overall size increases across all groups tended to occur in narrow intervals within the Early Paleozoic and Mesozoic era. These results question the generality of Cope’s rule in these groups, and suggest greater study be devoted to understanding the common causes of body size increase across groups in the Early Paleozoic and Mesozoic.

Faculty sponsor: Phil Novack-Gottshall

Mohammed Haq

“The Association Between Vehicular Traffic Volume, Particulate Air Pollution, and Blood Pressure in Chicago, IL”

Recent studies have shown an association between particulate air pollution and blood pressure in humans. Particulate matter 2.5 are fine air particulates, including: organic compounds, soil, or dust particles from sources such as vehicles, that humans can inhale. Studies have shown an association between PM2.5 and an elevated BP which can lead to serious cardiovascular risks such as: congestive heart failure, MIs, or atherosclerosis. To further findings on this association, this proposed study will observe whether an association between vehicular count, PM2.5, and BP exists in retired participants living in three retirement communities in Chicago, IL- an urban location with heavy traffic. Data will be collected on Sunday and Thursday of each week during the summer months of June to August due to the high traffic fluctuations which exist, according to the Illinois Department of Transportation. Environmental Particulate Air Monitor EPAM-5000, the PicoCount 2500 Traffic Counting Tube System, and the Panasonic Blood Pressure cuff will be used to determine whether a statistical association exists between traffic counts, PM2.5 levels, and blood pressure on a weekend and weekday.

Faculty sponsor: Jean-Marie Kauth

Nicole Jeffrey, Josh Rudolph

“Correlation of Student Success in Physics and Learning Assistants”

In this study, the correlation between student success and learning assistant evaluations was investigated. Over two semesters, students enrolled in elementary physics courses were given the opportunity to attend review sessions led by undergraduate physics majors, during which they were guided through example problems to help them better understand the material they were learning in lecture. In the middle of each semester, these students filled out anonymous surveys evaluating their learning assistants (LAs) and the LA program in general. Data was also compiled about exam grade distributions over the two semesters, and compared with the LA evaluation distributions in order to assess the causal relationship between academic success and attitude towards learning opportunities. Although the direction of causality remains uncertain, a strong correlation between the two factors was observed. Further investigation into the nature of this correlation is then discussed.

Faculty sponsor: Darya Aleinikava

Katlin Ketelsen, Ellen Seiberlich

“Technology in the Classroom: A Study on the Use of iPads in the Classroom”

The purpose of this study was to examine the growth of iPad usage in classrooms, the advantages and disadvantages of iPads, and the important role that the teacher plays in using and implementing iPads and iPad applications. With the growing popularity of technology in classrooms, it essential for educators to recognize the influence that technology has on the learning of their students. With thousands of applications on the market, it can be hard to determine which applications can be beneficial in various academic areas. This study surveyed a variety of educators, from grade school

to high school, to determine which applications were preferred and their impact on student learning.

Faculty sponsor: Alandra Devall

Harpriya Koritala

“Effect of Climate Change on the Distribution of the Five Sibling Species of *Anopheles culicifacies* in India”

Malaria is a potentially fatal disease of the Plasmodium parasite that is transmitted to humans through *Anopheles* mosquitos. In this research study, I would like to explore the effect that climate change has on the distribution of five sibling species of *Anopheles culicifacies*. This study will take place over the course of ten years, in India due to its diverse climatic conditions. My research team will start by collecting *Anopheles culicifacies* samples from six climatically diverse locations (samples will be taken from these rural/peri-urban areas, since *A. culicifacies* has the highest ecological distribution here). Then we will calculate the proportion of each of the five sibling species. This will be done once a month, for ten years. The average monthly temperature and precipitation will be measured. Then we will take into account the IPCC Global Climate Model A1B scenario to project what future climatic conditions in India will be. We will compare distributions of *A. culicifacies* from each location (at average temperature and precipitation) to predict the future distribution of the five *A. culicifacies* sibling species.

Faculty sponsor: Jean-Marie Kauth

Jessica Nelson

“How Variations in Behavior and Environmental Temperatures Can Affect the Blood Chemistry of Diamondback Terrapin Turtles”

The natural estuarine habitat of the Diamondback Terrapin turtle (*Malaclemys terrapin*) is unique because it is highly dynamic, in which salinity, oxygen availability, tidal level, and temperature are continuously changing. This variability poses physiological challenges for aquatic reptiles, like terrapins, particularly in winter, when they are dormant buried in mud. In this study, we examined possible effects of environmental changes and behavior on the blood biochemistry (i.e. urea, uric acid, lactate levels) of terrapins. Blood was drawn monthly (2012 Nov-2013 April) from 10 turtles enclosed in a semi-natural pen and a chemistry panel was performed. Environment and turtle temperatures were recorded at 30 min. intervals using miniature data-loggers. Temperature data 7 days before the blood draw were used to create a coefficient of variance (CV) for the environmental temperatures and the turtles' temperatures. The turtle CVs were compared to environmental CVs and used as possible indicators of turtle behavior and movement during winter. Using linear mixed models, we tested the hypothesis that Turtle CV best explained variation in urea, uric acid and lactate levels in the turtles.

Faculty sponsor: Leigh Ann Harden

Maegan Nero

“Exposure Rates of Obesogens in Humans and Their Correlation to Chronic Diseases”

Obesogens are a subgroup of Endocrine Disruptor Chemicals (EDCs) that are known to cause obesity through exposure. EDCs are commonly found in pesticides used in commercial farming, along with average household plastics and products such as sandwich bags and water bottles. While much research has been done to show the side effects exposure to EDCs have on the endocrine system, there is very little awareness of the detrimental effects that exposure to obesogens have on human health. Thus, I intend to do a survey where participants are asked on their proposed rates of exposure, and this data is then compared to actual rates of exposure taken. Actual rates of exposure will then be analyzed to see direct correlations between prevalence's of chronic diseases consisting of obesity, cardiovascular disease, and diabetes.

Faculty sponsor: Jean-Marie Kauth

Angelika Postrozny

“The Determination of Adderall's Toxicity to Discover Possible Human Health Risks of its Metabolite Amphetamine Currently Present in Surface Waters.”

Attention Deficit Hyperactive Disorder (ADHD) is a common disorder that affects many people across the US. The most

common and non-generic medication to treat the disorder is known as Adderall. From previous research, we are now aware that pharmaceuticals' metabolites are present in our surface waters. By extensive research we discovered health risks such as cancer and mental health are linked to those metabolites from their known toxicities. However the toxicity of Adderall is currently unknown. I am proposing research to be done to discover the toxicity of Adderall and possible health risks its metabolite amphetamine has being in our surface waters. This experiment will be conducted using lab rats and giving them increasing doses of the drug until the rats show signs of overdose. After recording the dosage, we will compare those concentrations to those of already recorded concentrations of amphetamine present in surface waters and assess the possible risks to the residents of the US.

Faculty sponsors: Anne Marie Stone, Kari Stone

Sabahat Raees

"Selenium as a Potential Preventer of Methylmercury Neurodegeneration"

Pregnant women consume large amounts of seafood for vitamins and proteins, but instead feed the fetus Methylmercury transported through the placenta and the umbilical cord. From prenatal exposure, infants display delayed psychomotor and cognitive thinking responses. In recent experiments, scientists found that the element Selenium accounts for the production of Selenoproteins, which prevents oxidative damage in the brain. I propose a double-blinded cohort study with two groups of pregnant women who will be given gynecologist approved prenatal vitamins. One will contain Selenium, Centrum Specialist Prenatal, while the other, Stuart Prenatal, will not. Post birth, women will state how well they complied their vitamin and 30mL cord blood will be taken to sample Methylmercury and Selenium levels. After a year, infants will take the BSID-II test by trained professionals to measure their psychomotor and cognitive thinking responses. With these results I hypothesize there will be a lesser delay in infants exposed to Centrum, versus the delay of infants exposed to Stuart, meaning that Selenium acts against Methylmercury as a preventer of neurodegeneration in fetuses.

Faculty sponsor: Jean-Marie Kauth

Hasan Rashid

"Using Course Prep Assignments to Gain Insight into Student Thought Processes"

Biochemistry is a complex discipline incorporating knowledge from several biological disciplines. In order to properly comprehend the concepts, students must have a strong understanding of prerequisites. They must also be able to build upon what they learned in previous units as the focus shifts from monomers to their polymers and systems. Because students in the Principles of Biochemistry course performed poorly on the 1st exam, their answers of questions pertaining to related concepts were compared between course prep assignments (CPAs) to gain insight into student ideas and thinking and identify the underlying issues. The results revealed that students failed to build upon knowledge from previous units and treated them as isolated systems. There was also a deficiency in prerequisite knowledge. The conclusion was that prerequisite material needed to be reinforced prior to delving into course content. Additionally, there should be an emphasis on how new units build upon previous units and the bigger picture. To remedy this, quizzes before every lecture and prerequisite exams during the first month of the course will be implemented.

Faculty sponsors: Allison Wilson, Niina Ronkainen

Kathleen Roe

"Arthur J. Schmitt Future Leaders Project: Youth Empowerment Series"

The goal of the Youth Empowerment Series is to empower youth in 6th-12th grades, ages 12-18, by increasing their confidence, participation within their communities and impact all without putting others down through participating in discussions as well as activities focusing on self-image and confidence, bullying, including cyberbullying, overcoming hardships and making a change in yours and others lives. This experience is in partnership with and will be completed at the Illinois Masonic Children's Home in La Grange. The participants of this series will be invited to the first ever Benedictine University's Women's Entrepreneurship Conference on March 5th. The series will run on Thursdays from February 25th – March 10th from 6:30-8:30 p.m.

Faculty sponsor: Joan Henehan

Emilia Szczesniak

“The Effectiveness of Activated Carbon from Orange Peels in the Adsorption of Amoxicillin from US Wastewaters”

The presence of pharmaceuticals causes health as well as environmental issues. Although many methods have been tested, most are not cost effective and eco-friendly. Activated carbon (AC), a substance which increases surface area which results in an increase of adsorption rates, have been harvested from vine wood, guava seeds, and synthesized AC, used to adsorb amoxicillin from wastewaters at different pH levels. Based on the experiment performed by Fernandez, *et al.*, activated carbon will be created through drying orange peels and soaking in phosphoric acid. Then based on methods of Pezoti, *et al.*, the AC will be added to an amoxicillin solution of varying concentrations and pH values. These solutions will later be tested for their rate of adsorption using kinetic models and through comparison of varying pH levels. The optimal pH level will be chosen.

Faculty sponsors: Anne Marie Smith, Kari Stone

Vincenzo Traversa

“The Effects of Waning pH Due to Increases in CO₂ on the Freshwater Mussel *Amblema plicata*”

Ocean acidification has been a rising subject in global concerns, yet research lacks in the freshwater field. The continuous rise of CO₂ in the atmosphere directly effects water chemistry. This excess carbon dioxide is absorbed by bodies of water too quickly. Naturally, there is a chemical process to regulate the levels of CO₂ with a calcium carbonate (CaCO₃-) reaction. Unfortunately, this chemical process happens slower than the frequency of CO₂ being absorbed. The CO₂ is causing a decrease in the pH of water and affects the aquatic organisms. To measure dissolved pCO₂ underwater, a tool called the HydroCTM will be used. *Amblema plicata* is a freshwater mussel, normally called the three-ridge, which are native to the Midwest United States. By taking samples of glochidia, three-ridge mussels in their larval stage, we could allow these young mussels to develop in waters with varying levels of pCO₂. During their development, measurements of the pH of the water as well as physical traits of the glochidia will be taken every few days in order to observe the developmental effects.

Faculty sponsors: Anne Marie Smith, Kari Stone

Sydney White

“The Effect of Alien Bee Species on Pollen Production and Habitat Takeover”

Colony Collapse Disorder (CCD) in the pollinator population is becoming increasingly prevalent, especially in the bee community. There have been investigations into its causes, one of which being availability of pollen. Competition is becoming increasingly harsh with the growth of urban areas and beekeepers are attempting to replace declining native hives with non-native alien colonies. I plan to research the effects of these introduced species on pollinator production to compare it against the years before the colony was introduced. I will track the pollination via cameras placed intermediately throughout the chosen area and record the specie of bee and the amount of visits in each area. I hypothesize that once introduced in a single, central location, the alien bees will radially expand from the centralized location and will increasingly dominate the area’s pollination production.

Faculty sponsor: Jean-Marie Kauth