Fall Poster Session

Intersections

December 5, 2014

Research and Creative Projects by
Undergraduate Students including
Senior Capstone Students

Case Western Reserve University
EST. 1826
think beyond the possible
Intersections: SOURCE Undergraduate Poster Session

December 5, 2014

Tinkham Veale University Center Ballroom
Intersections: SOURCE Undergraduate Poster Session

SOURCE thanks the following for financially supporting Intersections!

The Center for the Study of Writing
SAGES
Events

Intersections: Undergraduate Poster Session

December 5, 2014

Poster Session Noon-2:45pm
Celebration of Student Writing Noon-2:45pm

Tinkham Veale University Center Ballroom
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SOURCE PROVOST AWARD

Students may elect to have their presentations judged by faculty reviewers for our SOURCE Provost Award. One $200.00 and one $100.00 award will be given in each of seven categories: Arts, Engineering & Computer Science, Humanities, Natural Sciences & Mathematics, Nursing, Social Sciences, and Management & Accounting.

Awards will be announced at the Honors Assembly in December of 2014, during the Community Hour.
Many Thanks
Thank you very much to our alumni, faculty, post doctorate fellows, and graduate students who have volunteered to serve as judges for the SOURCE December 2014 competition. Without their assistance, our competition would not be possible. In addition, many students request copies of their evaluations to help them better prepare for future presentations.

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Jessica Cooke Bailey, Epidemiology and Biostatistics
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Marjorie Nigar Edguer, Social Welfare
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Mary Quinn Griffin, Nursing
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Jane Marek, Nursing
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Yanina Natanzon, Epidemiology and Biostatistics
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April 18, 2014

Oral Presentations

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Steven Cramer, 1939 Comes alive: Integrating computer gaming into the history classroom. Faculty Mentor: Amy Absher, SAGES/History.

Social Sciences
1st
E. Bronte Miller, Chinese American cultural perceptions of health and cancer. Faculty Mentor: Brian Gran, Sociology

Poster Presentations

Engineering
1st (tie) Tyler Freeto, Heel ulcer prevention: Development of a multi-sensor tissue test device. Faculty Mentor: Kath Bogie, Biomedical Engineering
1st (tie) Vishnupriya Srivastava, PCR validation of TLR knockout models to investigate the foreign body response to intracortical microelectrodes. Faculty Mentor: Jeffrey Capadona, Biomedical Engineering & Neurosciences
2nd (tie) Monika Goss, Development of tissue equivalent phantoms for ultrasound elastography characterization of in situ forming implants. Faculty Mentor: Agata Exner, Biomedical Engineering
2nd (tie) Matthew Krupcale, Nanoscale membrane structures for radiation detection. Faculty Mentor: Philip Feng, Electrical Engineering & Computer Science

Nursing
1st
Madeline Haas, Caring about twins’ Sleep: The CaTS study. Faculty Mentor: Elizabeth Damato, Nursing.
2nd
Sara Mithani, Heart failure self-management: Difference in young and old. Faculty Mentor: Mary Dolansky, Nursing

Natural Sciences
1st (tie) Kathryn Madalena, Sympathetic neuron response to CSPG-Rich Scar environment. Faculty Mentor: Jerry Silver, Neurosciences
1st (tie) Christina Xia, Parallel pathways for odor adaptation in the mammalian brain. Faculty Mentor: Jean Moriuchi, Biology
2nd (tie) Rodrigo Aguilera, Further insights into the unique apoptotic mechanism of securinine on p53 null colorectal cancer cells. Faculty Mentor: Focco van den Akker, Biochemistry
2nd (tie) Oliver Ernst, Sequential estimation of discretization errors in inverse problems. Faculty Mentor: Erkki Somersalo, Physics; Daniela Calvetti, Mathematics
2nd (tie) Jacob Hooks, Do differences in ability to process salty water predispose two non-native fish species to invade different environments in the US? Faculty Mentor: Ron Oldfield, Biology

Management & Accounting
1st
Meredith Dykehouse & Skyler Phillips. Predicting group task success based on group coordination quality. Faculty Mentor: John Paul Stephens, Organizational Behavior

Social Sciences
1st
Jared Friedman, To a psychopath, you are nothing but a ’pack of neurons’: Belief in dualism is encouraged by moral concern, not discouraged by careful thinking. Faculty Mentor: Anthony Jack, Cognitive Science
2nd (tie) Shannon Groll, “It’s not about how you look” : Divergence of implicit and explicit attitudes of fat stigma. Faculty Mentor: Eileen Anderson-Fye, Anthropology
2nd (tie) Eve Lanyi, Education in multilingual societies: Implementing the mother-tongue language policy in the Philippines. Faculty Mentor: Todd Oakley, Cognitive Science
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SAGES Capstone Students
SOURCE Summer Programs
2014 Summer Program Participants
2014 P-SURG Program Participants
2014 SURES Program Participants
Case School of Engineering – Alcoa Campus Partnership 2014 Participants
CWRU – Formal Summer Programs
A Portable Urodynamics Stimulation System for Continuous Data Recording

Kelsey Aamoth, Department of Biomedical Engineering; Dr. Steve Majerus, Department of Electrical Engineering

Persons with spinal cord injury often have hyperactive bladder contractions and a low bladder capacity as a result of the injury. Functional electrical stimulation of the genital nerve has been shown to improve these effects and improve the quality of life for these patients. To quantify these outcomes chronically, we will develop an ambulatory urodynamics system that can continuously monitor and record a subject’s bladder pressure and provide electrical stimulation when needed. We have achieved this outcome by developing a carrier board to be added to an existing programmable stimulator UECU (Universal External Control Unit) that has very limited memory. The carrier board and UECU were programmed to be compatible with each other and allow for additional memory storage on an SD card located on the board. The UECU system was designed to receive two analog inputs that contain bladder pressure information and transmit the data to the carrier board. The additional memory improves the monitoring time from 5 minutes to a few months at a 100Hz-sampling rate. The system also allows for electrical stimulation of 20 Hz at a range of 0-60mA selected by the user. We have been able to use this device to record data in acute human experiments. In future work, this device will enable us to perform chronic experiments with quantifiable data and allow us to see bladder behavior in a more natural environment.

Project Mentor: Dr. Dennis Bourbeau, Department of Biomedical Engineering  
Faculty Mentor: Dr. Ken Gustafson, Department of Biomedical Engineering

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Social Support and Ethnocultural Minority Status in Individuals with PTSD

Krina Adhikari, Department of Psychological Sciences

In the United States, trauma exposure (e.g., sexual assault, violence, or motor vehicle accident) is common and can lead to the development of posttraumatic stress disorder (PTSD). PTSD is a psychological disorder that is chronic and impairing if left untreated (Yehuda, 2002). Lifetime prevalence of PTSD is 7.8% among adults (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Multiple risk factors have been examined to predict the likelihood of PTSD including social support and ethnocultural minority status. Indeed, the lack of social support is one of the best predictors of PTSD following trauma (Brewin, Andrews, & Valentine, 2000). Similarly, positive social support, or a strong network of close friends and family has been shown to help reduce PTSD (Robinaugh et al., 2011). Ethnocultural minority status has been shown to be related to greater risk of exposure to trauma, when compared to the majority population (Pole, Gone, & Kulkarni, 2008) and a higher likelihood of PTSD development following trauma (Perilla, Norris, & Lavizzo, 2002). Few studies have examined social support and ethnocultural minority status together among those with PTSD. Thus, the aims of this project are to examine the relationship between ethnocultural minority status and social support, as well the relationship between ethnocultural minority status and PTSD severity. We will then examine the potential indirect contribution of lower social support to higher levels of PTSD among ethnocultural minorities.

Project Mentor: Norah Feeny, Department of Psychological Sciences
Localization and Visualization of Actin-Binding Protein 10

Ali Althans, Department of Biology; Lana Pollock, Graduate Student in Department of Genetics and Genome Sciences

Varying degrees of deafness affect almost 30 million Americans and lead to over $56 billion in medical costs worldwide. The hair cell is a sensory receptor that receives sound stimuli and forwards the information to neurons in a process known as mechanotransduction. Each hair cell is a cylindrically-shaped epithelial receptor cell with protruding stereocilia and a kinocilium at the apical surface of the cell, the hair bundle. The hair bundle is so crucial because it contains the channels necessary for the signaling involved in converting an electrical signal into a perceived sound. Made up of the actin-filled stereocilia, the bundle moves in accordance to the sound energy. This causes the opening of mechanically-gated channels at the tips of the stereocilia, allowing an influx of potassium and calcium ions. This results in the depolarization of the hair cells, permitting neuronal signaling through associated afferent nerve fibers to the brain. In addition to the bundle, the cuticular plate is also structurally significant: it is at the base of the bundle that connects it to the remainder of the hair cell, the soma. In order to learn more about the role of the hair cell in hearing and deafness, we must study the proteins responsible for maintaining the integrity of the bundle and cuticular plate. We have identified a protein, actin-binding protein 10 (ABP10), that we hypothesize acts to interconnect the actin networks in the cuticular plate. We here characterize its localization by visualization in zebrafish hair cells.

Project Mentor: Dr. Brian McDermott, Departments of Otolaryngology, Biology, and Genetics and Genome Sciences

***

Hemolysis Prevention Peripheral IV Catheter Design

Sofia Alvarado, Frances Payne Bolton School of Nursing; Sarah Kovacic, Frances Payne Bolton School of Nursing, Kelly Buchanan, Case School of Engineering; Jonathan Duff, Case School of Engineering; Prashant Bhagavatula, Case School of Engineering; Xingyl Tao, Case School of Engineering

Peripheral IV catheters are typically used to draw blood specimens immediately after they are inserted. After that time the catheter is not useful for collecting specimens because blood taken from the catheter is typically hemolyzed. We partnered as consultants with biomedical engineering students to design a new peripheral IV catheter that can be used to draw blood and does not cause hemolysis. This design would reduce vein backwall trauma that leads to hemolysis, avoid blocking blood flow in the vein, is cost effective, and does not create additional steps for the user. Our team discussed three main concept ideas to improve upon the IV catheter; guide wire use, a “swiss cheese” model and the “JD hook”. Each of these ideas searches to protect the backwall of the vein and reduce hemolysis as well as being cost effective and not creating additional steps for the user. Potential complications to our concept selection include a safe insertion and removal and the structural integrity of the device. As nursing consultants, we aided in the final catheter design decision with our clinical knowledge of what would best benefit the patients and health care staff. We hope to reduce the total number of “sticks” to patients, poor blood samples drawn, and trauma to the vein with our improvement to the catheter.

Project Mentors: Professor Colin Drummond, Frances Payne Bolton School of Nursing; Professor Jesse Honsky, Frances Payne Bolton School of Nursing
Motivating Factors for Participation in a Physician-Led Walking Program

Anna Ambrose, BSN student, and Serena Doyle, BSN student

The purpose of this qualitative study was to identify motivating factors of participation in a physician-led walking program over a four week consecutive period. Participants included both men and women ages 50 to 83. There were 12 total participants, with three attending two or more walks and six attending all four. A survey was given to all participants immediately prior to the start of the walk and they were asked to complete one each time they attended. The survey was open-ended and allowed participants to report subjective data. The physician and all participants then walked for one hour. This same process occurred for a total of four weeks. Results of the study show that the more significant motivator for participant was recommendation to attend by a health care provider, followed by enjoyment, socialization, cardiac rehabilitation, and health. Eight out of 12 participants exercised at least four times per week, indicating that they were already physically active prior to attending the program. This study supported that there are other factors besides health that motivate individuals to participate in exercise programs. This research can help future studies and the development of other walking programs. It can also be used to promote patient-centered care and help health care providers plan for discharge and follow-up care for all patients.

Advisor: Dr. Gayle Petty, Frances Payne Bolton School of Nursing

Perceptions of Impact of Weight on Quality of Life and Body Mass Index Percentiles in Overweight and Obese Adolescents

Precious Amoako, Department of Nursing; Oluwatomisin Olayinka, Department of Nursing

With the epidemic of pediatric obesity now well documented, its effects on children’s health and wellbeing are still being identified. In particular, little is known about the impact of weight on quality of life in children. In this study, we will examine the relationship between body mass index (BMI) percentiles and self-report of impact of weight on quality of life in low-income, overweight/obese middle school children. 360 participants with BMI≥ 20.0 were recruited from middle schools in a large urban city. BMI percentiles were calculated from height and weight measures obtained by trained, certified staff. Self-report of weight-related quality of life was measured using the Impact of Weight on Quality of Life (IWQOL-Kids) questionnaire. The IWQOL-Kids consists of a total score and 4 subscales: physical comfort, body esteem, social life, and family relations. The sample was predominantly African American (79.2%), aged 9-11 years, female (57.8%), and low income (35.8% had annual household incomes <$15,000). The mean BMI percentile was 27.1 (SD=4.8, range= 20.5 - 50.1). Weight-related quality of life total scores were relatively high among this overweight/obese group (M=88.2, SD=16.6) (possible range of scores was 0-100, with higher scores indicating better quality of life). Finding show a significant inverse relationship between BMI and weight-related quality of life (r=-0.30, p < 0.00) on the total IWQOL scale. Similarly, significant inverse relationships were found on all of the IWQOL subscales. Weight-related quality of life reported by overweight/obese urban middle school children is negatively associated with BMI. Interventions and programs aimed at reducing obesity have the potential to improve the quality of life of this vulnerable group of children.

Project Mentor: Dr. Shirley Moore, Department of Nursing

Intersections: Symposium and Poster Session
Evidence for Self-Recognition in the Turkey Vulture (Cathartes aura)

Cara Anderson, Department of Biology

The mirror self-recognition test, or MSR test, is a behavioral test to determine an animal’s ability to recognize itself. The MSR test relies on the idea that if an individual is able to recognize its own body, it will be able to utilize a mirror to remove a mark placed on its body that it could not have seen without the mirror. As of today, a handful of mammals (including chimpanzees, elephants, and dolphins) have passed the MSR test, but only one non-mammalian species: the European magpie. The procedure for this study closely resembles that of the study performed on the European magpie by Prior et al. in 2008, who, among others, indicate that self-recognition is a characteristic often found in species with complex social understanding. Because turkey vultures (Cathartes aura) exhibit social interactions within roosts I hypothesized that they would take a significantly shorter amount of time to remove an out of sight mark when in the presence of a mirror than without a mirror, which would suggest the capacity for self-recognition in this species.

Two captive turkey vultures belonging to the living collection of the Cleveland Museum of Natural History were given the MSR test. Because these two individuals had been previously accustomed to mirrors, an additional standardized mirror exploration was performed on two captive turkey vultures belonging to the collection of the Penitentiary Glenn Reservation which had never been presented with a mirror. Results will be discussed in the context of other species that have successfully passed the MSR test and what is known about C. aura social behavior.

Faculty Advisor: Dr. Mark Willis, Department of Biology

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Impact of Helmets on Cycling Activity and Health Outcomes

Jenna Applebee, School of Nursing; Eunice Kim, School of Nursing; Allison Vogler, School of Nursing

It was originally assumed that in Copenhagen, Denmark, a city with extremely prevalent cycling and no mandatory helmet law, there would be an excessive number of accidents resulting in traumatic head injury. Upon investigation, however, it was found that organizations throughout the city abstain from the promotion of helmets and argue that there are many other crucial safety measures to prevent injuries from cycling accidents. Helmet use is stressed in the United States to prevent head injury should an accident occur; however, the goal of the Danish transportation system is not to minimize the extent of injury once an accident has already occurred, but instead to prevent accidents and thereby injuries from occurring in the first place. This is being accomplished in Copenhagen through a combination of continuous improvement and expansion of cycle-friendly infrastructure, implementation of strict laws, and education of Danish cyclists. These initiatives, all working together to make cycling safer, have resulted not only in significantly fewer cycling accidents in Copenhagen compared to cities in the United States, but also have contributed to the steady increase in their cycling population. As more citizens opt for cycling over motor vehicle transportation, there is ultimately a decreasing rate of obesity in Copenhagen, among other health outcomes. Extensive literature review revealed that various methods, other than promoting helmet use, create a safer cycling practice. This cycling culture in Copenhagen, which has resulted in evidence of lower obesity rates, is something that countries, such as the United States, can learn from.

Project Mentor: Dr. Gayle Petty, School of Nursing
Dectin-2 Regulates the Complement-Signaling Pathway Independent of Dectin-1 in IL-17 Producing Neutrophils During Fungal Infection

Brittany Armstrong, Department of Biology; Eric Pearlman, Department of Ophthalmology and Visual Sciences; and Patricia R Taylor Department of Ophthalmology and Visual Sciences

Dectin-1 (Clec7a) and Dectin-2 (Clec6a, Clec4n) are C-type lectin receptors that are involved in fungal recognition and initiation of the innate immune response. When Dectin-1 is activated by β-glucan (a component of the inner fungal cell wall) or Dectin-2 is activated by α-mannose (a component of the outermost fungal cell wall) a pro-inflammatory cytokine response is induced against the fungal pathogen. Taylor, Pearlman et al. identified a population of IL-6 and IL-23 stimulated neutrophils, which express Dectin-1 and Dectin-2, produce and respond to IL-17A, and has increased fungal killing activity (Nature Immunology 2014). Using IL-6 and IL-23 activated bone marrow neutrophils from Dectin-1−/− and Dectin-2−/− mice (stimulated with Aspergillus fumigatus hyphal extract), a subset of anti-fungal genes regulated by Dectin-2, but not Dectin-1, including c3 and c5ar1 were identified. C3 initiates the alternative pathway of complement leading to the release of c5a, an important anaphylatoxin. C5a then binds to c5ar1 causing degranulation of neutrophils, and increased pro-inflammatory cytokine production. As there are also multiple genes that are regulated by both c-type lectins, we conclude that in addition to this canonical pathway, Dectin-2 regulates the alternative complement-signaling pathway in activated neutrophils that are independent of Dectin-1. This affects c3 and c5ar1 expression and the pro-inflammatory response during fungal infections.

Project Mentor: Dr. Patricia R. Taylor, Department of Ophthalmology and Visual Sciences
Faculty Sponsor: Dr. Michael Benard, Department of Biology

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Low Temperature Suspension of Shear Thickening non-Newtonian Fluids

Nicholas Barron, Department of Physics

There are a variety of useful applications in industry for shear thickening non-Newtonian fluids. For certain applications, maintaining shear thickening properties for long periods of time at temperatures below 0 Centigrade is desirable. In this project, such fluids will be identified from patent applications and scientific publications, and rheometric tests will be conducted to determine the properties of one or more of these fluids at temperatures equal to or less than 0 degrees Centigrade over an extended period of time. Cost effectiveness for a commercialization application via a brief supply chain analysis will also be determined for the fluid compositions tested.

Project Mentors: Ed Caner, Department of Physics; Dr. João Maia, Department of Macromolecular Science and Engineering
Identifying High Risk Behaviors in Reproductive Aged Women:
Counseling to Improve Health Outcomes

Rachel Beaty, FPB School of Nursing; Nicole Cornelius, FPB School of Nursing

Infant mortality is defined as a death of a child between birth and the first birthday. The Infant Mortality Rate (IMR) in the United States is 6.0 infant deaths per 1000 births; this ranks the U.S. with the 55th lowest IMR according to the Central Intelligence Agency. The IMR in the city of Cleveland is 15.3 per 1000 according to the Cuyahoga County Board of Health. This ranks Cleveland among countries like Bulgaria and Colombia, who are ranked 117th and 118th respectively in the world. Factors such as limited prenatal care, poor nutrition, infection, and high risk behaviors are all indicators and risk factors for infant mortality. The first portion of this project is focused on identifying high risk behaviors in women who are of reproductive age. The women are then counseled on their behaviors and provided education on the risks that these behaviors pose to themselves and their potential children. The second portion of the project focused on women who are pregnant and identifying common sexually transmitted infections in that population. The process of identifying changes in behavior, as verbalized by participants, and identifying rates of infection in women who are pregnant is in progress. The implications of this project will be to identify a need for a program or initiative to provide education to the women of Cleveland on how to prepare for pregnancy and how to take care of themselves during pregnancy.

Project Mentor: Lucinda Farina, MSN, CNM, Cleveland Department of Public Health
Faculty Mentor: Mandisa Molton, MN, MBA, RN, Faculty Advisor, School of Nursing

Fibromyalgia: The Struggle for Diagnostic Legitimacy and Patient Credibility in Modern-Day United States of America from a Feminist Perspective

Rosemary Behmer, Department of Biology

It is well known that there is “no shortage” of data that confirms that men receive superior management of chronic pain. In this paper, I will prove how the treatment of women with fibromyalgia disorder, specifically, is sexist by nature. The misogyny that is intertwined with how physicians view and treat women with fibromyalgia will be revealed first through a chronological assessment of how people with pain disorders have been treated, starting from the 1700s. From there, I will explain the evolution of fibromyalgia as a disorder and analyze the debates centered around the legitimacy of the disease. Finally, the existence of medical sexism will be proven via numerous studies on the nature of the doctor-patient relationship in both clinical and research settings.

Project Mentor: Professor Dianne Kube, Department of Biology
Predicting Brook Trout (*Salvelinus fontinalis*) Habitat Using Random Forest, a Machine Learning Model

Dakota Benjamin, Biology B.A.

Brook Trout, *Salvelinus fontinalis*, is a threatened fish species native to Northeast Ohio. Recently, the fish has been successfully reintroduced, and now resides in a total of 7 streams in Cuyahoga, Geauga, and Lake Counties. In order to improve future restoration efforts, this study aimed to predict suitable Brook Trout habitat within these three counties using a “random forest” model. Random forest is a statistical, machine learning model which builds many classification trees using a random subset of training data, and then decides the classification by the most common vote of each tree. Several geospatial information systems datasets were used as predictors for generating the random forest model: the presence of Sharon sandstone (a strong indicator of cold-water streams), soil type, topographic position index, topographic wetness index, and canopy height. The sites at which previous reintroductions had successfully resulted in viable populations were used as training data, and all headwater streams in the three counties were run in the model and determined as either “Suitable” or “Unsuitable” habitat. A map of habitat predictions was produced as a result. If future efforts are made to reintroduce Brook Trout in the study area, then these results will be helpful in creating a baseline survey area. This model could also be expanded to include other parts of the state where the species existed historically and could be reintroduced.

Capstone Advisor: Dr. Ronald Oldfield, Department of Biology

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Testing the Effect of Copper on the Properties of Polymers through TGA for Medical Applications and Devices

Neha Reddy, Department of Biomedical Engineering and Department of Music; Cindy Berry, Department of Biomedical Engineering; Dharani Kalyana Raman, Department of Biomedical Engineering

Several polymers have been used in the medical field, such as in facial prostheses, heart components, biodegradable sutures, and joints. A range of standard polymers widely used for medical applications were selected from the SPE Resin kit based on the effect of copper on thermal properties as determined by Thermo Gravimetric Analysis (TGA). In this study, different types of polyethylene (PE), polypropylene (PP), polycarbonate (PC), and poly ether ether ketone (PEEK) were tested in TGA in copper and platinum pans. If the effect of copper of the material is significant, copper should not be used in conjunction with the material as a polymer implant because copper has pro-oxidative properties under these circumstances. TGA measured the degradation of each material in terms of weight percent loss with respect to temperature. Analysis of the TGA curves yielded the first derivative, which determined the rate of change of the degradation. The peak of the first derivative graph established the inflection point on the original curve. A TGA curve with a lower degradation temperature in copper than in platinum signifies that copper reduces the thermal stability of the material and its effectiveness in an implant. With this data, the polymers for medical application were ranked based on their thermal properties and copper’s influence as a pro-oxidant.

Project Mentor: Dr. Alan Riga, Department of Macromolecular Science and Engineering
A Modular Control System for a Robotic Space Vehicle Simulator

Luc Bettaieb, Department of Electrical Engineering and Computer Science, Case Western Reserve University; Eliyahu Davis, Department of Electrical and Computer Engineering, University of Miami; Andrew Harris, Department of Mechanical and Aerospace Engineering, University at Buffalo; Brayden Hollis, Department of Computer Science, Rensselaer Polytechnic Institute; Cornelius Leary, Department of Mechanical Engineering, Virginia Tech

Future long-duration missions will require the ability to service components without the high risk and costs of current Extra-Vehicular Activity (EVA) technology. The FlexCraft is a single-person concept vehicle that will be flown by astronauts or teleoperated and holds promise as an EVA replacement. One of the FlexCraft’s intended functions is to use robotic manipulators to support large systems such as the Deep Space Habitat, International Space Station, telescopes, or satellites. The FlexCraft Simulator (FCS) is a test vehicle for FlexCraft development that resides in the Flight Robotics Laboratory at NASA’s Marshall Space Flight Center. Our team added additional control functionality to the existing system, allowing for manual and teleoperated control. We built, tested, and integrated power, sensing, electronics, software, and human interface subsystems. Using Robot Operating System (ROS) as the framework for controlling the vehicle with software, we built an extensible, modular control system with the sensing and human interface capabilities for complete control from a remote location. Testing was executed to ensure the functionality of all subsystems, including teleoperation, and to provide baseline data for future control configurations.

Project Mentor: Charles Dischinger, EV74, NASA Marshall Space Flight Center, Huntsville, AL
Faculty Advisor: M. Cenk Cavusoglu, Electrical Engineering and Computer Science

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Raising Alcohol Awareness in Alaskan Adolescents

Danielle Blonstein, Frances Payne Bolton School of Nursing

In the 2013 Mat-Su Community Health Needs Assessment, alcohol and substance abuse was identified as the priority health issue in the Mat-Su Valley, the fastest growing region in Southern Alaska. Furthermore, alcohol misuse among high school students was high, as 15-35% of high school students reported binge drinking in the last month. Clearly, this does not meet the Healthy People 2020 Goal: a binge drinking rate of only 8.5%.

Those that did not complete a traditional high school education are at the highest risk for abusing alcohol, including those that attend an alternative high school or attend a job-training program. Based on this information, in conjunction with the Job Corps, which is a free education and training program that helps young people learn a career and earn a high school diploma or GED, I created a Jeopardy Game, which provided different facts and information about alcohol awareness. The purpose of the game was not only to increase knowledge about alcohol misuse but also to provide information to reduce risky drinking behaviors. The game was played with 150 students at Job Corps in Palmer, Alaska, aged 16-24 years old, who were identified as being an at risk population for engaging in unsafe drinking behaviors. A pre and posttest survey indicated an increase in knowledge related to alcohol education. There was an overall 13% increase in correct responses from pre to post test, signifying the intervention was effective in increasing alcohol awareness.

Project Mentor: Professor Rita Sfiligoj, Frances Payne Bolton School of Nursing
Assessing and Monitoring Stress Levels of Surgical Intensive Care Unit Patients

Karen Booth, Alexandra Pelton, Claire Slusarz, Frances Payne Bolton School of Nursing, Jesse Honsky, Frances Payne Bolton School of Nursing, Colin Drummond, Department of Biomedical Engineering, Berit Eppard, Ryan Miller, Namratha Reganti, Wade Stewart, Department of Biomedical Engineering

The surgical intensive care unit is a high stress environment for intubated postoperative cardiac patients. One of the greatest sources of stress for an intubated patient stems from inability to communicate. Increased levels of stress lead to poor patient outcomes, therefore assessing and managing patient stress is an important part of the patient’s recovery. The aim is to make stress a quantifiable and measurable value, and use the quantification of stress to manage patients’ stress level. In order to accomplish this, the nursing consultant team is working with engineering students to create a sensor measuring patient’s heart rate, heart rate variability, blood pressure and GSF. These four measurements were chosen based on a literature review on the pathophysiology of stress. These measurements will be combined and weighted through an algorithm to produce a reliable way of detecting changes in physiologic stress levels. In order to evaluate the validity of the BodyMedia device, it will be tested in a stress-inducing environment to ensure it produces a reliable measurement of changes in stress levels. Once the stress sensor is proven to be reliable it will be used to measure the efficacy of a two-button communication system for intubated patients in reducing stress. The two-button system will be used to answer a standardized post-operative stress assessment containing “yes” and “no” questions related to the patients physical and emotional needs. Giving the patient the ability to communicate aims to manage patients’ stress levels. Through creating a method to measure stress and a way to mitigate the stress of the inability to communicate the hope is to improve the outcomes of the cardiac surgical patients who are intubated after surgery.

Project Mentor: Jesse Honsky, Frances Payne Bolton School of Nursing

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Increasing Sexually Transmitted Infection Testing in Cuyahoga County Residents Aged 15-29

Miranda Bradach, Candidate for Bachelors in Science and Nursing, Frances Payne Bolton School of Nursing; Emily Bulgrin, Candidate for Bachelors in Science and Nursing, Frances Payne Bolton School of Nursing

Cuyahoga County has had a steady increase in sexually transmitted infection (STI) rates among teens and young adults over the last nine years. While the rates of new infections slightly decreased in 2012, the majority of new Chlamydia and Gonorrhea infections are still reported in those under the age of 29. Because of this, senior nursing students of Case Western Reserve University, in conjunction with the Cuyahoga County Board of Health, chose to combat this issue through education about the risks of STIs and the importance of testing in an effort to improve the overall reproductive health and well-being of men and women. The goal of this project was to increase the number of clients seeking STI testing at the Cuyahoga County Board of Health Clinic by 20% following a seven-week intervention. To implement this intervention in the targeted population of 15-29 year olds social media, formal education, and informal focus groups were used. While the number of clients remained the same between pre-intervention and post-intervention, valuable insight was obtained with regard to how this population prefers to be educated on the topic of sexually transmitted infections.

Project Mentors: Deborah Horvath, Cuyahoga County Board of Health; Deborah Busdiecker, Cuyahoga County Board of Health; Dr. Gayle Petty, Frances Payne Bolton School of Nursing
Is New York City's 'Stop and Frisk' Policy an Effective Crime Deterrent, or Excuse to Profile Minorities?

Jeffrey Brown, Department of Economics

On January 30, 2014, incumbent mayor Bill de Blasio announced the end of New York City’s stop and frisk policy. This law has existed in New York for 20 years, and been a heated topic for almost as long. Some view it as a necessary action to help deter violent crime. Others see stop and frisk as the right to racially profile. The media highlights extreme cases of evidence for both viewpoints, but rarely inspects the policy as a whole. It is vital to examine all data equally when analyzing a law based off word of mouth. Since 2003, The NYPD and NYCLU have released quarterly reports on the amount of stops, arrests, and summonses. This data is broken down by precinct, race, and gender. They also release annual electronic data on the exact location of the event, age of the person stopped, if they were frisked, if a weapon was recovered, and if physical force was used. The NYPD also releases crime statistics on a weekly basis. I plan to match stop and frisk statistics with precinct location, income, age, and race. Afterwards, I will compare the number of stop and frisks per precinct in relation to the crime rate. This should help me show the effectiveness of the policy. I can then also consider the proportion of the community who experienced stop and frisk, check if that relates to the proportion of minorities in said precinct, and then measure if there was a comparable decrease. These variables would make correlation much more apparent.

Project Mentor: David Clingingsmith, Department of Economics

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Rubiks Groups of Polyhedra and Polychora

David Buzinski, Department of Mathematics

Conway described a geometric construction of the sporadic simple group M_{12} in terms of a "Rubiks" icosahedron. I will describe the groups that arise from generalizations of this method applied to other convex, regular 3-polytopes and 4-polytopes. In the case of the 4-dimensional 24-cell we realize the unique non-trivial double cover of M_{12}, acting as permutations on the 24 cells.

Project Mentor: Professor John Duncan, Department of Mathematics
Synthesis and Polymerization of Substituted Oxazine Ring of Polybenzoxazine

Francis Cassidy  Chemistry B.S., Hatsuo Ishida Macromolecular Science and Engineering

A novel form of benzoxazine monomer has been successfully synthesized and polymerized. Previous methods have used the combination of different amines and phenols resulting in limited specificity. These methods limit the addition of functional groups to only the nitrogen and oxygen groups of the oxazine ring. Use of a novel three step method allows for a more precise addition of functional groups on to the -CH2 regions of the oxazine ring allowing for a wider variety of polymers. The concept proven with monofunctional benzoxazine has been applied to make a difunctional form of benzoxazine. The novel monomer has successfully been polymerized and has been confirmed via DSC thermogram, an exothermic peak was observed at 237 °C. Benzoxazine’s high glass transition, char yield, and degradation temperature give this a class of polymer many unique advantages over most known polymers today. They also exhibit low water absorption along with a low dielectric constant which makes them a good candidate for electronic packaging and aerospace industries.

Project Mentor: Hatsuo Ishida Macromolecular Science and Engineering

Misalignment of Global Distribution of Developmental Health Assistance From The Global Burden of Disease: How political and social agendas impact WHO’s ability to address global health priorities

Kimberly Cheng, Department of Biology, Department of Chemistry, and Department of Psychology; Benjamin Nolting, Department of Biology

The World Health Organization (WHO) holds a crucial role in directing global health matters, monitoring and assessing health trends, guiding the health research agenda and coordinating multilateral efforts. Although WHO strives to accurately address global health priorities and allot funds from its program budget accordingly, its distribution has been heavily skewed towards infectious disease, with 87% of its budget given to infectious disease in 2008. However, past studies have shown the increased prevalence of non-communicable diseases and the lack of adjustment in the amount this area is allocated. This bias has been attributed to the influence of the political and social agendas of member states and private non-profit organizations in proportion to the amount each donates to the WHO program budget. The United States Government (USG) and the Bill and Melinda Gates Foundation (BMFG) are the largest assessed and private contributors to the WHO budgetary fund and thus should hold the most influence upon fund allocation. This review seeks to determine the extent to which the political priorities of the USG and the social ties of the BMFG influence the WHO’s ability to address health priorities set by GBD through its allocation of funds. Using this data, we then explore the impact this has upon recipient countries and determine strategies to minimize the influence of secondary agendas.

Project Mentors: Dr. Karen Abbott, Department of Biology; Dr. Benjamin Nolting, Department of Biology
Falls Prevention Among the Elderly in Community and Residential Settings

Elisse Cho, Department of Nursing; and Amanda Trefny, Department of Nursing

According to the Centers for Disease Control, in 2011 the United States reported 27,483 deaths from falls with approximately 83% occurring in persons age 65 years or older (CDC, 2011). Falling is a major concern in the geriatric population that results in fractures, traumatic brain injuries, reduced mobility, and loss of physical fitness. McGregor PACE is a program in Greater Cleveland designed to care for the elderly in the community, in their homes, and in day health centers. There were 137 falls reported by the participants from July 1st through October 12th 2014, making an average of 23.39 falls every 3 weeks. Through a literature search, it was discovered that education, exercise, regular medication review, and compliance with medical regimens contributed to a reduction of falls. Prior falls prevention interventions had been implemented at McGregor PACE including a take-home video, walking with the participants in the halls, a specific assessment in the clinic following a fall, as well as center assistants in the day rooms who help with toileting, exercise activities, and physical therapy. However, during the last three weeks in October, the falls reduction program was expanded to incorporate a falls risk assessment, poster reminders where recent falls had occurred, a weekly falls education class in the day room, and take-home brochures provided to the McGregor PACE participants. Although 22 falls were reported during the 3 week enhanced falls reduction program, the number was reduced from the average 3 week fall rate of 23.39 reported above indicating a reduction of 5.94%. More importantly, these strategies represent a sustainable model of care for these participants in the future.

Project Mentor: Dr. Patricia E. McDonald, Frances Payne Bolton School of Nursing

Emotional Effects on Task Repair in Work Groups

Jessica Choy, Major: Psychology; Minors: Biology and Chemistry; Meredith Dykehouse, Liana Manuel, Harini Ushasri (Organizational Behavior)

Emotions at work and within groups influence group processes such as coordination, and communication, and are therefore important for group performance. Group members can influence each other consciously and/or unconsciously to ultimately develop a group-level emotional state. This mutual influence can occur through emotional contagion, which usually occurs unconsciously through behaviors, verbal and nonverbal. Based on the literature, it is not yet clear whether homogenous groups who share a mood perform better (Barsade, Ward, Turner, and Sonnenfeld, 1998) than heterogeneous groups (Ashforth and Humphrey, 1995; Barsade and Gibson, 1998; Gross, 1956; Newcomb, 1956). In this study, I focus on the nonverbal behaviors of positive and negative affect and the effect it has on successfully completing task-repair. I argue that groups who successfully complete task-repair have members who show positive affect as well as members who show negative affect through nonverbal behaviors. A heterogeneous group will be more beneficial than having a homogenous group because the complementary nature of the cognitive effects of positive and negative emotions can be adaptive for individuals to repair their taskwork. Nonverbal behaviors were measured by a modified version of the Observer’s Instrument for Work Group Mood developed by Bartel and Saavedra (2000), and emotions were measured through self-report questionnaires from Positive and Negative Affect Scale or PANAS from Watson, Clark, and Tellegan (1988). Knowledge of emotional states in groups is important because certain emotional behaviors sway the team to maximize group performance towards success when faced with a task.

Project Mentor: John Paul Stephens, Organizational Behavior
The Relationship Between Stimulation Parameters and Perceived Reward in the Olfactory Tubercle

Diana Christian, Department of Biology

Many studies have used intracranial self-stimulation protocols to explore how activation of brain regions relates to behavior. The olfactory tubercle is a region of the olfactory cortex implicated in odor processing, hedonics, and reward, but little is known about the connection between parameters of stimuli and the perceived reward. The purpose of this project is to replicate a previous study that found that stimulation of the olfactory tubercle is rewarding, and to elaborate upon that study by comparing different stimulation protocols, by differing amplitude, duration, and frequency of the stimulation (FitzGerald, Richardson and Wesson, 2014). I hypothesize mice will initiate self-stimulation significantly more often when longer duration stimuli at higher frequencies and amplitude are given. I will test this in mice implanted with a stimulation electrode unilaterally in their olfactory tubercle. These mice will be given the opportunity to press a touchpad which will trigger a small electrical stimulus, and the number of press events will be measured throughout 60 minute experimental sessions. This will help elucidate the relationship between the olfactory tubercle and reward, and will suggest the optimal protocol for further research in this area.

Project Mentor: Professor Daniel Wesson, Department of Neurosciences

Designing Devices, Building Rapport: A Look into the Outcomes of Engineering Students Utilizing Nursing Students as Clinical Consultants During the Design Process

Amanda Crow, Francis Payne Bolton School of Nursing, B.S.N Candidate

In the biomedical design process, there is potential for disconnect between the designers, and the healthcare professionals who will then use the devices. Despite the very best of intentions, a product may fail to be of application, and therefore fail to be relevant. How does one prevent this? A proposed solution is to utilize a cross-disciplinary approach during the product design process; an approach that in theory incorporates both the engineers designing the product, and the healthcare professionals who will utilize it in practice. When applied in the academia, incorporating both engineering students and healthcare professional students, there is a great deal to be learned. Both parties contribute unique abilities and experiences, as well as distinct perspectives that may be foreign to the other party. This opportunity for collaboration allows for progression and learning in the areas of design and clinical consultation for engineering and healthcare students respectively. Additionally, it works to forge an early understanding of the other party’s role in the design process.

This process poses two questions. First, do designers who utilize a healthcare professionals as a clinical consultant fair better in their design efforts than those who do not utilize a healthcare professional as a clinical consultant in their design process? Second, will utilizing this model amongst students foster better relationships amongst the parties of designers and clinical consultants in the future?

Project Mentor: Dr. Marilyn J. Lotas, PhD, RN, FAAN, Francis Payne Bolton School of Nursing

Nutrition Analysis of the National Youth Sports Program (NYSP)

Timothy Detwiler, School of Nursing; Rachel Wolf, School of Nursing; Shin Kim, School of Nursing; Kiara Johnson, School of Nursing and; Xinye Gu, School of Nursing

Obesity is a growing epidemic in Northeast Ohio and across the nation. Proper nutrition education and adherence to healthy dietary practices have been identified as barriers to optimal health outcomes in the Greater Cleveland Area. As students at the Frances Payne Bolton School of Nursing, we researched the influence of intensive nutrition classes at the National Youth Sports Camp held at Case Western Reserve University. The research was designed to increase knowledge and behaviors associated with healthy dietary habits. The goal was to intensify healthy dietary practices that could help to create better health outcomes, and reduce childhood obesity among the youth.

Project Mentor: Dr. Faye Gary, School of Nursing
Spatial dynamics of canine distemper virus in Galápagos sea lions and introduced dogs

Katherine Dixon, Department of Biology; Christopher Moore, Department of Biology; and Karen C. Abbott, Department of Biology

The Galápagos Islands are home to roughly 50,000 Galápagos sea lions that are endemic to the archipelago. One risk to Galápagos wildlife comes from the introduced domestic dogs. These dogs pose a threat to sea lions by attacking them and spreading canine distemper virus, which can use multiple species as hosts. Canine distemper has a mortality rate of 50% in dogs, wreaking havoc on the gastrointestinal tract, respiratory tract, and nervous system. The mortality rate in pinnipeds is unknown, but can be as high as 70% for similar morbilliviruses. Researchers on the islands have seen signs the disease has already established itself in the Galápagos sea lion population. A model was built on a preexisting-spatially explicit, two-host canine distemper virus model from Yellowstone National Park (Almberg et al. 2010). The model was modified and extended to account for differences in behavior and a different, complex spatial structure, where sea lions and dogs interact only along coasts. The model sheds light on the problem of distemper in Galápagos sea lions, but also provides a base for management solutions to be tested as research is continued. Domesticated species are typically easier to treat medically but wild species are often of greatest conservation concern, so understanding this type of disease spread is incredibly important. Management solutions such as a vaccine for the canine population, which exists but is currently banned from the archipelago, and eradicating dogs from the islands are management plans that are feasible and will be tested using this model.

Project Mentor: Professor Karen C. Abbott, Department of Biology

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Morphological and metrical comparison of the calcaneus in Chimpanzees, Gorillas, and Humans

Madelynne Dudas, Department of Anthropology

There has been anatomical restructuring of the calcaneus in humans as an adaptation to bipedality. The purpose of this study was to identify the morphological differences that distinguish the calcanei of the quadrupedal African apes and bipeds. This study used a combination of metric and nonmetric characteristics of the calcaneus in order to define these differences, focusing on the cuboid facet morphology. Many of the nonmetric characters appeared in both gorillas and chimpanzees, or in humans, but not in both locomotion-style groups. Humans were found to have cuboid facets with the deepest point located more superiorly on the medial edge of the facet, than that of gorilla and chimpanzee which are more centrally located on the facet. Of the measured characteristics, the greatest difference was the ratio of body height to width between the two quadrupedal species and humans, with humans having a significantly greater ratio. These finding can be applied to other specimens of hominins to help characterize their method of locomotion.

Project Mentor: Dr. Scott Simpson, Department of Anthropology & Department of Anatomy

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Intersections: Symposium and Poster Session
Perception Studies of New Lighting Technology based on Light-Emitting Diodes

Justin Evaristo, Department of Electrical Engineering and Computer Science

As compared to the traditional lighting technologies such as incandescent and fluorescent lamps, white light-emitting diodes (LEDs) not only have higher efficiency and longer lifetime, but also offer the ability to manipulate the color properties of the emitted white light. Though this new technology has great advantages over its older counterpart there are a few factors that prevent it from completely dominating the competition, namely its slightly higher purchase price and people’s preference of the quality of lighting that the traditional bulb offers. As manufacturing breakthroughs create a steady drop in the price of LED bulbs the question now comes to how to perfect the white color quality for different applications. In this study we designed multiple perception experiments with multiple white LEDs, together with incandescent and fluorescent bulbs to analyze the effect of the color compositions on people’s preference. Spectrum and color rendering index of these light sources are characterized separately. Statistical results of the experiment will be presented.

Project Mentor: Professor Hongping Zhao, Department of Electrical Engineering

Degradation and Reliability Analysis of Active Devices; Quantitative Image Analytics

Justin S. Fada, Department of Mechanical and Aerospace Engineering; Timothy J. Peshek, Department of Material Science and Engineering; Mohammad A. Hossain, Department of Mechanical and Aerospace Engineering; Roger H. French, Department of Material Science and Engineering

Degradation and reliability performance of manufactured devices is of critical interest to a product’s future design considerations and operational standards. Through the use of the Solar Durability and Lifetime Extension (SDLE) Center’s resources, studies have been created to evaluate the effects of certain stressors on the performance of active devices. Thermal image profiles of micro-inverters are being studied to unveil trends in reliability loss under real-world environmental stressors. To analyze the effects of wind as a specific stressor, wind enclosures and residential roof sections have been employed on the SDLE solar-trackers and fixed-rack module/micro-inverter pairs to compare with “open” non-disturbed systems. Additionally, environmental degradation of solar cells are analyzed through electroluminescent (EL) imaging via a modified Samsung NX100 white light DSLR camera sensing the cell’s near-IR spectral emission. Non-illuminated “dead” sections, high-resistance fading, and cell cracking are easily seen in the images. The goal of this study is to identify overall darkening as key to the nature of cell degradation over time through detailed image analytics. Cholesteric liquid crystal displays provided by Kent Displays will be baseline and subjected to a series of stress mechanisms through use of accelerated degradation equipment at the SDLE center. Image analysis of these samples will be utilized to specifically identify and characterize the appearance of dendrites under certain environmental stressor formulations. All three of these device studies employ quantitative image analytics through the use of ‘R’ open source software, which allows for identification of desired characteristics of device degradation and reliability.

Project Mentor: Professor Roger H. French, Department of Material Science and Engineering
Educating VNA Clinicians on Implementing Brief Interventions for Substance Abuse

Chloe Milliman, Department of Nursing; Kasey Filliater, Department of Nursing

Cleveland has experienced a growing problem with substance abuse. The registered nurses (RNs) at the Visiting Nurse Association (VNA) recognized a need for more education on evidence-based treatment for substance abuse disorders. It is important to provide continuing education to adequately address the healthcare needs of these patients and reduce the rates of substance-related comorbidities. The primary goal of this project was to obtain data on the RNs’ current substance abuse treatment of patients. A secondary goal was to provide an online education program to increase the RNs’ knowledge of evidence-based treatment of substance abuse disorders. It was hoped that the RNs would increase their knowledge of evidence-based interventions and implement the brief interventions that were taught. A pre-posttest survey was administered to 79 RNs who work in hospice, mental health, and medical-surgical home care nursing. During the interim period, an online presentation pertaining to evidence-based interventions was sent to all RNs through their employee E-mail. Twenty-nine RNs responded to the posttest survey representing a response rate of 36.7%. All of the responding RNs reported that their knowledge increased in terms of evidence-based interventions for persons suffering from substance abuse. Additionally, 97% of responding RNs reported they would most likely implement the evidence-based interventions in future patient care. The results of the project demonstrate education enhanced RN care has the potential to improve patient outcomes. Further exploration is needed to determine if the VNA’s RNs utilized knowledge gained from the online educational program and whether the evidence-based interventions were effective.

Faculty Mentor: Patricia McDonald, PhD, RN, Frances Payne Bolton School of Nursing

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Pediatric Behavioral Health Referrals

Jennifer Meyer, Department of Nursing; Elisabeth Furey, Department of Nursing; and Faye Gary, Department of Nursing

Behavioral health disorders in children can be debilitating. When these children are untreated or undertreated, their quality of life could steadily decline. A lack of treatment could be related to several factors, including poverty, stress, and parental mood states. In Fairfax, Ohio, at a community-based clinic where this research was conducted, the rates of pediatric behavioral health issues and poverty rates are high; we identified this phenomenon as a major health concern in the community. Hoping to eventually help to improve the children’s quality of life and parental awareness regarding the benefits of treatment, we focused on a specific pediatric population: children with treatable behavioral health disorders. We implemented an intervention that involved the most influential people in the lives of the children, their parents. Our purpose was to learn more about parental beliefs, and then develop a script that would be used to collect data about the referrals that were made by the clinic staff, and parental follow-up activities. The parents of the children who had been referred to Rainbow Care Connection (RCC) were contacted by phone to determine if they had made an appointment for their children. If they had, we asked if the child’s symptoms were improving, staying the same, or getting worse. If they had not followed up with RCC, we asked why they had not been able to follow the recommendations. We also asked if there were an additional actions that the clinic staff could do to help them with follow-up. The results suggested that over half (52.4%) of the parents had followed-up with treatment; their children’s behavioral health problems/symptoms had improved. More research is needed to examine the beliefs that parents have about behavioral health interventions.

Project Mentor: Faye Gary, Department of Nursing
Development of compounds for the allosteric regulation of MT1-matrix metalloprotease (MMP)

Dean Gabay, Department of Biology; Dr. Menachem Shoham, Department of Biochemistry

Matrix metalloproteases (MMP) play an important role in extracellular matrix degradation, cell proliferation, migration, differentiation, and apoptosis, and are therefore a prime target for the suppression of tumor metastasis. This research involves the study of the fragment antigen binding (Fab) at the allosteric site of MT1-MMP. With virtual screening, the goal is to test for small compounds that can mimic the specific antibody for that site and consequently be developed as a more functional inhibitor of that MMP. After screening, the finalized list of possible compounds will be tested in vitro for more accurate results.

Project Mentor: Professor Menachem Shoham, Department of Biochemistry
Faculty Sponsor: Professor Susan Burden-Gulley, Department of Biology

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Analysis of Determinants Influencing Schistosomiasis Transmission in Coastal Kenyan Villages

Kristin Garr, Department of Anthropology, Center for Global Health and Disease

Schistosomiasis remains a concern in international health due to its categorization as a neglected tropical disease. Symptomology ranges from apparent rashes of the skin, fever, and chills, to anemia, malnutrition, and bloody urine as the body’s physiological reaction to the helminthic parasitic eggs. *Schistosoma haematobium* (*S. haematobium*) is the primary flatworm found in Kenya, and relies on paratenic snail hosts as the vector for transmission. In depth analysis of proximity to bodies of water, socio-economic status, and sanitation and hygiene will serve to suggest correlation between infection rates. This study aims to understand the social and ecological determinants affecting parasitic transmission, specifically of Schistosomiasis, on the study cohort in eight coastal Kenyan villages.

Principle Investigator: Charles H. King, M.D., Center for Global Health and Disease
**The schema of the self: narrative tendencies of cognition and how they relate to the construction of identity**

Kimberly Grogan, Cognitive Science

A self is an abstract entity every human is seemingly naturally endowed with, though how this cognitive phenomenon is developed is still debated. Daniel Dennett proffered the theory that a self is a kind of center of narrative gravity. A self is similar to a center of gravity in that it allows for a kind of cognitive center around which to organize one’s experiences, but is not something tangible or real—it is a story that the mind unconsciously creates in order to lend order and cohesion to our existence (1992). I propose in this project that the phenomenon of creating a self is not only narrative in the literal sense as Dennett asserts, but also a larger scale iteration of the narrative tendencies of cognition in general in which bottom-up processing is inherently influenced by top-down processing in order to create structure and cohesion. I examine the different ways in which perceptual experiences are constructed (Shimojo, 2001; McLeod, 2012), memories are constructed (Shaeter, 2003; Conway, 2001), how patterns and similarities across differing domains are constructed through the invocation of image schemas and conceptual metaphors (Mandler, 1984; Lakoff, 1999; Oakley, 2010), and the ways in which we construct our identities through stories and interaction with others (Nurius, 1993; Reese, 2002). Human cognition functions with the objective to catalyze ease of interaction with reality while streamlining and/or minimizing cognitive labor and does so at a micro-level in common functioning and at a macro-level with regards to the creation of an identity.

*Advisor: Professor Vera Tobin, Department of Cognitive Science*

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**Nursing Consultation with Biomedical Engineering to Design an Object Presence Device for the Blind**

Sara Gulasey, Department of Nursing, Teresa Hibbard, Department of Nursing

The design process for medical devices is most successful when there is input from a multidisciplinary team. With input from different disciplines, there is valuable information gained into how the device can be best used in the clinical setting allowing ideas to grow and become more applicable for the population the group is trying to serve. Senior nursing capstone students and senior biomedical engineering students worked collaboratively to design an object presence system for the blind. Through consulting sessions, nursing worked with engineering to focus the design on a specific population, and identify needs of that population. The initial idea revolved around an object sensing vest. Through the use of interdisciplinary collaboration, the group was able to exchange ideas and create a more useful system. The system that was decided upon by the team is an attachment with a sensor to a pair of eyeglasses to detect objects in front of or to the sides of a patient in a wheelchair. The nursing and engineering students will continue to explore options and exchange ideas throughout the remainder of the semester, building on the immense progress that has already been made.

*Project Mentors: Dr. Colin Drummond, Department of Biomedical Engineering, Professor Jesse Honsky, Department of Nursing*
The Effects of Resettlement on Child Refugees

Emma Haas, Departments of Psychology and Spanish

For this capstone, I completed both a literature review and a weekly internship at Catholic Charities, the largest resettlement office in Northeast Ohio, in Migration and Refugee Services. I focused on the impact of refugee resettlement on the mental health and development of child refugees. According to the United Nations research on refugee populations, children make up approximately 40 percent of the world’s refugees. I examined existing research and used my experience at Catholic Charities to inform my research. To begin, I utilized my Psychology major to look at how being uprooted from a home country impacts child development and mental health. I compared “normal” child development patterns with refugee children and identified the core stressors that may contribute to a decline in mental well-being. Next, I researched the role of education and formal schooling to better understand the barriers faced by child refugees and the process of forming self-identities. Lastly, I explored the role that refugee resettlement agencies play in the resettlement process to help integrate child refugees and their families. The mission of Catholic Charities, the resettlement agency I interned for, is to build upon the courage and strength of newcomers and to empower them to achieve self-sufficiency and independence. As an intern, I worked each week in different areas of refugee resettlement. Some of my duties included attending job interviews, writing resumes, helping in ESL classes, and creating curriculum for a single mothers group. This firsthand experience complemented my research and increased my understanding of refugee issues.

Project Mentor: Elizabeth Banks, Director of the Center for Civic Engagement and Learning

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Haltere Movement and Function during Dipteran Walking

Joshua Hall, Department of Biology; Dane McLaughlin, Department of Biology; Shwetha Mureli, Department of Biology; Nicole Arnold, Department of Biology; and Jessica Fox, Department of Biology

The hind wings of species in the order Diptera have evolved into reduced structures called halteres. Unlike wings, halteres are not used to produce lift for flight, but are used solely for collecting mechanosensory information. Understanding how flies use mechanosensory information collected by halteres in flight has been a point of emphasis in the field of neurobiology; however, little is known about the role of halteres during walking. In our study, high-speed video was used to capture haltere movements of 20 Dipteran families. Flies within the suborder Nemotocera, which are the least evolutionarily advanced, exhibited a high level of control over haltere motion. The presence and amplitude of oscillations in Nemotocera was variable. The ability to oscillate a single haltere while the other remained at rest was also observed. Most other fly families exhibited no haltere movement while walking. However, oscillations were observed in two additional cohorts within the phylogeny. Flies in the subsection Calyptratae were observed oscillating their halteres at high amplitude and a rate similar to their wing beat frequency. Calyptratae oscillations begin as walking initiated and taper to rest as soon as the fly halts. Additionally, flies within the subfamily Tephritoidea were observed performing slow oscillations, which were not synchronized with walking. An additional observation made was that halteres transitioned between in and out of phase during the duration of a walking period. In the future we will explore how the information collected by halteres may assist flies during walking.

Project Mentor: Dr. Jessica Fox, Department of Biology
Effect of Sustained Application of Agricultural Lime on Solanum lycopersicum and Cucumis sativus

Rebecca Haluska, Department of Biology, Systems Biology; Christopher Bond, University Farm; Ana Locci, Ph.D., University Farm

Minimizing soil inputs without negatively impacting yield is a major factor in sustainable farming. To this end, it is important to evaluate fertilizing practices to determine both the benefits and drawbacks of certain soil treatments. This study aims to evaluate the health of two species of plants grown with four different soil treatments plus control with an aim to evaluate growth under high-pH and high-magnesium conditions. This models those found in fields treated with a large amount of dolomitic limestone. This was done to analyze possible long-term drawbacks associated with liming soil, a process typically undertaken annually throughout the state; several hundred thousand tons of domolitic limestone are purchased yearly for this purpose in Ohio. While research is still ongoing, both species have so far tolerated the treatments, though there is an apparent correlation in lycopersicum between the high-pH treatment and chlorosis (a symptom of nutrient deficiency). The yield at high pH compared to the yield at unmodified pH will indicate whether sustained application of limestone is detrimental to crop yield, and aid in the determination of a possible threshold at which overliming becomes a concern.

Project Mentor: Christopher Bond, University Farm

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Lessons in Personal Health at National Youth Sports Camp

Shelby Hamilton, School of Nursing; Katie Holland, School of Nursing; Jasmine Johnson, School of Nursing; Tristan Weber, School of Nursing; Vanessa Doho, School of Nursing

The National Youth Sports Program was a 6-week summer camp held on the Case Western Reserve University Campus for Cleveland area youth, ages 10-16. The program offers basketball, softball, soccer, swimming, track, and educational classes, including law, art and mathematics. Integrated into this program were five 50-minute personal health lessons that were developed and implemented with the objective of identifying and decreasing gaps in the youth’s knowledge about personal health behaviors. The topics included first aid, immunizations, active health, general well-being and hygiene. Pre and post test scores about the campers’ personal health knowledge were recorded and analyzed. The results suggested that the majority of the youth showed overall improvement by at least two points post-intervention; scores increased from an average score of two points to an average of four points. Despite these positive results, the researchers recognize that it is not enough to simply inform youth of healthy lifestyle choices. A follow-up intervention with nursing students at the 2015 camp that examines long-term learning and behavioral change are recommended.

Project Mentor: Dr. Faye Gary, School of Nursing
Assessing and Improving Heart Failure Competency of Home Care Nurses

David Hess, School of Nursing; Grace Hsu, School of Nursing

About 5.1 million people in the United States suffer from heart failure (HF), with over 670,000 individuals being newly diagnosed every year. Due to the complex nature of HF, patient self-management is essential in reducing or avoiding readmission. This study was designed to assess nurses’ knowledge of HF. Twenty-two registered nurses and licensed practical nurses, employed in the home based unit of the Louis Stokes VA Medical Center, took part in a one hour seminar on Heart Failure. The seminar included content on pathophysiology, signs and symptoms of exacerbation, and pharmacological and non-pharmacological interventions related to Heart Failure. Nurses’ knowledge of HF was assessed before and after the training session. A 10-item multiple choice format was used for the pre and posttests. The pretest results showed an average score of 61.8% correct among the nurses. For the post test, the average score was 82.0%. Nurses scored significantly higher on the test after the educational intervention. The results demonstrated that the presentation was effective in increasing heart failure knowledge among the nursing staff. It was beyond the scope of this study to assess whether or not increasing nurses’ knowledge and competency levels would affect the patient’s self-management of HF. In that regard, it is recommended that further research be done on a longer term scale to determine if the nursing staff retains HF knowledge and translates it into actual care of patients.

Project Mentor: Dr. Cheryl Killion, PhD, RN, FAAN, Frances Payne Bolton School of Nursing

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Diet Preferences of Green Frog Tadpoles, With and Without Competitive Stressors

Laura Hill, Department of Biology; Dr. Michael Benard, Department of Biology

Both the scientific community and general public have long considered tadpoles to be herbivores. However, this assumption has recently been reconsidered. Tadpole diet preferences are still widely unknown, and have been infrequently studied. As amphibian species continue to decline globally, it is important to consider their role in ecosystems to better predict the future of freshwater communities. In this study we examined diet preferences of green frog tadpoles (Rana clamitans). Our first experiment tested if tadpoles preferred to feed on aquatic invertebrates or algae. This experiment contained six treatments: 1) tadpoles with insects, 2) tadpoles with algae pellets, 3) tadpoles with insects and algae pellets, 4) insects but no tadpoles, 5) algae pellets but no tadpoles, and 6) insects and algae pellets but no tadpoles. The no-tadpole treatments served as controls to determine the quantity of pellets that disintegrated on their own, how frequently insects preyed on one another, and whether or not insects consumed part of the pellets. Our second experiment tested if tadpole diet preferences changed when they encountered competitors. Tadpoles are known to compete with one another under certain conditions, so competitor tadpoles may influence the amount and type of food focal tadpoles consume. In this experiment, tadpoles were presented with both insects and pellets, and were placed in a divided tank with either another tadpole or no competitor. We predicted that tadpoles would eat fewer insects when competitors were present. By examining tadpole diet preferences under different conditions, we can better anticipate changes in freshwater communities.

Project Mentor: Dr. Michael Benard, Department of Biology
**Bed Fall Prevention**

Kishan Desai, Biomedical Engineering; Martin Gitomer, Biomedical Engineering; Sara Hook, Nursing; Xuejun Pan, Biomedical Engineering; Anton Spencer, Biomedical Engineering; Amber Strickland, Nursing;

Falls are prevalent in older adults residing in nursing homes. The majority of elderly adults experience muscle weakness, vision and hearing difficulties, are prescribed various medications and have some degree of mental impairment, all of which can increase the risk of a fall. Nursing home residents commonly fall while attempting to exit the bed. There have been numerous assessments, devices and interventions developed in order to prevent falls in nursing homes. Fall rates have been reduced with the assistance of these preventative measures, but falls are still too common. In many cases, residents that experience falls endure injuries, declines in physical function, reductions in quality of life, and sometimes death. Falls can take a physical, emotional, and financial toll on individuals and their families. To address this critical health care issue, we collaborated with a group of Biomedical Engineering (BME) students to design a device to prevent elderly residents from falling out of bed. Throughout the design process we provided the BME students with clinical support based on research, our knowledge, and experiences with bed falls. Through numerous consultations, we offered a clinical perspective to the BME students’ designs. In addition, we shadowed at a local nursing home in order to gather more accurate information about nursing homes, bed falls, and current falls prevention strategies. This encounter greatly changed our perspective of this project. Based on our observations at the nursing home, we decided to create a bed fall response system used in combination with a toileting device.

*Project Mentors: Professor Colin Drummond, Frances Payne Bolton School of Nursing; Professor Jesse Honsky, Frances Payne Bolton School of Nursing*

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**Non-Invasive Parkinson’s Tremor Suppression through Transcranial Alternating Current Stimulation**

Laura Huber, Frances Payne Bolton School of Nursing; Christina Rozman, Frances Payne Bolton School of Nursing, Mary Clare Flaherty, Department of Biomedical Engineering; Gabriel McLeod, Department of Biomedical Engineering; Sherry Huang, Department of Biomedical Engineering; Chiraag Lathia, Department of Biomedical Engineering; Barry Goldberg, Department of Biomedical Engineering; Evan Ostrowski, Department of Biomedical Engineering

Parkinson’s Disease is a neurodegenerative disease caused by low levels of the neurotransmitter dopamine and seriously affects motor function. Each year, about 50,000-60,000 new cases are diagnosed (National Parkinson Foundation Website). Thankfully, there is hope for those living with this terrible disease due to new advances in medical technology. Many new techniques and procedures have been developed to treat and suppress one of its most devastating side effects, tremors. At Case Western Reserve University, two nursing students partner with a group second-year engineering students as consultants, to help them design a less invasive method of suppressing tremors. The goal is to create an external and cost effective alternative to Deep Brain Stimulation (DBS). While DBS is a gold-standard treatment for Parkinson’s, it is also extremely expensive and invasive. The team’s method is Transcranial Alternating Current Stimulation, which would involve placing an electrode on the external surface of the scalp and radiating a current into the motor cortex to lessen the tremor The goals of the nurse consultants are to use clinical experience to a) help the engineering students find a feasible material to create the electrodes, b) help them understand the realistic clinical relevance of their design, and c) identify any concerns with patient reception and understanding of the device.

*Project Mentors: Professor Colin Drummond, Frances Payne Bolton School of Nursing; Professor Jesse Honsky, Frances Payne Bolton School of Nursing*
Virulence Factor Control in Antibiotic Resistant *Staphylococcus aureus*

Elsa Imbimbo, Department of Biology; David Kuo, Department of Biochemistry; and Menachem Shoham, Department of Biochemistry

Methicillin Resistant *Staphylococcus aureus* (MRSA) is a major cause for concern in the medical field because of the declining number of antibiotics that effectively treat MRSA infections. This problem calls for treatments that avoid simply killing bacteria, as these create selective pressure for more resistant strains. Antivirulence compounds offer an alternative or adjuvant to antibiotic therapy. Instead of killing bacteria, biaryl-hydroxyketone compounds inhibit the production of virulence factors in MRSA. Lead compounds F1, F12, and F19 have been tested in vitro and in vivo against the USA300 strain of MRSA where efficacy was shown at a concentration of 1ug/mL. Due to the remarkable performance of the lead compounds against the USA300 strain, the present study began further testing to determine if these compounds were equally effective against other strains of resistant *S. aureus*, namely, Vancomycin Resistant *Staphylococcus aureus* (VRSA). Preliminary data show that VRSA exhibits a lower level of hemolysis than the USA300 strain and testing VRSA required modification of the original rabbit’s blood hemolysis assay protocol. This finding demonstrates that there is some variation in bacterial toxin production, and underscores the importance of testing these compounds on each strain. More data from hemolysis assays will be collected to assess the efficacy of the lead compounds on VRSA and other *S. aureus* bacteria.

*Project Mentor: Professor Menachem Shoham, Department of Biochemistry*
*Faculty Sponsor: Professor Michael Benard, Department of Biology*

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Directing Neuroplasticity to Improve Rehabilitative Outcomes of the Upper Limb in Incomplete Quadriplegia

Daniel Janini\(^1\,^2\); Kelsey Potter\(^1\); Nicole Varnerin\(^1\); David A Cunningham\(^1\); Ela Plow\(^1\)

1: Biomedical Engineering Department, Lerner Research Institute, Cleveland Clinic
2: Biology Department, Case Western Reserve University

After incomplete spinal cord injury (iSCI), cortical maps of stronger muscles overtake maps of weaker muscles. This pilot study assessed whether rehabilitation causes adaptive re-mapping and recruitment of spared corticospinal tracts, and whether stimulation of motor cortices using transcranial direct current stimulation (tDCS) enhances these changes. Subjects (n=5) were randomly assigned to receive rehabilitation of upper limb muscles with either tDCS or sham stimulation for 2 weeks. Measurements of function and cortical organization were taken before and after therapy. Upper Extremity Motor Score and Action Research Arm Test were used to test motor function. Transcranial magnetic stimulation was delivered to scalp sites as muscle activity was measured with electromyography in order to map motor cortical representations of strong and weak muscles. Upper extremity motor strength, hand grip function, and hand grasp function improved in both groups, but the group receiving tDCS showed greater improvement. Before therapy, maps for weaker muscles were smaller (p<0.01) and less excitable (p<0.01) than maps for stronger muscles. However, after therapy, the opposite results were seen: maps of weaker muscles were larger (p=0.07) and more excitable (p=0.046) than maps of strong muscles. These changes were larger in the group receiving tDCS. Our results indicate that current rehabilitation practices improve function through an enlargement of weak muscle map size and recruitment of spared corticospinal tracts. Moreover, pairing rehabilitation with tDCS augments these changes.

*Project Mentor: Dr. Roy Ritzmann, Department of Biology*
Oxidative Damage of DNA and RNA Nucleotides by the Folic Acid Derivative, 6-Carboxypterin, Upon UVA Irradiation

Hannah Jenkins, Department of Chemistry; Kelsie Leary, Department of Chemistry

Preliminary studies by the Crespo group have suggested that 6-carboxypterin (CPT) is a participant in DNA damage upon absorption of ultraviolet-A (UVA) radiation. To validate this finding, we have proposed a kinetic mechanism wherein UVA absorption by CPT leads to the formation of highly reactive singlet oxygen species. According to our proposed mechanism, by keeping the initial concentration of CPT constant in steady state spectroscopic investigations, the rate of CPT photo-oxidation should decrease as the concentration of DNA in the solution is increased. A slower rate of CPT photo-oxidation in this type of study would indicate that DNA is competing with CPT to react with singlet oxygen in solution. It is important to highlight that DNA and its nucleotide components do not absorb UVA radiation; therefore, irradiation of DNA-CPT solutions with UVA only results in excited CPT. Through systematic concentration dependence studies, we have indeed observed slowed rates of CPT photo-oxidation in the presence of increasing concentrations of the DNA and RNA nucleotide monomers GMP, TMP, and UMP. Our results provide strong support to the idea that oxidative damage to DNA occurs when CPT absorbs UVA radiation in the presence of molecular oxygen.

Project Mentor: Carlos E. Crespo-Hernández, Department of Chemistry

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An Iterative Seeded Watershed for 3D Nuclei Segmentation of the Drosophila Fly

Dana Jeter, Department of Mathematics; Thomas Atta-Fosu, Department of Mathematics

This research examines images of Drosophila fruit fly cells in order to provide code for efficient and quick segmentation and classification. These images of cells were provided by collaborators in the biology department, Claudia Mizutani and Rui Neves. As the fly embryo grows older, segmentation becomes more and more difficult. A combination of mathematical methods were used to attempt to segment and classify the images of cells. The objective of the project is efficient, robust, and automated program to segment three dimensional and non-uniform images of cell. The resulting program would categorize and provide data for the biology researchers of CWRU. The poster will examine several different methods used on the data, including seed finding using the Fourier transform, segmentation using watershed, and denoising in various ways.

Project Mentor: Professor Weihong Guo, Department of Mathematics
Detecting Health Illiteracy in Cleveland’s Underserved Population

Devon Kaufman, Bachelors of Science in Nursing

Health illiteracy is an issue that permeates through all classes, ages, and races. It can lead to lower health outcomes, decreased utilization of preventative healthcare services, and increased hospitalization rates. For areas like Cleveland, where functional illiteracy rates (the inability to read at a level necessary for daily living) are high, this risk increases. Due to the social stigma attached to illiteracy, reading problems largely go undetected. The goal of this project was to implement a tool in MetroHealth’s Family Medicine Clinic that could be used to flag patients at risk for health illiteracy. The Rapid Estimate of Adult Literacy in Medicine Revised tool (REALM-R) is a screening instrument used to assess an adult patient’s risk for health illiteracy. The REALM-R was administered at the beginning of a patient’s healthcare visit and a score of six or less flagged the patient for poor literacy skills. Following the patients appointment, discharge teaching was provided and an interview was conducted to determine if their REALM-R score correlated with their ability to comprehend their after visit summary (AVS) instructions. Overall, patients had more difficulty navigating the AVS, than explaining the information they had received verbally. Nine out of twenty-five patients interviewed were flagged as health illiterate, which included both the youngest and oldest patients, 22 years to 75 years, respectively. The next step will be to implement the REALM-R tool clinic wide. The language and format of the AVS would also need to be changed to reflect the needs of the population.

Project Mentor: Carol Sams, MSN, CNP, Metrohealth System
Faculty Advisor: Mandisa Molton, MN, MBA, RN, Frances Payne Bolton School of Nursing

Self Perception and Avoidance in a PTSD Treatment Sample of Trauma Survivors With and Without Childhood Abuse Histories

Katie Kershenbaum, Department of Psychology

Posttraumatic stress disorder (PTSD) is a chronic and impairing psychological disorder that develops following exposure to trauma (e.g., sexual assault, car accident). The type of trauma and the age at which the individual experienced the trauma can play significant roles in the severity of one’s PTSD symptomatology. Experiencing a traumatic event as a child, rather than an adult, may cause different outcomes due to the level of maturity and understanding, brain development, and amount of time passed before seeking treatment. In a sample of adults receiving treatment for PTSD, this study examines potential differences between adults who experienced trauma in childhood versus in adulthood. Participants received 10 weeks of prolonged exposure therapy (PE), an efficacious PTSD treatment, and the content of their sessions was videotaped and coded by trained raters. Using the Change and Growth Experiences Scale, CHANGE (Hayes et al., 2007), two variables were examined: self-perception and avoidance. It was hypothesized that individuals with childhood trauma would report more avoidance in life and have a greater negative self-perception compared to individuals who experienced adulthood trauma (Bagley & Ramsay, 1985; Briere, 1984). The age at which one experiences a trauma and the trauma type is critical to the recovery process and the way treatment ensues. Research has suggested implementing treatment styles specific for childhood trauma PTSD (Briere, 2002). This study may help further the understanding of how age can greatly affect the trauma experience and coping skills as well as provide the opportunity for advancing treatment techniques particularly for victims of childhood abuse.

Project Mentor: Dr. Norah Feeny, Department of Psychological Sciences
Implementing the Green Dot Program to Decrease Domestic Violence in Kodiak, Alaska

Kinsey Kolega, Francis Payne Bolton School of Nursing

Domestic Violence is an insidious and often ill-addressed issue in America. Alaska in particular, with its isolated, rural communities, has high rates of this type of violence which includes physical, emotional, and sexual abuse against a family member or romantic partner. This research focused on the implementation of the Green Dot program- a nationally recognized and evidence-based program targeted towards community intervention in order to prevent violence. Green Dot training teaches community members to recognize situations that could potentially lead to violence and provides different methods of intervention that can be adapted to fit almost any scenario. Since many people face barriers to intervening, such as fear of embarrassment, or being perceived as “nosy”, the program also invites discussion into how those can be overcome. I studied the efficacy of the training in our pilot group; members of Kodiak High School’s Gay Straight Alliance. I chose this group because I felt teens were the most at-risk group in the community, and because the Gay Straight Alliance had been an active part in other domestic violence prevention programs in the past.

Project Mentor: Elsa Dehart, RN Kodiak Public Health Center
Faculty Advisor: Professor Rita Sfiligoj, Department of Nursing

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CSF1R activation by its ligands, IL-34 and M-CSF, plays an important role in microglial function

Nathan Kong1, Mark Stauffer2, Julia Kofler, M.D.2
Case Western Reserve University, Department of Biochemistry and Cognitive Science1, Department of Neuropathology, University of Pittsburgh School of Medicine and the University of Pittsburgh Medical Center

Colony stimulating factor-1 receptor (CSF1R) is a trans-membrane tyrosine kinase on the cell surface of myeloid lineage cells, including macrophages and microglia, and is a key regulator in the differentiation and proliferation of these cells. Of its two endogenous ligands, interleukin-34 (IL-34) and macrophage colony stimulating factor (M-CSF), IL-34 is thought to be functionally more important in the brain and predominantly produced by neurons under physiological conditions. Recently, mutations within the tyrosine kinase domain of CSF1R have been linked to the white-matter disease, hereditary diffuse leukoencephalopathy with spheroids (HDLS). The first goal of the present study was to determine if astrocytes represent a secondary source of CSF1R ligand in the brain. Using qPCR, we found that fetal derived human astrocytes produce IL-34 under baseline conditions with increased expression following stimulation with IL-1β (2.16±0.76 fold) and tumor necrosis factor α (13.75±9.7 fold), suggesting that IL-34 release by activated astrocytes may be functionally important under pathologic conditions. Using macrophages as a model system for microglia, our second goal was to determine if macrophage phenotype is different between M-CSF or IL-34 primed macrophages. No significant gene expression differences were found in resting macrophages or following classical or alternative activation. Lastly, we wanted to assess microglial phenotype in HDLS tissue. Compared to normal brain and vascular leukoencephalopathy cases, white matter in HDLS showed decreased CSF1R gene expression, but a compensatory increase in M-CSF and IL-34 expression. Altered gene expression levels of several cytokines and cell surface proteins were also observed. The results of this study show that the interaction of CSF1R with its ligands IL-34 and M-CSF plays a vital role in microglial functioning in the brain.

Project Mentor: Julia Kofler, M.D., Department of Neuropathology, University of Pittsburgh School of Medicine and the University of Pittsburgh Medical Center
Regional Differences in cMyBP-C Expression and Phosphorylation Levels in Mouse Hearts

Hyerin Kwak, Department of Physiology and Biophysics (Major: Economics/Pre-Medicine)

Cardiac myosin binding protein-C (cMyBP-C) is a thick filament protein found only in cardiac muscle cells that is crucial in regulating the actomyosin cross-bridge formation through the phosphorylation of its M-domain. The sites of phosphorylation primarily studied within the M-domain are the Ser273, Ser282, and Ser302 residues. Previous research has shown that the phosphorylation of cMyBP-C is decreased in heart failure, even in human hearts. Therefore, it is important to know the pattern of this protein’s expression through regions of the heart and the differences in phosphorylation of the different regions and see if these regional patterns are somehow altered from a normal, healthy state to a diseased state. This research is concerned with studying whether there are regional differences in the level of cMyBP-C in mouse hearts and whether there are regional differences in the level of phosphorylation of the three Serine residues of the M-domain of cMyBP-C. The base, apex, and mid-left ventricle (LV) of WT mouse hearts were directly compared. The epicardium and endocardium of WT mouse hearts were directly compared as well. Future experiments for this research will focus on looking at the regional patterns of cMyBP-C expression and phosphorylation levels using a disease model induced by isoproterenol, a beta-adrenergic agonist, and phenylephrine, an alpha-adrenergic agonist, implanted in a pump in mice for 2 weeks.

Faculty Sponsor: Dr. Julian Stelzer, Department of Physiology and Biophysics
Graduate Student Mentor: Ken Gresham, Department of Physiology and Biophysics

The Detection of Early Stage Prostate Cancer with Protein Biomarker AMACR

Freda Li, Department of Chemical & Biomolecular Engineering; Dr. C.C Liu, Department of Chemical & Biomolecular Engineering, Laurie Dudik, Electronics Design Center; and Leo Kung, Department of Chemical & Biomolecular Engineering

Prostate cancer is the second most common type of cancer among men, but it can often be treated successfully if detected early. Prostate-specific antigen (PSA) blood testing is the current method of detection for prostate cancers. PSA is normally found in semen, but small amounts can be found in blood. Healthy men have levels under 4 nanograms per milliliter of prostate specific antigen in blood (ng/mL), however when prostate cancer develops, PSA levels usually increases above 4. Thus, PSA is limited in its ability to accurately detect prostate cancer at early stages. Alpha-methylacyl-CoA racemase (AMACR) is a promising biomarker or the detection of prostate cancer assessment. AMACR has demonstrated to be able to distinguish cancer from benign prostate cells with high sensitivity and specificity. However, previous research on AMACR has been done only in tissue examination, such as biopsy, which is a complicated and expensive process.

This research centers around the detection of AMACR in fluids such as blood using a simple biosensor. AMACR catalyzes the chemical reaction:

\[(2R)-2\text{-methyl-acyl-CoA} \rightleftharpoons (2S)-2\text{-methylacyl-CoA}\]

This reaction leads to the release of hydrogen peroxide, which can be measured by the biosensor in this research. Antibodies to AMACR are used in immunohistochemistry to demonstrate prostate carcinoma, since the enzyme is greatly over-expressed in this type of tumor.

Project Mentor: Professor C.C. Liu, Department of Chemical and Biomolecular Engineering
Mindfulness and Health: A Review

Kathy L. Lin, Department of Psychological Sciences; Lisa Liang, Department of Nutrition

Mindfulness, a state of active attention focusing on the present, consists of observing one’s thoughts and feelings without judgment. Maintaining a moment-by-moment awareness of one’s surroundings, mindfulness also involves acceptance where there is no right or wrong. Studies have shown that the practice of mindfulness has numerous physical and mental health benefits to individuals of various age, racial and ethnic groups, health conditions and occupations. Mindful individuals have improved sleep, immune activity, self-esteem, and quality of life, learn adaptive coping skills to handle addictive behaviors, food cravings, and substance use, experience less stress, rumination, pain sensitivity, negative affect, anxiety, and unforgiving emotions. This study conducts a thorough literature review on the health benefits of mindfulness and reports findings in the hopes of spreading intellectual information concerning mindfulness. Furthermore, through such a review of literature, we give suggestions on how future directions in this field of research can proceed. For instance, future studies should examine the long-term effects of mindfulness on health and determine how long one has to practice mindfulness to in order to produce positive changes.

Project Mentor: Christopher Lyddy, Organizational Behavior
Faculty Sponsor: Professor John P. Stephens, Organizational Behavior

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Developing a Screening Platform for Small-Molecule Inhibitors which Disrupt the Interaction between Monocarboxylate Transporters and Cluster of Differentiation-147 (CD147, Basigin) in Glioblastoma

Jessica Lin, Department of Biology

Locally reduced oxygen levels are a feature of many malignancies, particularly those which grow rapidly. One cancer in which hypoxia-induced necrosis and neovascularization is central to pathological diagnosis is glioblastoma the most common and lethal malignant brain tumor. Hypoxic regions are frequent in glioblastoma, and increased levels of tumor hypoxia have been associated with worse clinical outcomes. The focus of our current study is on the identification of small molecule inhibitors capable of disrupting protein-protein interactions between the hypoxia induced monocarboxylate transporter -4 (MCT4) and its chaperone cluster of differentiation -147 (CD147). We screened a collection of 774 compounds using split luciferase reporter assay. We identified a handful of small molecules capable of reducing reporter activity by at least 40%. Following the initial screen, we sought to determine the effects of these lead compounds on tumor cell proliferation by performing standard growth assays using the MTS reagent (Promega). We are hoping to study the cytotoxic effects these agents have against GBM neurosphere cultures in a dose dependent fashion. We hope that these studies will lay the foundation for direct translation into preclinical and clinical therapeutic trials in the near future.

Project Mentors: Dillon Voss, Department of Neurosurgery and Dr. Raffaella Spina, Department of Neurosurgery
Faculty Sponsor: Dr. Eli Bar, Department of Neurosurgery
The Relationship Between How “Out” One Is and Parental Support, Self-Esteem, and Community LGBQ Presence

Kathy L. Lin, Department of Psychological Sciences; Jennifer Birnkrant, Department of Psychological Sciences; Dr. Amy Przeworski, Department of Psychological Sciences

The process of coming out, in which an individual reveals his or her lesbian, gay, bisexual, or queer (LGBQ) orientation to others, is a complex one. A positive step towards being gay, lesbian, bisexual, or queer, coming out can be rewarding as it plays a key role in the development of a healthy and integrated sexual identity. Moreover, disclosure allows one to embody one’s sense of self and live an honest life (McLean, 2007). Jordan and Deluty (1998) found that lesbians who disclosed their sexual orientation more widely experienced increased positive emotion, less anxiety, and greater self-esteem. Simultaneously, the coming out process can be difficult and challenging as LGBQ individuals face risks such as rejection, victimization, and stigmatization from disparate social contexts including family, peers, religious community, and the workplace (Mohr & Fassinger, 2003). Although the sexual orientation of LGBQ individuals is not a matter of choice, LGBQ individuals do make a decision concerning whether or not to disclose their orientation to others. In making such a paramount decision, various factors are taken into consideration (Schope, 2002). Thus, LGBQ individuals are simultaneously “in” and “out” of the closet in certain circumstances as their level of disclosure may change depending on the type of audience and environmental setting they encounter (McLean, 2007). This project specifically examines the relationship between how “out” one is and parental support, self-esteem, and the amount of LGBQ presence in one’s community based on individuals’ responses to an online questionnaire looking at such variables.

Project Mentor: Professor Amy Przeworski, Department of Psychological Sciences

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The Effects of Copper and Aluminum on the Melting Temperature and Crystallization Temperature of Polymer Implants as Determined through DSC

Ben Lister, Department of Macro Molecular Science and Engineering, Katherine Rodgers, Department of Macromolecular Science and Engineering, Ragul Yuvaraj, Department of Macromolecular Science and Engineering, Xi Wang, Department of Macromolecular Science and Engineering, and Alan Riga, Department of Macromolecular Science and Engineering

Thermal properties of medical implantable polymers may vary depending on the metal the DSC pan is made of. Running multiple polymers in aluminum and copper pans using DSC and recording the melting and crystallization temperatures yields sufficient data to calculate the effect of pan type on said temperatures. A further understanding of how implantable polymers interact with various metals could yield better prosthetic implantations.

Project Mentor: Alan Riga, Department of Macromolecular Science and Engineering
Optical Inhibition for Rapid and Reversible Block of Axonal Sub-Populations

Emilie H. Lothet, Yves T. Wang, Niloy Bhadra, Kevin Kilgore, E. Duco Jansen, Hillel J. Chiel, Michael W. Jenkins

Department of Biology, Case Western Reserve University, Cleveland, OH
Department of Pediatrics, Case Western Reserve University, Cleveland, OH
Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH
Department of Orthopedics, MetroHealth Medical Center, Cleveland, OH
Department of Biomedical Engineering, Vanderbilt University, Nashville, TN
Department of Neurosciences, Case Western Reserve University, Cleveland, OH

Treatments for chronic pain using drugs or surgery lack real-time control. Kilohertz high frequency alternating current to block neurons is a new alternative, and we previously demonstrated that the significant onset response could be abolished with optical inhibition. Here, we show that optical inhibition alone can block all or subpopulations of unmyelinated axons.

Suction electrodes were placed for stimulation and recording on each end of an unmyelinated pleural-abdominal nerve from *Aplysia californica*, with a 600-µm optical fiber in between, delivering 200 Hz 200-µs pulses. Block was repeatably established with no detectable change in nerve function afterwards. At threshold for optical inhibition, small slow fibers were blocked more quickly than large fast fibers, after which all fibers were blocked. Small slow fibers could also be stably blocked without affecting large fast fibers. Additionally, at 4% duty cycle, block threshold was not significantly different between 25 and 800 Hz. At 2 Hz, the optical inhibition threshold increased, and block could be established in approximately 30 ms. Furthermore, raising bath temperature reduced the power needed for optical inhibition. At higher bath temperatures, block could be induced without optical input. These results suggest that the mechanism of optical inhibition may be due to increases in temperature.

Optical inhibition provides rapid neural block and enables small slow fibers to be blocked first, contrary to the order produced by electrical block. Since sensory neurons are smaller than motor neurons, this may provide a treatment for chronic pain without affecting motor control.

Project Mentor: Dr. Hillel Chiel, Department of Biology, Biomedical Engineering, and Neuroscience; Dr. Michael Jenkins, Department of Pediatrics and Biomedical Engineering
Hyperthermia Sensitizes Glioblastoma Stem Cells to Radiation through Inhibition of AKT signaling

Tuopu (Jacob) Ma\textsuperscript{1,2,3}, Jianghong Man\textsuperscript{3}, Jocelyn Shoemake\textsuperscript{3}, Anthony Rizzo\textsuperscript{3}, Qiulian Wu\textsuperscript{3}, Jeremy Rich\textsuperscript{3}, Andrew Godley\textsuperscript{4}, Jennifer Yu\textsuperscript{3,4}

\textsuperscript{1}Case Western Reserve University Department of Biology; \textsuperscript{2}Case Western Reserve University Department of Chemistry; \textsuperscript{3}Cleveland Clinic Department of Stem Cell Biology and Regenerative Medicine; \textsuperscript{4}Cleveland Clinic Department of Radiation Oncology.

\textbf{Background} Glioblastoma (GBM) is a highly infiltrative and incurable primary brain tumor. Median patient survival is about 1 year despite aggressive surgery, chemotherapy, and radiotherapy. Previous studies have shown GBM to exhibit radioresistance, which may be attributed to a specific subpopulation of tumor cells, glioblastoma initiating cells (GSCs) that preferentially upregulate survival and invasion pathways in order to re-propagate tumors. Thermoradiotherapy is a modality that has been shown in a phase III GBM trial to improve patient survival. To determine mechanisms behind hyperthermic sensitization, we performed a human phospho-kinase array analysis and identified suppression of AKT activation with thermoradiotherapy. We hypothesized that hyperthermia sensitizes GSCs to radiation through inhibition of the PI3K-AKT pathway, a key pro-survival GBM pathway.

\textbf{Methods} Four conditions (control, hyperthermia, radiation, and hyperthermia with radiation) were examined \textit{in vitro} and \textit{in vivo}. We tested effects of hyperthermia and radiation on proliferation, apoptosis and survival \textit{in vitro} and \textit{in vivo} using xenograft models of GBM.

\textbf{Results} Analysis of relative cell numbers revealed thermoradiotherapy was more efficient (50\%) in killing GSCs and suppressing colony formation compared to radiation alone. Whereas AKT levels increased following irradiation, addition of hyperthermia abrogated AKT signaling to inhibit proliferation and promote apoptosis. Cell death was assessed through cell cycle analysis, TUNEL assay, and 53BP1 immunostaining. 53BP1 foci, an indication of DNA breaks, were persistently elevated after thermoradiotherapy and GSCs treated with thermoradiotherapy showed increased TUNEL staining and greater sub G1 populations compared to radiation alone. Kaplan-Meier analysis of intracranial xenograft models of GBM revealed that mice that underwent thermoradiotherapy had significantly improved survival compared to radiation alone, hyperthermia alone, or sham treated mice (p=0.0231).

\textbf{Conclusion} Thermoradiotherapy inhibits radiation-induced up-regulation of the PI3K-AKT survival pathway in GSCs. Hyperthermia improves the efficacy of radiotherapy towards GBM and translates into improved survival in a mouse model. These findings support the combined use of hyperthermia and radiation to maximize GBM treatment efficacy and improve patient care.

\textit{Project Mentor: Jennifer Yu, MD, PhD, Department of Radiation Oncology, Department of Stem Cell Biology and Regenerative Medicine}
Assessing the Role of the PSI Domain in Semaphorin3C in Glioblastoma Stem Cells

Tuopu (Jacob) Ma1,2, Chaomei Xiang3, Jennifer Yu3,4

1Case Western Reserve University Department of Biology; 2Case Western Reserve University Department of Chemistry; 3Cleveland Clinic Department of Stem Cell Biology and Regenerative Medicine; 4Cleveland Clinic Department of Radiation Oncology.

Glioblastoma (GBM) is a highly infiltrative and incurable primary brain tumor. Median patient survival is about 1 year despite aggressive surgery, chemotherapy, and radiotherapy. Previous studies have shown GBM to exhibit resistance towards chemoradiation, which may be attributed to a specific subpopulation, glioblastoma stem cells (GSCs), that preferentially upregulate survival and invasion pathways in order to re-propagate tumors. Clearly, there is an inherent need to find a way of targeting and killing GSCs.

Semaphorins encompass a family of membrane-bound and secreted proteins that bind to neuropilin and plexin receptors. Their interactions with Rac1, a GTPase that promotes cancer stem cell survival, stimulate cell migration and ultimately result in metastasis. Our data have shown that Semaphorin3C (Sema3C) is preferentially expressed in GSCs, with high protein levels correlating with poor survival in GBM patients. Our studies have also shown that Sema3C knockdown inhibits cell proliferation, induces apoptosis and inhibits Rac1 activity in GSCs. Finally, we have found that Sema3C expression in normal brain is absent to low, suggesting that anti-Sema3C therapy will have minimal impact on the normal brain.

TCGA data have shown that a somatic point mutation is found in high frequency in both GBM and colorectal cancers. This mutation of a polar arginine to a nonpolar tryptophan is found in the PSI domain of the Sema3C protein. We aim to identify the function of this domain and how it is affected by this mutation. We plan to construct a GSC line that constitutively expresses this mutation and subsequently assess GSC ability to proliferate, migrate, and self-renew. Because this mutation is found to be in high expression in GBM, we believe that this mutated domain promotes tumor maintenance and progression. Finally, we plan to generate, through use of the CRISPR/Cas-mediated genome engineering system, a Sema3C knockout mouse model for further experimentation.

Project Mentor: Jennifer Yu, MD, PhD, Department of Radiation Oncology, Department of Stem Cell Biology and Regenerative Medicine

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The Optomotor Response in a Variety of Fly Families

Dane McLoughlin, Department of Biology; Jessica Fox, Department of Biology; Shwetha Mureli; Department of Biology; Josh Hall, Department of Biology

The optomotor response is a mechanism found in flies to stabilize the course of their flight when it has been displaced. The purpose of this experiment is to test the optomotor response by observing the motion of a fly’s wings and halteres during tethered flight. The halteres are external gyroscopic organs that flies have in place of hind wings, and they are thought to provide body position information to the fly as it flies. Flies were tethered to pins so that their body position was not able to change, and they were placed in an arena with LED lights, which would simulate movement in their field of vision. High-speed cameras were used to capture the movement of the halteres and wings as they oscillated during tethered flight. These videos were digitized to observe any differences in the motion of the halteres and wings between the simulated movement and a stationary background. The phase relationships and angles of oscillation for both the wings and halteres were recorded for the stationary and moving backgrounds. This was done for flies across many families, so that we could see the differences in angles of oscillation and the optomotor response between the different families of flies. The results of this experiment will hopefully provide more evidence about the actual mechanism of the optomotor response, because we have tested whether the visual system can initiate the response or if it is solely based on changes in body position.

Project Mentor: Dr. Jessica Fox, Department of Biology
Comparison of Macronutrient Composition of Human Breast Milk Using Two Methods of Analysis

Stephanie Merlino, Department of Nutrition, Case Western Reserve University; Chris Wijers, Denison University; Sharon Groh-Wargo Ph.D. R.D., Department of Nutrition, Case Western Reserve University School of Medicine; Sumesh Parat M.D., Neonatology, MetroHealth Medical Center; Rajesh Pandey M.D., Neonatology, MetroHealth Medical Center

Human breast milk (HBM) is the preferred feeding for all infants but requires fortification to meet the nutritional needs of rapidly growing preterm infants. Standard fortification is based on estimates of macronutrient concentrations found in HBM. The nutrient density of HBM is known to vary widely within and between mothers’ milk supplies so the standard method of fortification poses the risk of under- or over-estimating nutrient intake. Individualized fortification strategies are being developed using human milk analyzers, which measure protein, fat, and lactose concentrations within a given milk sample. This study assesses the accuracy and precision of macronutrient measurements in HBM using the Calais Milk Analyzer (Metron Instruments, Solon, Ohio), a filter-based mid-infrared (MIR) analyzer by comparing its results to the “gold standard” reference chemistry. The ultimate goal is to have an FDA approved HBM analyzer that can be used in a clinical setting to improve fortification protocols that promote better nutrition in preterm infants within the NICU.

Project Mentor: Sharon Groh-Wargo Ph.D. R.D., Department of Nutrition, Case Western Reserve University School of Medicine

Urinary Nitric Oxide Metabolites among High-Altitude Adapted Populations

Lawrence Monocello¹, Allison Janocha², Kristin Ricci², Buddha Basnyat³, Maniraj Neupane⁴, Amha Gebremedhin⁵, Serpil Erzurum² and Cynthia Beall¹

¹Department of Anthropology, Case Western Reserve University, Cleveland, OH, USA 44106
²Department of Pathobiology, Cleveland Clinic Foundation, Cleveland, OH, USA 44195
³Travel and Mountain Medicine, Patan Academy of Health Science, Kathmandu, Nepal
⁴Mountain Medicine Society of Nepal, Kathmandu, Nepal
⁵Department of Internal Medicine, Faculty of Medicine, Addis Ababa University, Addis Ababa, Ethiopia

Hypoxia is a severe stress on high altitude populations. However, several human populations—Tibetan, Bolivian Aymara, Sherpa, Andean, Ethiopian Oromo, and Ethiopian Amhara—have been living successfully at high altitude for thousands (and tens of thousands among the Tibetans and Aymara) of years, suggesting the opportunity for evolutionary (genetic) adaptation. Nitric oxide, as a vasodilator, may play a role in adaptation to chronic hypobaric hypoxia by increasing blood flow—and therefore increasing oxygen delivery to tissues—to make up for hypoxia-induced low blood oxygen content. Previous research has shown that the concentration of urinary nitric oxide metabolites (NOx) in Tibetan high altitude natives (4200 meters) is high compared to a lowland U.S. population. We hypothesized that urinary NOx levels would be higher among indigenous high altitude populations as a measure of total NO, and measured NOx levels in urine samples from four native high altitude populations (Tibetan, Sherpa, Ethiopian Amhara, and Ethiopian Oromo), three lowland control populations (Cleveland, Ethiopian Amhara, and Ethiopian Oromo), and one population of recent upward migrants (Nepali). The data show that the three long-term high altitude populations express similar corrected urinary NOx levels, which are also higher than the low-altitude populations, supporting a hypothesis that elevated levels reflect time at altitude. Interestingly the more recent Ethiopian Oromo population expresses the same levels at high and low altitude, indicating that they do not adapt to high altitude by raising NOx. The Nepali population expressed extremely high values, probably due to diet and/or reversible acclimatization.

Project Mentors: Professor Cynthia Beall, Department of Anthropology and Dr. Serpil Erzurum, Department of Pathobiology, Cleveland Clinic Foundation.
Faculty Sponsor: Professor Cynthia Beall, Department of Anthropology.
Increasing Immunization Awareness in Fairbanks, Alaska

Alexandra Morris, Frances Payne Bolton School of Nursing

Nationwide, Alaska consistently has a low immunization rate. The 2013 National Immunization Survey reported that Alaska had the fifth lowest rate of immunization coverage for that year, in addition to scoring below the national average for the past five years. MyIR.net™ is a new program that allows residents free online access to their immunization record from the state’s immunization system, VacTrAK. Those who register can see their immunization records, receive reminders, and print out immunization certificates from home. When I arrived at the Fairbanks Regional Public Health Center, staff had received training to introduce the program to their clients. However, due to competing priorities, it had been underused and poorly implemented. My project at the center was to inform clients of the MyIR.net™ program, to register at least one-third of those informed, and to get feedback from those registered to measure the program’s effectiveness. By spreading the word and encouraging people to register for MyIR.net™, I worked towards my long-term goal—increasing awareness of immunization recommendations as defined by the State of Alaska.

Project Mentor: Professor Rita Sfiligoj, Frances Payne Bolton School of Nursing

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Woman’s Locus of Control Identification is related to Choice of Childbirth Provider

Kaitlyn Murray, Department of Psychological Sciences; Dr Kyra Rothenberg, Department of Psychological Sciences; Dr Marjorie Greenfield, University Hospital’s

The specific objective of this study is to determine if a patient's choice of birthing provider is related to her Locus of Control orientation. Locus of Control (LOC) relates to the extent to which people believe they can control events that happen to them. There are two main classifications, Internal LOC and External LOC. People who scored within a range indicating Internal LOC believe that outcomes of events in their lives are mainly attributed to their own actions. External LOC tend to attribute outcomes of events to outside sources beyond their control (Robinson, et al., 1991). For this study, we hypothesize that patients using midwives are more likely to have an Internal LOC. Midwives generally provide a more personalized birthing experience than the OB-GYN alternative. Midwives along with the patients help to create a birthing plan specific to each individual mother's needs (Mathias, et al., 2007). Expectant mothers are classified based on their overall scores on a scale designed to measure Locus of Control. Participants that score below 12 on the LOC scale are classified as Internal LOC orientation. From our analysis, 85% of midwife patients scored in the Internal LOC range, thus supporting the hypothesis.

Project Mentor: Dr. Kyra Rothenberg, Department of Psychological Sciences
Effects of electroporation on transcription and editing in isolated physarum mitochondria

Greg Naegele, Department of Biology; Jillian Houtz, Department of Biochemistry; Nicole Cremona, Department of Biology; Dr. Jonatha Gott, Department of Biochemistry

The acellular slime mold *Physarum polycephalum* is known for its extensive editing of mitochondrial RNA. The editing is notable for the co-transcriptional insertion of non-encoded nucleotides. C insertions are the most common along with C-to-U substitutions, where cytidine undergoes deamination to leave uridine. Previously, we have mapped the sequences required for nucleotide insertion to a ~9 base pair region upstream and downstream of the editing site. In isolated plant mitochondria, transcription and editing have been observed from exogenous DNA inserted by electroporation. We wanted to establish whether or not electroporation affects transcription or editing from endogenous DNA in *Physarum*. In order to observe the effect of electroporation on transcription, we established conditions for efficient DNA uptake and compared electroporated mitochondrial cells to control cells that were not electroporated. To compare transcription levels, nuclear genes served as the negative control and mitochondrial genes were transcribed. Electroporation seemed to have no significant effect on transcription of endogenous DNA and the exogenous DNA was transcribed at a low level but the RNAs were unedited. In the future, we plan to explore and define conditions that support transcription and editing from exogenous DNA.

Project mentor: Dr. Jonatha Gott, Department of Biochemistry
Faculty Sponsor: Dr. Mark Willis, Department of Biology

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Mitochondrial dynamics in the pathogenesis of Alzheimer disease mouse models

Priya Nandy, Department of Biology; Sandra Siedlak, Department of Pathology, Case Western Reserve School of Medicine; Dr. Xiongwei Zhu, Department of Pathology, Case Western Reserve School of Medicine

Neuronal activity depends on mitochondria to provide proper glucose utilization, synaptic function, and plasticity. In Alzheimer disease (AD) there is reduced brain glucose utilization and synaptic dysfunction, which evidence attributes directly to mitochondrial abnormalities. To study the role of mitochondrial dysfunction in AD two mouse models were used, one with mitochondrial fusion protein mfn2 knocked out in neurons and a double transgenic model produced by crossing the hemizygous mfn2 KO with amyloid precursor protein overexpressing mice, a model which develops AD-like pathology. By immunohistochemistry and western blot, microglial and astrocyte activation, heat shock protein 70 (HSP 70), changes in neuronal populations, amyloid deposition, and oxidative stress were compared in the hippocampus and cortex of the different mouse models. These characteristics are carefully being analyzed in order to understand how mitochondria fission and fusion disruption leads to cell death and amyloid plaque development, in these models that closely mimics the neuronal changes found in human AD.

Project Mentor: Xiongwei Zhu, Department of Pathology, Case Western Reserve School of Medicine
Faculty Sponsor: Professor Barbara Kuemerle, Department of Biology
Does BMI Affect the Diagnostic Efficacy of Computer Aided Diagnostic (CAD) Software in the Identification of Malignant Pulmonary Nodules in Dual-Energy Subtracted Chest Radiographs

Nicholas J. Novak, Department of Anthropology; Scott Simpson, Department of Anatomy; Robert C. Gilkeson, Department of Radiology

The increasing level of obesity in the general population is a major public health concern in industrialized nations. While obesity increases morbidity and mortality, increasing body habitus also impacts the utilization and analysis of medical imaging. The purpose of this study is to compare the diagnostic effectiveness of Computer Aided Diagnosis (CAD) software in combination with a hardware based bone suppression tool, Dual Energy Subtraction Radiography (DESR) on thoracic radiographs of patients with varying levels of obesity as measured by Body Mass Index (BMI). A retrospective pilot study compared the diagnostic performance of a commercially available method of bone suppression when used with available CAD software for the accurate identification of malignant pulmonary nodules. Chest radiographs from 33 patients with CT and pathology proven malignant pulmonary nodules and 20 CT negative patient controls were utilized for analysis. Values for Sensitivity and Specificity were used to compare diagnostic performance of CAD. Preliminary results suggest that for all 53 patients, the diagnostic efficacy of CAD to correctly identify malignant pulmonary nodules or correctly identify negative cases was: Sensitivity = 81.8%, Specificity = 60%. Patients were divided into two groups: normal with BMI ≤ 25, n=26 and Overweight/Obese/Morbidly Obese (OOMO) with BMI > 25 n=27. For Normal patients: Sensitivity = 80.0%, Specificity = 72.7%. For OOMO patients: Sensitivity = 83.3%, Specificity = 44.4%. These preliminary findings suggest that CAD is unable to detect the absence of malignant pulmonary nodules in OOMO patients.

Faculty Mentor: Dr. Scott Simpson, Department of Anatomy

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Prenatal Yoga and Mindfulness Meditation for Alaskan Natives

Jessie Liyi Peng, Frances Payne Bolton School of Nursing

Throughout history, Alaskan Natives in Bethel, Alaska have been disproportionately affected by poverty, homelessness, substance abuse, chronic depression, and sexual abuse, conditions that trap the Alaskan Native women in stressful psychological states inadequate for healthy childbirth. As extensive research has linked prenatal psychological stress with infant mortality, a maternal mental health intervention was developed to improve Bethel’s Alaskan Native infant mortality rate and maternal-infant outcomes. Based on randomized controlled studies discovering that prenatal yoga and its mindfulness meditation components significantly improve maternal stress and infant outcomes, a culturally-adapted prenatal yoga and mindfulness meditation class was implemented for n=15 third-trimester Alaskan Native maternal inpatients in Bethel, Alaska’s Yukon-Kuskokwim Health Corporation (YKHC). Classes were held 3 times a week for 4 weeks, and lasted 40 minutes each. A multiple-group pretest-posttest study was conducted for all twelve classes to assess changes in maternal psychological stress levels, as measured by the 9-item Psychological Stress Measurement (PSM-9) questionnaire, a tool with Cronbach’s alpha coefficient of 0.95 and internal consistency of 0.89. Average pretest and average posttest data was analyzed, showing a 20% decrease in average PSM-9 scores in women after attending the class, indicating that a prenatal yoga and mindfulness meditation program is a valuable future investment in improving the health of Bethel’s Alaskan Native maternal-infant community.

Project Mentor: Rita Sfiligoj, Frances Payne Bolton School of Nursing

Intersections: Symposium and Poster Session
Identifying New Interactors of Condensin II Subunit dCAP-D3 in *Drosophila melanogaster*

Emanuela Peshel, Department of Biochemistry; Lindsey Klebanow, Lerner Research Institute Department of Molecular Genetics; Jessica Lenoir, Lerner Research Institute Department of Molecular Genetics; Andrew Schuster, Lerner Research Institute Department of Molecular Genetics; Jordan Smith, Lerner Research Institute Department of Molecular Genetics; and Dr. Michelle Longworth, Lerner Research Institute Department of Molecular Genetics;

Condensin II is known for its important roles during mitosis and its subunit, dCAP-D3, is found in almost every cell type. Condensin II and dCAP-D3 also have roles outside of mitosis, including the looping of interphase DNA and the direct regulation of gene transcription during G1 phase. However, the full repertoire of proteins and pathways that dCAP-D3 interacts with during development is not fully understood. Here, we show that decreased expression of dCAP-D3 in developing wing discs leads to the loss of the anterior cross-vein. We have used this phenotype to screen for novel interactors of dCAP-D3 during development by performing a deficiency screen of the *Drosophila* second chromosome. Currently, our screen has identified a number of potential gene candidates whose depletion modifies the dCAP-D3 loss of function phenotype, and we are focusing on suppressors as a way to identify novel, direct interactors of dCAP-D3. Immunofluorescence staining of cell cycle markers reveals that decreased expression of dCAP-D3 results in decreased numbers of cells undergoing DNA replication and decreased numbers entering mitosis, as well as increased numbers of cells undergoing cell death. An assessment of developmental protein pathways through immunofluorescence staining indicates that dCAP-D3 may regulate the expression of Knot (kn), a protein important for wing vein development located on the second chromosome next to a cluster of genes previously shown to be targets of dCAP-D3. We are now testing whether any of our candidate suppressors also affect knot expression, thereby abrogating the misregulation imparted by loss of CAP-D3 activity.

Project Mentor: Dr. Michelle Longworth, Lerner Research Institute Department of Molecular Genetics

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Interprofessional Collaboration in Designing a Flight Nursing iPad Stabilization Device

Tanner Purnhagen, Frances Payne Bolton School of Nursing; Abigail Zee, Frances Payne Bolton School of Nursing

Flight nurses face a unique set of challenges and environmental considerations while working in a small, cramped aircraft. Often working with high acuity patients, it can be difficult to enter patient health information while also caring for the patient. An efficient, more secure way to enter patient information could lead to better hand-off reports and charting by the medical staff. In line with the progression of the meaningful use timeline, this could improve outcomes in critically ill patients. From the field to the classroom, the goal of collaboration is to help enhance the Sikorsky 576 flight-nursing simulator at the Dorothy Ebersbach Academic Center for Flight Nursing. This project will mark a major collaboration between the Frances Payne Bolton School of Nursing and the Department of Biomedical Engineering. Our team has come up with an iPad stabilization unit, to ease the workflow in the helicopter, while allowing for maximum portability.

Project Mentor: Dr. Colin Drummond, Department of Biomedical Engineering/ Frances Payne Bolton School of Nursing; Professor Jesse Honsky, Frances Payne Bolton School of Nursing; Dr. Marilyn Lotas, Frances Payne Bolton School of Nursing; Dr. Cheryl Killion. Frances Payne Bolton School of Nursing

Intersections: Symposium and Poster Session
Lorain County Falls Initiative: Phase 1

Hannah Quick, Department of Nursing; Christina Shen, Department of Nursing and Political Science; Barb Kowalski, RN, BSN, PHN; Lorain County General Health Department Nursing Supervisor

Every year, one in three adults over the age 65 years falls. Falls are the leading cause of injury death in people over age 65; over 30 billion dollars each year are spent on medical costs related to falls (Center for Disease Control, 2013). Particularly in Ohio, the rising rate of falls has been declared an epidemic (Ohio Injury Prevention Partnership, 2011). The Lorain County General Health Department aims to reduce the number of falls in the community by summer of 2015 through a five-phase, grant-funded initiative. This project focuses on Phase 1 of the Lorain County Falls Prevention Initiative. Phase 1 objectives include identifying the Lorain County health care providers to be involved in future phases and compiling a database of evidence-based exercise programs for older adults who are at risk of falling.

Project Mentor: Barb Kowalski, RN, BSN, PHN; Lorain County General Health Department
Faculty Advisor: Gayle Petty, DNP, RN; Department of Nursing

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Trk B receptor agonist, 7,8-Dihydroxyflavone, is a sleep suppressor

Yousef Raslan1, Pingfu Feng2, Afaf Akladios2 and Phil Smith2
1 Department of Chemistry, Case Western Reserve University and 2Cleveland VA Medical Center Research Department, Cleveland OH 44106

Tropomyosin-receptor-kinase (Trk) B receptors regulate synaptic strength and plasticity in the nervous system. Brain-derived neurotrophic factor (BDNF), a neurotransmitter that binds to the Trk B receptors, has been widely studied for the effects it has on nerve growth, neural protection, and mood regulation. Trk B agonist, 7,8-Dihydroxyflavone (DHF), enhances the binding of BDNF to Trk B, and has been studied and published for its anti-depressant effects, memory consolidation, fear effects, and neuroprotective effects. However, there is minimal information on the effects of 7,8-DHF on sleep due to the lack of studies performed on this topic. Brain operations were conducted on 17 male mice while attaching them to metallic nodes that connected to the sleep study program, Somnologica. The function of this program was to record brain waves in 24-hour increments for five days and distinguish between the three main stages of presence; Wake, Non-REM Sleep (NREM), and REM Sleep. After five days, the specimen was sacrificed, and the essential components of the brain were removed and stored in a subzero freezer and later used for microscopic neuronal analysis. Comparative analysis of the brain activity between wild-type mice and mice injected with 7,8-DHF were conducted. Currently the collected data is being analyzed to compare and contrast with similar studies from the past where species injected with DHF have shown significant decrease in sleep.

Project Mentor: Dr. Pingfu Feng, Cleveland VA Medical Center Research Department
Faculty Sponsor: Professor Rekha Srinivasan, Department of Chemistry

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Improving Knowledge of Sexual and Reproductive Health in Adolescent Hispanics

Brendan Raymond, Department of Nursing and Liz Sethner, Department of Nursing

The Cleveland Department of Public Health having reflected upon the lower numbers of the Hispanic community receiving treatment related to sexual and reproductive health, aims to increase its numbers in the immediate future. Healthcare standard agencies such as the Center for Disease Control and Healthy people 2020 have also aimed at increasing the reproductive healthcare provided to young adults and adolescents. Research shows that the nature of healthcare is becoming more accessible with the dissemination of knowledge through the internet and social media networking. The aim of this study was to determine if outreach into the community would increase the knowledge of Hispanic adolescents between the age of 15 and 24 years. Participants in the study were given two surveys, one occurring before and one occurring after a brief and general education intervention. Participants prior to the intervention scored an average of 72.5 percent correct. The participants post intervention increased their scores by answering all the post survey questions correctly.

Project Mentor: Lucinda Farina, Cleveland Department of Public Health
Faculty Mentor: Gayle Petty, Department of Nursing

Intersections: Symposium and Poster Session
Outcomes for Patients With Nutritional Insufficiency Using a Standardized Protocol

Miranda Richmond - Department of Psychology

Eating disorders are life threatening biopsychosocial illnesses with acute medical complications that may require inpatient hospitalization for stabilization. Nutritional Insufficiency (NI) is used to describe the effects of eating disorders. One step that is taken in treating NI is hospital admission for acute medical stabilization. The primary goal of hospital admission is correction of medical complications from NI and start of weight restoration. One complication that can occur during hospitalization is refeeding syndrome, a life threatening condition in which a shift of electrolytes occurs when the body starts making adenosine triphosphate (ATP). An inpatient protocol was created and implemented at the Cleveland Clinic to standardize the treatment of patients with NI; this carepath was expanded for use in both Main Campus and Hillcrest Hospital in August 2013. A retrospective chart review was performed of children, youth and young adults from 2005-2008 versus 2012-2014 to determine average length of stay, weight, BMI and percent mean body weight at admission and discharge and time resolution of medical instabilities. Average length of stay for 2005-2008 was 6 days versus 3 days from 2012-2014 (p = .21). Bradycardia resolved by Day 2.5 vs 2.0, also clinically nonsignificant between groups. In both groups, most patients were admitted with bradycardia or other cardiac abnormality; orthostatic pulse change took the longest to correct. Comparison of admission and discharge percent MBW by gender was not statistically significant (p = 0.756) but was limited by the small number of male subjects (5 versus 8 pts). Normalization of most clinical instabilities occurred when patients achieved 80% MBW, excluding hypokalemia. The number of patients with refeeding syndrome was 0 and the number of deaths was 0. Implementation of a clinical practice guideline resulted in sufficient acute weight gain for medical instabilities while preventing medical complications of refeeding. Improvements in length of stay and time to correct medical instabilities occurred over time in a single health care system. The carepath was able to be used effectively in both a community hospital setting and a main campus academic setting with equal ease.

Project Mentor: Dr. Ellen Rome, General Pediatrics, Cleveland Clinic

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Heteromultivalent Ligand-mediated Capture of Circulating Tumor Cells

Preethi Siva, Department of Biomedical Engineering; Christa Modery, Department of Biomedical Engineering

Metastasis, or the spread of cancer cells from a primary tumor to a secondary site in the body, is associated with poor patient prognosis and accounts for >90% of cancer-related deaths. One of the main avenues for metastasis is through the blood, and the ability to detect circulating tumor cells (CTCs) could provide a means of early cancer detection and diagnosis. However, CTC detection has remained a challenge due to extremely low blood concentrations of CTCs and the heterogeneous phenotype of metastatic cells. Our lab has previously investigated the interactions between metastatic cells and active platelets and exploited these interactions via heteromultivalent ligand modification of a synthetic particle platform to yield enhanced binding of metastatic cancer cells under flow. Building on these studies, we have created an ex-vivo microfluidic assay utilizing a library of metastatic cell-relevant ligand-receptor interactions to arrest CTCs onto a surface for detection using fluorescence microscopy. Using human breast cancer MDA-MB-231 as a model metastatic cell and MCF-7 as a non-metastatic control, our results showed that heteromultivalent ligand modification of the flow surfaced resulted in an increase in not just metastatic cell capture but also the capture rate. Future research aims to use this heteromultivalent surface decoration in a polydimethylsiloxane (PDMS) microfluidic device to provide high throughput CTC detection for clinical screening and diagnostics.

Project Mentor: Professor Anirban Sen Gupta, Department of Biomedical Engineering
A Photographic Atlas of the Pathological Specimens
of the Hamann-Todd Collection

Amanda Slotter, Anthropology and Evolutionary Biology; Professor Scott Simpson, Department of Anatomy

The Hamann-Todd Skeletal Collection, currently located at the Cleveland Museum of Natural History, was started in 1912 and now amounts to over 3,000 skeletons. Considering the value of such a resource to the scientific community an effort to make the collection universally accessible to the scientific community is currently underway. Knowing that the collection is now over a century old and that the life of the bones is not infinite the information recorded could prove valuable. The goal of this research project was to create a user-friendly database that would contain individual entries for each of the human specimens in the collection as well as entries documenting the pathologies found. The database was populated over the summer with pathological specimens that were individually identified, photographed, edited and recorded in the database.

Project Mentor: Professor Scott Simpson, Department of Anatomy

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Examining Evidence of Atrocity Crimes in the Ongoing Conflict Between the Republic of Sudan and the people of the Nuba Mountains.

Garrett Stoltzfus, Department of Anthropology

In 2005, several decades of civil war in Sudan ended in an uneasy ceasefire. Against many predictions, the peace continued for several years, even through the referendum and separation of South Sudan as an independent nation in 2011. However, soon after this relatively civil departure, violence once again began in Sudan between the remnants of previous rebel groups and the government. The conflict has a complex history that entwines politics, ethnicity, material resources, and religion into a struggle between these factions and a government dominated by Islamist ideology and headed by Omar Bashir. While multiple groups unified to fight against the Sudanese government, this paper concentrates on the people of the Nuba Mountains. Since the resumption of the fighting, several international monitoring groups have condemned involved parties for activities believed to represent atrocity crimes including genocide, crimes against humanity, and war crimes. This paper examines evidence of or against such actions presented by the United Nations, various political factions, monitoring groups, and first-hand accounts. Sources are critiqued for bias and used to reveal motivations. Ultimately, they are applied to examine the validity of an accusation of atrocity crimes against the Republic of Sudan or the Nuba Mountain’s rebel faction under a framework offered by the United Nations.

Project Mentor: Professor Lee Hoffer, Department of Anthropology
The number of falls among the elderly population in Ohio has increased drastically over the past ten years and presents a major problem for the health and health-care of the elderly. Falls are one of the leading causes of non-fatal injury among older adults, and falls have long-term sequelae that can result in major loss of independence and function. A primary strategy for decreasing falls among the elderly is to determine risk factors for falling. A Falls Risk Assessment Tool, to be used for evaluating the elderly population of Lorain County, was constructed in collaboration with the Lorain County General Health District (LCGHD). The assessment tool was developed by reviewing preexisting assessment tools and literature related to fall prevention. The Falls Assessment Tool is designed to be administered orally by the nurse during an initial screening of older patients. Important fall risk factors, including polypharmacy, history of falls, vision, and cognitive ability, are covered in the tool. The assessment tool was tested in various Adult Health Clinics in Lorain County and was revised according to the gathered data. By integrating a falls risk assessment, appropriate for community out-patient settings into LCGHD’s Adult Health Clinics, risks of falling can be identified. In addition referrals can be made to physicians, therapists, and exercise and educational programs designed for the elderly. The long term goal is to reduce the number of falls within the community and to help keep older adults living independently and at a higher functional level.

_Project Mentor: Dr. Cheryl Killion, Frances Payne Bolton School of Nursing_

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**The Size of the Core for Non-Uniform Hypergraphs**

_Hongjin Su_, Department of Mathematics

A graph is a representation of a set of objects where some pairs are connected by links. A hypergraph is a graph where each link can connect any number of objects. The r-core of a hypergraph is a subhypergraph where each object occur in at least r links, and carry all the properties that the hypergraph has. This research is trying find the size of the core—that is the expected number of objects and links in the r-core. To find this, there are two ways available to implement: 1) using Branching Process to create the r-core directly; 2) using CORE algorithm to reduce a random non-uniform hypergraph to an r-core.

_Project Mentor: Professor Harold Connamacher, Department of Electrical Engineering and Computer Science_
Are plant-soil feedbacks phylogenetically conserved in spring ephemerals?

Drake Sweet and Jean H. Burns, Department of Biology

Understanding mechanisms that govern plant community assembly is a major goal for ecologists. Studies have shown that plants influence the biological composition of the soil, which affects the success of plants grown consecutively in conditioned soil. This phenomenon is known as a plant-soil feedback (PSF), and the influence on the plant can be positive or negative depending on the interaction. Closely related plant species often share traits such as root morphologies, and are affected similarly by soil mutualists and pathogens. Because of this, we expect that closely related species will exhibit similar plant-soil feedbacks. To test this prediction, we conducted an experiment to see if PSFs are phylogenetically conserved in spring ephemerals native to northeastern Ohio. *Viola blanda* was grown in both live and sterilized soil that was conditioned by conspecific, 2 congeneric, and 3 distantly related species, with 5 replicates each. Plant response was measured using leaf diameter and number of leaves per plant. A molecular phylogeny was built using genetic sequencing data obtained from Genbank, and will be used to determine if phylogenetic distance influences the strength of PSFs in the spring ephemeral *V. blanda*. Although results are pending, this study should help ecologists better understand how the phylogenetic makeup of a plant community influences the strength of their interactions with soil communities. This may provide insight into how novelty relates to success through soil interactions, which could help us better understand how nonnative species become incorporated into foreign communities, providing a potential mechanism for invasiveness in plants.

*Project mentor: Jean Burns, Department of Biology*

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Evaluation of the Use of Teach-back Method in the Home Care Setting

Rachel Tan, Department of Nursing; Laura Huber, Department of Nursing.

The teach-back method is a way to confirm that an explanation you have given someone can be explained back to you by that person. This method is included in the concept of health literacy, which suggests that clinicians use simple language and open-ended questions when communicating with patients in addition to asking patients to repeat back content learned. In home care, teach-back is especially important, specifically when a patient is performing care without the constant supervision of medical professionals. This research was conducted by observing nurses in the home to evaluate the present use of the method in educating patients. An activity and lesson were then presented to the nurses to inform them on the current theory of health literacy and its effectiveness in healthcare. A pre-and post-questionnaire were utilized before and after the presentation to evaluate the nurses’ perception of how often they use and will use these concepts in their teaching. A post observation of nurses in the home was then conducted to gauge change. The results of the home visit observations before and after were then graphed and compared with the pre- and post-questionnaires for results and discussion on the use of teach-back in homecare. The goal of this research is to determine how much education nurses have received on teach-back; to quantify how often this method is used specifically in home care, and how realistic it is to apply to this setting.

*Project Mentor: Amy Bieda, PhD, APRN, PNP-BC, NP-BC, School of Nursing*
Title: A new species, *Dystacta tigrifrutex* sp. n., from Nyungwe National Park, Rwanda (Insecta, Mantodea)

Riley Tedrow¹,², Kabanguka Nathan³, Nasasira Richard³, Gavin J Svenson¹,²

¹Department of Invertebrate Zoology, Cleveland Museum of Natural History, 1 Wade Oval Drive, Cleveland, Ohio, USA
²Department of Biology, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio, USA
³Kitabi College of Conservation and Environmental Management (KCCEM), C/O Rwanda Development Board, P.O Box 330 Huye, Kigali, Rwanda

A recent targeted entomological survey in the Republic of Rwanda has produced two conspecific male and female specimens of an undescribed species of praying mantis (Mantodea). The specimens were collected in Nyungwe National Park in May of 2013. The species is closest morphologically to *Dystacta alticeps* Schaum, 1852. Therefore, a new species is described, *Dystacta tigrifrutex* sp. n., along with the first instar nymphs and ootheca. In addition, the genus *Dystacta* Saussure, 1871 is re-described to provide a broader definition of the genus group now that two species are included. Limited natural history observations are provided.

*Project Mentor: Gavin J. Svenson, Department of Biology*

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Participant Perceived Benefits of “Walk With A Doc” Program at Southwest General Hospital

Dedra Teel, Department of Nursing, Christina Rozman, Department of Nursing

The prevalence of obesity is increasing among all age groups at an alarming rate. Since a major contributing factor in weight gain is a sedentary lifestyle, interventions designed to encourage physical activity should be implemented to assist in reducing the obesity epidemic. Walking is a beneficial exercise that is easy for most individuals of all ages, and has no associated costs. “Walk with a Doc” is a free physical exercise program at Southwest General Hospital that promotes health and wellness and increases awareness of the benefits of walking. Once a week a staff physician leads the walk and simultaneously engages community members in a health related discussion along the Metroparks Lake to Lake trail behind the hospital. To determine how community members perceived the program, a short survey was conducted. Participants were largely Caucasians males between the ages of 45 and 69. Some of the most predominant perceived benefits included an enhancement in mental well being, an increase in physical endurance, and an increase in the desire to become more involved with physical activity. Over sixty percent of respondents stated the program helped them increase their level of physical activity. This evaluation will help the organization determine whether the program will continue for a second summer.

*Project Mentor: Cheryl Killion, PhD, RN, FAAN, Frances Payne Bolton School of Nursing, Katherine McTaggart BSN, RN, Southwest General Hospital*
Sodium absorption in summer and winter acclimated freshwater teleosts

Katrina Thede, Department of Biology; Simon A. Wentworth, Department of Biological Sciences at George Washington University; Varsha Aravindabose, Department of Biology; Dr. Jeffrey Garvin, Department of Physiology and Biophysics; Dr. Randall Packer, Department of Biological Sciences at George Washington University.

In order to maintain sodium (Na) homeostasis in a hypotonic environment, freshwater teleosts must constantly absorb Na through their gills. Additionally, teleosts in temperate climates have the extra challenge of living in an environment in which the ambient temperatures range from 1-30°C. We hypothesize that 1. Na absorption across the gills occurs via a protein homologous to mammalian Na/H exchanger (NHE), 2. Na is exchanged for NH₄, the nitrogenous waste product of the fish, rather than H⁺, and 3. Gill proteins from 5°C cold-acclimated fish (CA) will have higher activity than those from 20°C warm-acclimated fish (WA). To test this we first sequenced and assembled the genome and transcriptome of WA fathead minnows (*Pimephales promelas*). RNA and DNA from WA were isolated using the Qiagen RNeasy Plus Mini Kit, and the QIAamp DNA mini kit respectively. We found that WA express proteins that are homologous to four mammalian salt transport proteins: NHE, Na/Cl co-transporter (NCC), acid-sensing ion channels, and several proteins homologous to NH₃ transporters. We are now sequencing transcriptomes of WA and CA and measuring the activity of Na transport proteins in the gills. Preliminary data showed that Na flux into gill vesicles saturated with a Kᵢ/2 of 6 mM indicating a carrier mediated process. Our next step is to measure the activities of NHE, NCC, and acid sensing ion channels in WA and CA under different ionic conditions.

Project Mentor: Professor Jeffrey Garvin, Department of Physiology and Biophysics
Faculty Sponsor: Professor Jean Burns, Department of Biology

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Alcohol-induced cytosolic and mitochondrial redox changes in rat organs - a stable isotopomer analysis

Iris Tsai, Department of Nutrition; Xuezhu Sun, Department of Nutrition; and Zhicheng Jin, Department of Nutrition

A new mass isotopic method was proposed to assay the cytosolic and mitochondrial redox in the present work. The ratios of lactate/pyruvate (LAC/PYR) and 3-hydroxybutyrate/acetoacetate (BHB/AcAc) reflect the redox status of cytosol and mitochondria. Pyruvate and acetoacetate were reduced to one deuterium labeled LAC (M+1 LAC) and BHB (M+1 BHB). (Un)labeled LAC and (un)labeled BHB were derivatized by pentafluorobenzyl bromide followed by acetic anhydride. The derivatized BHB/LAC and their isotopomers were differentiated by GC-MS with m/z at 131/132 for M and M+1 LAC, and at 145/146 for M and M+1 BHB. With the developed method, we measured the cytosolic and mitochondrial redox changes in rat organs (brain, heart, liver and kidney) and plasma induced by two-weeks alcohol drinking. The LAC/PYR ratio (cytosolic redox) was significantly induced by alcohol in the liver and brain, and slightly increased in heart. However, alcohol had no effect on the LAC/PYR ratio in kidneys and plasma. The BHB/AcAc (mitochondrial redox) was increased by alcohol in the liver, heart, and plasma, but remained unchanged in the kidney. The redox data in organs showed that the kidney has a strong ability to maintain the redox ratio that probably is crucial to kidney function.

Project Mentor: Professor Guo-Fang Zhang, Department of Nutrition

Intersections: Symposium and Poster Session
Analyzing the Immune Responses to Hemostatic Nanoparticles in Porcine Liver Injury Models

Nishant Uppal, Department of Biomedical Engineering; and DaShawn Hickman, Department of Biomedical Engineering

Although severe trauma is the leading cause of death for individuals between the ages of 1 and 44, there are currently few viable and effective clinical methods that are available to treat severe internal hemorrhaging, the most common cause of post-traumatic injury and significant internal hemorrhaging. To address this lack of clinical tools, the development of hemostatic nanoparticles has been investigated to provide a novel treatment that both reduces bleeding and improves survival for patients suffering from severe traumatic injury and significant internal hemorrhaging. Although Shoffstall et al. have observed success in the application of GRGDS nanoparticles in rat femoral artery injury models, there have been difficulties when applying these nanoparticles in porcine hepatectomy models. Following nanoparticle treatments, an acute immune response that appears to be Complement Activation-Related Psuedo-Allergy (CARPA) has been observed. Since porcine models are more relevant to human hemodynamics, this immune toxicity must be resolved in order to advance the potential of hemostatic nanoparticle treatment. Therefore, this allergic response must be identified and analyzed in order to be properly mitigated. By using plasma from treated porcine patients to conduct c3a complement activation assays, this immune response can be quantified and related to the viability and efficacy of hemostatic nanoparticles.

Research Advisor: Dr. Erin Lavik | Department of Biomedical Engineering

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Reducing Sodium Intake in Patients with Hypertension

Olivia Verhagen, Frances Payne Bolton School of Nursing, Senior BSN Student

Every one in three adults in Cleveland is living with hypertension. Nearly all American adults consume a high-sodium diet, which can cause and exacerbate chronic diseases such as hypertension, coronary artery disease (CAD), and renal failure. Adults in Cleveland are at an increased risk for high sodium diets due to lifestyle, lack of resources, and lack of education. Studies show limiting sodium intake is essential for preventing and reversing hypertension and other chronic diseases. The purpose of this project was to educate patients with hypertension, CAD, and/or renal failure on the importance of reducing sodium in their diet. The objective was to examine if there was an increase in knowledge and awareness after providing five minutes of educational counseling. Twenty-one patients from the Otis Moss Jr. Medical Center were selected for this project. Diagnoses consisted of hypertension, CAD, and/or renal failure. Educational materials, including healthy versus unhealthy foods, were given to each patient. Nine of the 21 patients participated in a follow-up phone call. Two-thirds of the 9 patients made changes in their diets just one week later and two-thirds of the 9 patients knew how much sodium they should be consuming daily. Despite these preliminary findings several limitations existed, which consisted of the following: time allotted for education and lack of response to follow up. High sodium diets can cause, or complicate, many chronic diseases. Educational programs targeted at low to moderate sodium intake have the potential to decrease chronic conditions, such as hypertension, and should be researched further.

Project Mentors: Carol Johnson, BSN, RN, Nurse Manager, Otis Moss Jr. Medical Center; Mandisa Molton, MN, MBA, RN, Faculty Advisor, Frances Payne Bolton School of Nursing

Intersections: Symposium and Poster Session
Investigating the Growth Mechanisms of Atomically Thin Transition Metal Dichalcogenides

Christopher Wagner, Engineering Physics

Monolayers of transition metal dichalcogenides (TMDCs), such as MoS$_2$ and MoSe$_2$, have been the subject of increased interest due to their promising potential in nanoelectronics, optoelectronics, and other fields. To date, the synthesis of large area high quality monolayer TMCDs has proven difficult and high quality samples are generally restricted to the micron scale. The intent of this project is to study the growth mechanism of TMDCs on a substrate via the physical vapor deposition method. An increased understanding of the material’s growth process may facilitate the synthesis of single layer wafer-scale, high quality TMDC.

Project Mentor: Dr. Xuan Gao, Department of Physics

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Effects of Diet on Lipid Peroxidation in Rat Brain

Carrie Westfall, Department of Nutrition; Sharon Zhang, Mouse Metabolic Phenotyping Center (MMPC)

Lipid peroxidation refers to the oxidative breakdown of lipids. In this process, free radicals “steal” electrons from the cell membranes of the lipids resulting in cell damage. The objective of this study is to use a targeted metabolomic approach to determine the effects of different dietary intakes on fatty acid and acyl-CoA intermediary metabolism in brain. The diets used are a standard diet, a Western diet (high carbohydrate, high fat), a low fat diet, and a ketogenic diet. The ketogenic diet is a high fat, no carbohydrate diet which is associated with health benefits related to diabetes, liver disease, and stroke. By using light chromatography mass spectrometry (LC-MS), lipid peroxidation levels along with the presence of lipid peroxidation by-products in the rat brain such as: 4-hydroxynonenal (HNE), acyl-CoA, and 4-hydroxynonenal glutathione (GSH-HNE) can be analyzed. Evaluating these levels can help determine if the ketogenic diet has neuroprotective results in the rat brain.

Project Mentor: Michelle Puchowicz- Department of Nutrition

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Waveform Fitting Algorithm: A Framework for Parameter Estimation in Neural Conductance Models Using Current Clamp Data

Alexander J. White, Department of Biology

Determining the underlying dynamics of a neuron is computationally expensive and requires a large quantity of experimental data. Often the calculations require using voltage clamps and many different channel blockers to tease out the ion channels present in the cell membrane. This process is often averaged over many neurons to produce a conductance based model. However, the parameters of an individual neuron may differ from its neighbors, or even itself, given enough time. Models based on averaged parameters can fail to reproduce the behavior of the individuals. In this project, I develop an algorithm that finds certain parameters (conductances, capacitance, and driving potentials) of a neuron from a single current clamp experiment. Using the recorded voltage, we calculate the hidden gating variables by solving a system of non-homogeneous linear differential equations, assuming the gating variable dynamics take a known form. Having determined the gating variables, we calculate the conductance of each type of ion channel in the membrane by using a least squares method. The efficiency and accuracy of my method compares favorably with existing methods in the literature.

Project Mentor: Professor Peter Thomas, Department of Mathematics and Biology
Comparing Prevalence for Malignant Primary Brain and CNS Tumors to Other Common Cancers

Adah Zhang, Department of Epidemiology and Biostatistics; Quinn Ostrom, Case Comprehensive Cancer Center; and Dr. Jill Barnholtz-Sloan, Case Comprehensive Cancer Center

Although brain and central nervous system (CNS) tumors are rare in adults, they are the most common solid tumors in young children. Studies of brain and CNS tumors have been lacking due to up to date data availability and previous data limitations. Prevalence is defined as the proportion of new and existing diseases in a population and is key to understanding the burden of disease in a population. In this study, the prevalence of malignant primary brain and CNS tumors are compared to the prevalence of other common cancers stratified by age group: childhood (0-14), adolescent and young adult (AYA) (15-39), and adult (40+), to highlight the relative impact of brain and CNS tumors the United States. The data used for this study is obtained from two population based data resources, the Surveillance, Epidemiology, and End Results Program (SEER), and the Central Brain Tumor Registry of the United States (CBTRUS). Prevalence rates reflect the complex relationship between incidence, survival, and population demographics, which can provide useful information about burden of disease for the research and medical community.

Project Mentor: Quinn Ostrom, Case Comprehensive Cancer Center
Project Sponsor: Dr. Jill Barnholtz-Sloan, Case Comprehensive Cancer Center

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Metabolism of 4-hydroxynonenal-modified bovine serum albumin in the perfused rat liver

Xiaoni Zhao, Department of Nutrition; Zhicheng Jin, Department of Nutrition; Jessica M. Berthiaume, Department of Physiology & Biophysics; Gregory P. Tochtrop, Department of Chemistry, Guo-Fang Zhang, Department of Nutrition

4-Hydroxynonenal (HNE), one of the most abundant lipid peroxidation products from omega-6 polyunsaturated fatty acids (n-6 PUFAs), is readily to modify proteins. Proteins or enzymes modified by HNE may lead to improper folding or lose their activities depending on the modifying locations. The metabolic fate of HNE-modified protein is not clear. In the present work, the metabolism of [5,5,6,6,7,7,8,8,9,9,9-2H11]HNE-modified bovine serum albumin (BSA) in the perfused rat liver was characterized using the association of metabolomics study with mass isotopomer analysis. Rat livers were perfused with or without 4% BSA modified by 0.1 mM [5,5,6,6,7,7,8,8,9,9,9-2H11]HNE for 50 minutes in recirculating mode. The following evidences show that HNE is released from the bound BSA: (i) HNE is constantly released to perfusate assayed by gas chromatography-mass spectrometry; (ii) HNE conjugate with glutathione (GSH) accumulated in the perfusate with the perfusion time; (iii) Propionyl-CoA in the perfused rat liver is labeled from the catabolism of [5,5,6,6,7,7,8,8,9,9,9-2H11]HNE released from [5,5,6,6,7,7,8,8,9,9,9-2H11]HNE-BSA. The release of HNE from HNE-BSA is unlikely from the simple degradation of BSA by proteases. Experiments are underway to explore the possible mechanisms.

Project Mentor: Professor Guo-Fang Zhang, Department of Nutrition
Celebration of Student Writing
December 5, 2014

The Celebration of Student Writing showcases undergraduate student writing projects from across the university. The celebration encourages students to (re-)present and display their research and writing in formats other than conventional word-processed documents. Some students create video projects; others produce poster presentations or read aloud portions of their writing; still others design models or digital illustrations that present their writing projects in new media.

The Writing Resource Center coordinates the Celebration of Student Writing. The Writing Resource Center (WRC) at Case Western Reserve University provides writing consultation to students across the university in Bellflower Hall and other campus locations and online. More than 30 full-time Writing Program faculty and graduate students staff our center. Each year, WRC consultants conduct more than 4,000 individual sessions with approximately 1,200 individual writers ranging from first-year students to graduate students and faculty.

The Center for the Study of Writing, which in part supports the Celebration of Student Writing, was established in 2008 to facilitate research and scholarship on writing at the University and in the world. It serves three distinct but interrelated roles at the University: to support writing and research by resident and visiting students and scholars; to facilitate exciting new courses and curricula on writing; and to provide an array of practical writing and publishing support services to the University and University Circle communities. For more information, see http://www.case.edu/writing/csw.

Since 2009, the Center for the Study of Writing has been sustained by generous gifts from Marilyn McCulloch (FSM ‘50); from Edward S. Sadar, M.D. (ADL ‘64, SOM ’68) and Melinda Melton Sadar (FSM ‘66); from Sharon Schnall (MBA ‘87) and Dr. R. Drew Sellers (EMBA ‘08); from Eric Winter, M.D. (CWR ‘98, GRS ‘91, MD ‘98); from Jackson McHenry (ADL ‘52); and from an anonymous donor.

The Celebration of Student Writing is additionally supported by the SAGES Program and the Department of English.
SAGES First and University Seminars:

**FSCC 100:** First Seminar, Food Concerns and Controversies

**Course Instructor:** Mary Assad

**Students:** Varun Garg, Beto Gonzales Campos, Tim Guo, Karina Husodo, Julia Kim, Daniel Kim, Jaehee Lim, Tina Lu, Echo Ma, Meghraj Rathod, Spark Yang, Johnny Yin

This section of FSCC 100 focuses on food concerns and controversies in contemporary American society. We explore a range of food-related topics including but not limited to the content of food; the purposes of food; cultural meanings of food; organic food; “healthy” eating; obesity; and the ethics of food consumption and production. Some questions we are considering over the course of the semester include: What is food? Why do we eat? What relationships exist between food and culture? What ethical issues are involved in food production and personal food consumption? How does food affect one’s personal health? What does healthy eating involve, and what are the associated benefits and challenges? By the end of the semester, each student will choose a topic they care about, research beliefs and levels of knowledge about the topic among the campus community, and argue for the topic's importance through a poster presentation.

**FSCC 100:** First Seminar, Academic Conversations

**Course Instructor:** Susan Dominguez

**Students:** Steven Yankun Chen, Beezy Pingshi Wang, Eugene Yawei Zhang, Peilin Ge, Mio Tongtong Liu, Eve Manting Wang, Suzie Yang Hu, Jerry Bixing Qiao

This SAGES First Seminar will sponsor a SCRABBLE tournament with two games occurring simultaneously. The theme for the tournament is "CASE ENGLISHES" and contestants will use the newly revised SCRABBLE Dictionaries, which contain many new technology-oriented words. Students, Faculty, Staff, and Administrators are welcome to compete.

**FSCC 100:** First Seminar, Culture and Education

**Course Instructor:** Elise Geither

**Students:** Hang Chen, Dharani Raman, Kwan Lau, Siddhraj Rathod, Ana Luiza Scalamandre, Harry Shen, Judy Shi, Ziyang Xie, Kailai Xu, Zeng Yun Yao, Wenxing Yin, Hanyu Zhang

Students in the First Seminar "Culture and Education" have explored how various cultures define "education" and "schools" along with the varied perceptions of parent and teacher roles in preschool education. Touching on our work in this area, students developed research projects focusing on different areas of the education system in the US.
FSSO: 119 Philanthropy in America

**Faculty Advisor:** Barbara Burgess-Van Aken

**Students:** Pearl Choi, Claudia Gates, Alex Habeeb, Ashleigh Janz, Jared Jones, Abel Keith, Emily Kwan, Charlie McCarthy, Jaren Ong, Brian Parro, Poorvi Satya, Myles Smith, Kari Sneitzer, Maddie Strnad, Esther Yoo, Rachel Zeger, Zach Zinserling

In Philanthropy in America we spent the first part of the semester discussing pressing social needs and debating priorities for cutting up the philanthropic pie. In the second unit of the course we researched different genres of nonprofit organizations. Our final project was to work in a group to design a hypothetical nonprofit organization that addresses an unmet social need. What we are presenting here today are the posters, pamphlets, and slide shows for each organization.

FSSO 140: Working-Class Literature

**Course Instructor:** Megan Swihart Jewell

**Students:** Elijah Newcomb, Tasha Jhangiani, Meagan Smith, Charlie Cai, Linda Chen, Rhea Mehra, Chloe Lim, Michael Oei, Aesha Rajan, Ariel Raj, Shizen Moh

In this first seminar, students examine the relationship between social class and literature, reading narratives written by and about laborers in the hopes of understanding the complexities of working-class life in America. Students also focus on issues of social class in the University Circle and Greater Cleveland areas as well as in the immediate University environment. Students will present and discuss their final course anthologies of working-class literature that engage with social class issues in literature and beyond.

FSSY 146: Doc Talk - Language & Medicine

**Course Instructor:** Kimberly Emmons

**Students:** Katie Basch, Gage Blair, Emma Briggs, Samuel Broadus, Yassin El-Najjar, Ishita Gupta, Jodie Hurd, Dominic Kizek, Eric Lundberg, Megan Lynch, Rishabh Mazmudar, Sonya Mehta, Ahnjé Moses, Andrew Moyal, Alicia Pacheco, Thomas Stiadle, Aemilee Ziganti

This course has explored the role of language in constructing, experiencing, treating, and understanding the states we call “health” and “illness.” Over the course of the semester, our seminar discussions have explored a wide array of questions: What is the role of language in enhancing (or detracting from) individual well-being? How can narrative practices facilitate ethical medicine (and reform medical ethics)? How do our own illness stories fit into (and challenge) scholarly taxonomies? What do medical genres tell us about the ways medicine is practiced and experienced? What research questions and forms of academic inquiry are most likely to improve health in the future?
In addition to our discussions, each seminar member joined a group that chose a medical object from the Dittrick Medical History Center’s collection. This object then served as the catalyst for a series of discussions with CWRU scholars in a variety of disciplines. In their poster presentations, the groups display the range of possible questions and research projects inspired by the objects they selected. The groups’ objects include: the stomach pump, the iron lung, the stethoscope, and the EKG machine. As the posters will demonstrate, these medical objects provide us with an opportunity to interrogate forms of disciplinary inquiry and to consider opportunities for interdisciplinary collaboration.

**FSSO 167: TV and Social Perceptions of Scientists**

**Course Instructor:** Malcah Effron

**Students:** Calvin Boyle, Donald Chen, Michele Chin, Estee Cramer, Vincent Giacopelli, Divya Joseph, Connor Kiernan, Trino Mitra, Annelisa Monica, Austin Ott, Alejandra Quintana de la Torre, Isidora Radovanovic, Kurt Schafer, Alexander Shimek, Mitchell Wolf, Hayley Yi

Using their own writing as examples, the students will put together a display with suggestions for how to respond to feedback such as how to develop, unpack, or further explain their ideas.

**USNA 287H: Plants in Medicine**

**Course Instructor:** Erika Olbricht

**Students:** Teja Badami, Spencer Burton, Jessica Chan, Leah Cummings, Madonna DiBella, Alexandra Faidiga, Caitie Gaffney, Alex Haueisen, Amelia Iglesias, Tim Kolosionek, Nick Kwon, Patrick Leo, Eric Mann, Olga Nazarenko, Chakira Smith, Kayla Wiatroski, Kerrick Woyschner

This SAGES class considers how herbal remedies, historical and contemporary alike, might alter our notions health and how we "medicate" to achieve it. Our class is researching traditional medicinal herbs like pennyroyal, lemon balm, elder, and bearberry, as well as plants with lesser-known medical applications, like viburnum, chrysanthemum, mandrake, and chocolate!
English Department Courses:

**ENGL 398:** Technical Communication for Engineers

**Course Instructor:** Michael Parker

**Students:** Ian Anderson, Freddy Arce, David Bass, John Billingsley, Yixin Feng, Michael Nikita Agrawal, Kiley Armstrong, Jeffrey Brown, Sarah Carbone, Erin Dreger, Alex Haufler, Shaun Howard, Joseph Lerchbacker, Benjamin Marks, Evelyn Moss, Yasser Mounkara, Aaron Neyer, William Ordiway, Jay Patel, Shriya Srinivasan, Justin Tang, William Topel, Ethan Tu, Steven Wendling, Kimberly Wolf

The final project in ENGL 398 involves crafting a fully formed research/project proposal. Each proposal individually relates to the knowledge and expertise of the student, and it is the hope of the class that the proposal will serve as a spring-board into actual research in a later semester. Part of the proposal making process is the individual presentation. In this iteration of ENGL 398, the students will be creating a poster presentation of their written proposal. The students will be arguing for the ability to perform their research.

**ENGL 395:** English Capstone

**Course Instructor:** Martha Woodmansee

**Students:** Jacob Behrend, Michael Thomas, Bethany Wisinski

The English Capstone culminates with projects as varied as the fields within the English Department. This year’s English Capstone students will present remediations of the projects they have pursued in their capstone seminars. Students and projects are as follows:

**Senior Capstone Award**
The Senior Capstone Award, provided by the Case Women’s Club, is open to all seniors presenting their senior capstone projects. The Senior Capstone is the culmination of our SAGES, Seminar Approach to General Education and Scholarship, program. The senior capstone allows students to gain experience in defining a problem and then developing a response to that problem, whether this involves research or artistic creation. Students work individually or in small groups under the guidance of faculty mentors. Last year’s winner was Oliver Ernst and he worked with Erkki Somersalo in the Department of Mathematics, Applied Mathematics and Statistics. His project was titled "Sequential Estimation of Discretization Errors in Inverse Problems." SOURCE congratulates the following students who are presenting their senior capstone projects today:

<table>
<thead>
<tr>
<th>Krina Adhikari</th>
<th>Jasmine Johnson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophia Alvarado</td>
<td>Devon Kaufman</td>
</tr>
<tr>
<td>Anna Ambrose</td>
<td>Katie Kershenbaum</td>
</tr>
<tr>
<td>Cara Anderson</td>
<td>Eunice Kim</td>
</tr>
<tr>
<td>Jenna Applebee</td>
<td>Kinsey Kolega</td>
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<td>Brittany Armstrong</td>
<td>Nathan Kong</td>
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<tr>
<td>Nicholas Barron</td>
<td>Sarah Kovacic</td>
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<td>Rachel Beaty</td>
<td>Jessica Lin</td>
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<tr>
<td>Rosemary Behmer</td>
<td>Kathy Lin</td>
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<tr>
<td>Dakota Benjamin</td>
<td>Jacob Ma</td>
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<td>Danielle Blonstein</td>
<td>Dane McLoughlin</td>
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<td>Karen Booth</td>
<td>Stephanie Merlino</td>
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<td>Jeffrey Brown</td>
<td>Jennifer Meyer</td>
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<tr>
<td>Francis Cassidy</td>
<td>Chloe Milliman</td>
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<tr>
<td>Kimberly Cheng</td>
<td>Lawrence Monocello</td>
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<tr>
<td>Elisse Cho</td>
<td>Alexandra Morris</td>
</tr>
<tr>
<td>Diana Cho</td>
<td>Kaitlyn Murray</td>
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<tr>
<td>Nicole Cornelius</td>
<td>Greg Naegele</td>
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<tr>
<td>Amanda Crow</td>
<td>Priya Nandy</td>
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<tr>
<td>Katherine Dixon</td>
<td>Nicholas Novak</td>
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<td>Vanessa Doho</td>
<td>Alexandra Pelton</td>
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<td>Serena Doyle</td>
<td>Jessie Peng</td>
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<td>Madelynne Dudas</td>
<td>Emanuela Peshel</td>
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<tr>
<td>Kasey Filliat</td>
<td>Tanner Purnhagen</td>
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<tr>
<td>Elisabeth Furey</td>
<td>Christina Rozman</td>
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<tr>
<td>Kristin Garr</td>
<td>Claire Slusarz</td>
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<tr>
<td>Sarah Glait</td>
<td>Garrett Stoltzfus</td>
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<tr>
<td>Sara Gulasey</td>
<td>Jacob Storch</td>
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<tr>
<td>Emma Haas</td>
<td>Amber Strickland</td>
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<tr>
<td>Shelby Hamilton</td>
<td>Rachel Tan</td>
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<tr>
<td>David Hess</td>
<td>Dedra Teel</td>
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<tr>
<td>Teresa Hibbard</td>
<td>Katrina Thede</td>
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<tr>
<td>Laura Hill</td>
<td>Amanda Trefny</td>
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<tr>
<td>Katherine Holland</td>
<td>Allison Vogler</td>
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<tr>
<td>Sara Hook</td>
<td>Olivia Verhagen</td>
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<tr>
<td>Grace Hsu</td>
<td>Christopher Wagner</td>
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<tr>
<td>Laura Huber</td>
<td>Tristan Weber</td>
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<tr>
<td>Elsa Imbimbo</td>
<td>Carrie Westfall</td>
</tr>
<tr>
<td>Daniel Janini</td>
<td>Abigail Zee</td>
</tr>
<tr>
<td>Hannah Jenkins</td>
<td>Adah Zhang</td>
</tr>
</tbody>
</table>
SOURCE Summer Programs

The SOURCE Summer Programs provide financial support for Case Western Reserve University students from all academic majors to take part in research and creative endeavor projects. The programs are very generously supported by the Case Alumni Association, the Dominion Foundation and the University.

2014 SOURCE Summer Program Participants

<table>
<thead>
<tr>
<th>Student</th>
<th>Project Title</th>
<th>Mentor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelsey Aamoth</td>
<td>Develop a device to characterize bowel activity in patients with spinal cord injury</td>
<td>Kenneth Gustafson, Biomedical Engineering</td>
</tr>
<tr>
<td>Diana Acosta</td>
<td>Analyzing Second Virial Coefficient’s of Viral Capsids at Different pH Levels and Ionic Strengths for Biomedical Drug Delivery Applications</td>
<td>Roger French, Materials Science and Engineering</td>
</tr>
<tr>
<td>Precious Amoako</td>
<td>Comparison of Interventions Targeted to Reduce Obesity in Urban Youth.</td>
<td>Shirley Moore, Nursing</td>
</tr>
<tr>
<td>Amy Aube</td>
<td>Electrochemical reactions carried out with a plasma electrode</td>
<td>Mohan Sankaran, Chemical Engineering</td>
</tr>
<tr>
<td>Morgan Bolger</td>
<td>Histological Effectiveness of Polymeric Nanoparticles on Lesion Volume, Glial Scarring, and Apoptosis Resulting from Traumatic Brain Injury</td>
<td>Erin Lavik, Biomedical Engineering</td>
</tr>
<tr>
<td>Kathleen Broderick</td>
<td>Assessing Patient Exposure to Transport</td>
<td>Andrew Reimer, Nursing</td>
</tr>
<tr>
<td>Charles Burke</td>
<td>Terracotta Manufacturing in Ancient Rome</td>
<td>Kevin Dicus, Classics</td>
</tr>
<tr>
<td>Alexander Cao</td>
<td>Chaos in a Closed-Loop Model of Rhythm Generation Characterization of airway epithelial cells with CFTR gene modified using the CRISPR-Cas9 system to express the R117H mutation</td>
<td>Chris Fietkiewicz, Electrical Engineering and Computer Science</td>
</tr>
<tr>
<td>Michelle Chen</td>
<td>Cyclodextrin microparticles for the controlled release of antibiotics for poly-microbial device infection</td>
<td>Mitchell Drumm, Genetics</td>
</tr>
<tr>
<td>Sophia Colevas</td>
<td>Constructing a Toy Model to Explore the Possible Instability in Friedmann Robertson Walker Spacetime.</td>
<td>Horst von Recum, Biomedical Engineering</td>
</tr>
<tr>
<td>David Cyncynates</td>
<td></td>
<td>Glenn Starkman, Physics</td>
</tr>
</tbody>
</table>
Erika Cyphert: Controlled Delivery of an Antibiotic Using an in Situ Affinity Change in Bacterial pH, Horst von Recum, Biomedical Engineering

Olivia Dahm: Study of Diamond Nucleation Using Computer Programming Software, John Angus, Chemical Engineering

Gilad Doron: Optimization of Targeted Nanoparticle Treatment of Breast Cancer, Stathis Karathanasis, Biomedical Engineering

Christopher Everett: Role of BMP-2 and Dexamethasone in Inducing Osteogenic Differentiation in Human Adipose-Derived Stem Cells, Eben Alsberg, Biomedical Engineering

Jacob Farkas: Encapsulation of Charge-Transfer Complexes (CTC) for Mechanochromic Sensors Application, David Schiraldi, Macromolecular Science and Engineering

Nicholas Fung: Effect of Cowden syndrome-associated germline SDHB-Q24R mutation on PTEN anti-tumor function, Charis Eng, Genetics

Joshua Hall: Mechanochemical control of walking in Drosophila, Jessica Fox, Biology

Emily Harker: Polymer Conjugates for Programmed Delivery of Epidermal Growth Factor, Jon Pokorski, Macromolecular Science and Engineering

Jonathan Harper: Search for Quark-Gluon Plasma in Cosmic Ray Showers, Corbin Covault, Physics

Jeremy Hirschler: The PML-RAR translocation mediates APL cell sensitivity to FABP5 inhibition, David Wald, Pathology

Sophia Hu: Virulence Factor Control in Streptococcus pyogenes, Menachem Shoham, Biochemistry

Dana Jeter: Real-time visualization of neural stem cell transcriptome (NIH), Weihtong Guo, Mathematics, Applied Mathematics and Statistics

Sophia Knowles: Modeling changes in EEG energy during human development, Chris Fietkiewicz, Electrical Engineering and Computer Science

Pavan Kota: Active Targeting of Ultrasound Contrast Agents to Ovarian Cancer Cells, Agata Exner, Radiology

Maria Lesieutre: A Hybrid Neuromechanical Ambulatory Assist System, Ronald Triolo, Biomedical Engineering

Xiangjie (Levy) Li: Exploring an ideal oil solution for Clotrimazole, using Hansen solubility parameter, Gary Wnek, Macromolecular Science and Engineering

Jessica Lin: Developing a Screening Platform for Small-Molecule Inhibitors Which Disrupt the Interaction between Monocarboxylate Transporters and Cluster of Differentiation-147 (CD147, Basigin) in Glioblastoma, Eli Bar, Neurosurgery

Jonathan McCandless: Single Layer MoS₂ Electroluminescence Optimization and LED Characterization, Philip Feng, Electrical Engineering and Computer Science

Sara Mithani: Self-Management Benefits Oral Health in Post Menopausal Women, Leena Palomo, Dental School

Andrew Moore: Diamond Films for Integrated Electroanalysis and Spectroscopy to Distinguish Neurochemical Release from Cells, Heidi Martin, Chemical Engineering

Arun Murugesan: Antibody Responses to Malaria in Children of Kenya, Indu Malhotra, Center for Global Health and Disease

Priya Nandy: Mitochondrial Dynamics in the Pathogenesis of Alzheimer Disease, Xiongwei Zhu, Pathology

Remy Niman: Ankle Transducer to Measure Ankle Torques in the OR, Ronald Triolo, Orthopaedics

Benjamin Nudelman: Posture Dependent Control of Stimulation in a Standing Neuroprosthesis, Musa Audu, Biomedical Engineering
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jessica Oh</td>
<td>Cross Cultural Study of Tuberculosis Effects on an Aging Population</td>
<td>David Canaday, Infectious Diseases</td>
</tr>
<tr>
<td>Grace Olivier</td>
<td>The Outer Disk of the Milky Way</td>
<td>Heather Morrison, Astronomy</td>
</tr>
<tr>
<td>Olivia Ortega</td>
<td>Public Service Internship</td>
<td>Elliot Posner, Political Science</td>
</tr>
<tr>
<td>Joshua Osborne</td>
<td>Constraining Universe Topology Using Harmonics in CMBR</td>
<td>Glenn Starkman, Physics</td>
</tr>
<tr>
<td>Kavya Pai</td>
<td>Using Viral Vectors to Study Neurodegeneration in the Ventral Striatum</td>
<td>Daniel Wessman, Neurosciences</td>
</tr>
<tr>
<td>Jay Patel</td>
<td>Segmentation and Shape Based Feature Modeling for Treatment Evaluation of Glioblastoma Multiforme</td>
<td>Anant Madabhushi, Biomedical Engineering</td>
</tr>
<tr>
<td>Gregory Penzias</td>
<td>Automated Fusion of Prostate Histology, Multi-Parametric MRI, and PET for Improved Characterization of Prostate Cancer</td>
<td>Anant Madabhushi, Biomedical Engineering</td>
</tr>
<tr>
<td>Saadia Pervaiz</td>
<td>Anglo- Indian Children in British India: Regulating Race in the 18th and 19th Centuries</td>
<td>Ananya Sasgupta, History</td>
</tr>
<tr>
<td>Emanuela Pesheal</td>
<td>Identifying New Interactors of Condensin II Subunit dCAP-D3 in Drosophila melanogaster</td>
<td>Michelle Longworth, Molecular Genetics</td>
</tr>
<tr>
<td>Lauren Phillips</td>
<td>Bone/Cartilage Bilayers Demonstrating Spatial Control of Human Mesenchymal Stem Cell Differentiation</td>
<td>Eben Alsberg, Biomedical Engineering</td>
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<tr>
<td>William Qu</td>
<td>Engineering a MGMT mutation in hematopoietic cells with the CRISPR/Cas system to confer resistance to high dose chemotherapy</td>
<td>Paul Tesar, Genetics</td>
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<tr>
<td>Alexander Razavi</td>
<td>Cry Proteins in Genetically Modified Corn: Are they recognized by the human innate immune system?</td>
<td>Christopher King, Center for Global Health and Diseases</td>
</tr>
<tr>
<td>Amanda Slotter</td>
<td>A Photographic Atlas of the Pathological Specimens of the Hamann-Todd Collection</td>
<td>Scott Simpson, Anatomy</td>
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<tr>
<td>Smrithi Sunil</td>
<td>The role of Cluster of Differentiation 14 in the Stability of Chronic Intracortical Recordings</td>
<td>Jeffrey Capadona, Biomedical Engineering</td>
</tr>
<tr>
<td>Nicholas Tatnall</td>
<td>Full field deformation mapping for the quantification of mesoscale deformation mechanisms</td>
<td>Jennifer Carter, Materials Science and Engineering</td>
</tr>
<tr>
<td>Riley Tedrow</td>
<td>A Targeted Taxa Insect Inventory of Three National Parks of Rwanda</td>
<td>Gavin Svenson, Biology</td>
</tr>
<tr>
<td>Kathrina Thede</td>
<td>Sodium potassium 2 chloride cotransporter activity in summer and winter adapted teleosts</td>
<td>Jeffrey Garvin, Physiology and Biophysics</td>
</tr>
<tr>
<td>Daniel Villamil</td>
<td>Halogen-free Flame Retardation of Polymeric Materials with High Performance and their Basic Scientific Issues</td>
<td>David Schiraldi, Macromolecular Science and Engineering</td>
</tr>
<tr>
<td>Kevin Wang</td>
<td>Modeling the kinematics of the odontophore in Aplysia californica</td>
<td>Hillel Chiel, Biology</td>
</tr>
<tr>
<td>Zachary Williams</td>
<td>Lithospheric Folding on Mercury</td>
<td>Steven Hauck, Earth, Environmental, and Planetary Sciences</td>
</tr>
<tr>
<td>Xiaoni (Monica) Zhao</td>
<td>Metabolic Fate of 4-hydroxynonenal-modified Proteins</td>
<td>Guofang Zhang, Nutrition</td>
</tr>
<tr>
<td>Student</td>
<td>Project Title</td>
<td>Faculty</td>
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<tr>
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</tr>
<tr>
<td>Boluwatito Abraham</td>
<td>Characterizing a novel FoxO-dependent neurotrophic pathway that controls plasticity in Drosophila melanogaster</td>
<td>Heather Broihier, Neurosciences</td>
</tr>
<tr>
<td>Alan Burke</td>
<td>Ultrasound and Nanobubbles: Imaging, Targeting, and Treating Cancer</td>
<td>Agata Exner, Radiology</td>
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<tr>
<td>Dean Gabay</td>
<td>Development of antivirulence treatments against Multidrug-Resistant Acinetobacter baumannii</td>
<td>Menachem Shoham, Biochemistry</td>
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<td>Jonathan Hess</td>
<td>Role of WWTR1-CAMTA Fusion Protein Domains in the Pathogenesis of Epithelioid Hemangioendothelioma</td>
<td>Brian Rubin, CCF Molecular Genetics</td>
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<td>Firaas Jadaan</td>
<td>Understanding the Reaction Mechanism by which the Folic Acid Photoproduct, 6-Carboxypterin, Damages DNA</td>
<td>Carlos Crespo-Hernández, Chemistry</td>
</tr>
<tr>
<td>Shyam Kotak</td>
<td>Identifying Patients Uncharacterized Brain Tumor Samples through Network Biology Tools Gradient of Phosphorylation of Cardiac Myosin Binding Protein C in Mouse Heart Model Measuring the Instability of the Human Prion Protein Gene Octarepeat Region in Neuronal Cells and Human Brain Exploring the interactions between proteins FtsN and FtsB or FtsL in E. coli cytokinesis Activation of Rac1 by Semaphorin3C Promotes Survival and Invasion of Glioblastoma Initiating Cells Elastomeric Nanocomposites from OMA and GelMA hydrogels A Preliminary Look at the Effects of Individualized Fortification of Breast Milk for Very Low Birth Weight Infants Analysis of Structural Stability in DNA and RNA Through High-Throughput Sequencing Optical Coherence Tomography Based Assessments of the Microcirculation Platelet-inspired Technology for Ex Vivo Capture of Circulating Tumor Cells</td>
<td>Gurkan Bebek, Center for Proteomics and Bioinformatics Julian Stelzer, Physiology and Biophysics Carlos Crespo-Hernández, Chemistry Piet de Boer, Molecular Biology Jennifer Yu, Radiology Eben Alsbeg, Biomedical Engineering Sharon Groh-Wargo, Nutrition Michael Harris, Biochemistry Michael Jenkins, Pediatrics Anirban Sen Gupta, Biomedical Engineering</td>
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<tr>
<td>Student</td>
<td>Project Title</td>
<td>Faculty</td>
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<tr>
<td>Madeline Atkins</td>
<td>Tephrachemical fingerprint analyses of volcanic tuffs of Afar, Ethiopia to determine paleoecology and paleoclimate of early humans</td>
<td>Beverly Saylor, Earth, Environmental, and Planetary Sciences</td>
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<tr>
<td>Francis Cassidy</td>
<td>Synthesis and Polymerization of Substituted Oxazine Ring of Polybenzoxazine</td>
<td>Hatsuo Ishida, Macromolecular Science and Engineering</td>
</tr>
<tr>
<td>James Dempsey</td>
<td>Preparation of a High Performance Cross-linking Polyimide for Possible Use in Natural Gas Purification Membranes</td>
<td>Hatsuo Ishida, Macromolecular Science and Engineering</td>
</tr>
<tr>
<td>Justin Evaristo</td>
<td>Perception Studies of New Lighting Technology based on Light-Emitting Diodes</td>
<td>Roger French, Materials Science and Engineering</td>
</tr>
<tr>
<td>Cara Fagerholm</td>
<td>Degradation of UV Stabilized PET for Solar Films and PV Module Backsheets</td>
<td>Roger French, Materials Science and Engineering</td>
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<tr>
<td>Justin Fada</td>
<td>Thermal Image Analytics of Micro-Inverters used for PV Modules</td>
<td>Christopher Bond, University Farm</td>
</tr>
<tr>
<td>Timothy Flinn</td>
<td>Creating Alternative Energy with Wind Power</td>
<td>Christopher Bond, University Farm</td>
</tr>
<tr>
<td>Rebecca Haluska</td>
<td>The Availability of Soluble Magnesium in Soil Treated with Natural-Source Fertilizer As Compared to Commercial Fertilizer</td>
<td>Matt Gray, City of Cleveland, Sustainability Office</td>
</tr>
<tr>
<td>Laura Hurst</td>
<td>Education and Outreach for Sustainability in the City of Cleveland</td>
<td>Matt Gray, City of Cleveland, Sustainability Office</td>
</tr>
<tr>
<td>Kevin Laverty</td>
<td>Optimization of Organic Photovoltaic Materials: Films and Interfaces</td>
<td>Kenneth Singer &amp; Ina Martin, Physics</td>
</tr>
<tr>
<td>Hana Litwin</td>
<td>Analyzing Green Roofs in Cleveland</td>
<td>Matt Gray, City of Cleveland, Sustainability Office</td>
</tr>
<tr>
<td>Taylor Nguyen</td>
<td>Electrode Materials Development for Large Scale Production of Organic Light Emitting Diodes</td>
<td>Mohan Sankaran, Chemical Engineering</td>
</tr>
<tr>
<td>Kelly Peterson</td>
<td>Tailored Substitution of Perylene Diimide for Controlled Self Assembly</td>
<td>Emily Pentzer, Chemistry</td>
</tr>
<tr>
<td>Jordan Swisher</td>
<td>Immediate Economic Impacts of Moratoriums on Gas and Oil from Shale Deposits On Publicly Traded Corporations; Changes in Donations and Payments made</td>
<td>Emily Pentzer, Chemistry</td>
</tr>
<tr>
<td>John Turner</td>
<td>To &quot;Ethical Investors&quot;</td>
<td>Justin Gallagher, Economics</td>
</tr>
<tr>
<td>Daniel Varghai</td>
<td>Sustainable Bio-based Nanocomposites for Green Energy Applications</td>
<td>Ica Manas-Zloczower, Macromolecular Science and Engineering</td>
</tr>
<tr>
<td>Elan Weiss</td>
<td>Weathering Study of the Degradation of poly(methyl methacrylate) Clear Coat</td>
<td>Roger French, Materials Science and Engineering</td>
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</tbody>
</table>
### Academic Year Undergraduate Research Internship Spring

#### Spring 2014 Participants

<table>
<thead>
<tr>
<th><strong>Student</strong></th>
<th><strong>Project Title</strong></th>
<th><strong>Faculty</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivia Dahm</td>
<td>Modeling of graphite-diamond interface: relevance for diamond nucleation</td>
<td>John Angus, Chemical Engineering</td>
</tr>
<tr>
<td>Anise Grant</td>
<td>Use of Group Contribution Theory in Surfactant Selection for Cellulose Nanowhiskers-Epoxy Nanocomposites</td>
<td>Ica Manas-Zloczower, Macromolecular Science and Engineering</td>
</tr>
</tbody>
</table>

#### Case Western Reserve University

**Formal Summer Programs**

**Research & Creative Endeavors**

CWRU has a number of formal programs across campus. Information about these and other programs can be linked from the SOURCE website: [http://www.case.edu/provost/source/opp/funding.htm](http://www.case.edu/provost/source/opp/funding.htm)

- Academic Careers in Engineering & Science (ACES+)
- Case’s Rising Engineers and Technological Entrepreneurs (CREATE)
- Center for AIDS Research Minority HIV Research Training Program (MHRTP)
- Center for Layered Polymeric Systems (CLiPS)
- Center for Proteomics and Bioinformatics (PRISM)
- Center for Stem Cell and Regenerative Medicine Undergraduate Student Summer Program (ENGAGE)
- Emergency Medicine Research Division at UH
- Experiential Learning Fellowships – College of Arts and Sciences
- Heart, Lung & Blood Minority Research Training Program
- Hematology Training Program
- Origins
- Physiology and Biophysics NSF-REU
- Provost’s Summer Undergraduate Research Grant (P-SURG)
- Rainbow Babies and Children’s Hospital
- SOURCE Summer Research Program
- Summer on the Cuyahoga
- The Summer Medical & Dental Education Program
- Summer Undergraduate Research in Energy Studies (SURE)
- Summer Undergraduate Research in Pharmacology (SURP)
- Summer Undergraduate Research in Physiology (SURP)
- The Wellman Hill Political Science Internship
Please note:
Research project titles, student names, mentor names and abstracts were submitted by the student researcher. The SOURCE office cannot ensure the accuracy or omission of information submitted for publication.
Support of Undergraduate Research and Creative Endeavors

Case Western Reserve University
Sears 451
10900 Euclid Avenue
Cleveland, Ohio 44106-7212

http://www.case.edu/provost/source/intersections/intersections.html