20th Annual Student Research & Community Engagement Symposium

Tuesday April 18th
2017

UMASS Lowell
Inn & Conference Center
12-4 PM

www.uml.edu/StudentResearchSymposium

Artwork by Samantha Anthony
TUESDAY, APRIL 18, 2017, 12:00 P.M. – 4:00 P.M.
UMASS LOWELL INN & CONFERENCE CENTER

AGENDA

11:00 a.m.  Student Check-In for Poster Presentation Competition
            Grand Ballroom Foyer, 1st Floor

11:15 a.m.  Judging Panel Check-In
            Junior Ballroom, 2nd Floor

12:00 -2:00 p.m.  Poster Presentation Competition
            First Floor:
              • Lower Locks Boardrooms 1 & 2
              • Lowell Boardroom
            Second Floor:
              • Hamilton Rooms 1, 2, 3
              • Tsongas Boardroom
              • Junior Ballroom

1:30 p.m.  Student Check-In for Poster Session
            Grand Ballroom Foyer, 1st Floor

2:00 p.m.  Poster Session and Reception
            Grand Ballroom, 1st Floor

2:30 p.m.  Welcome & Opening Remarks
            • Vice Chancellor for Research & Innovation
              Julie Chen, Ph.D.
            • Vice Provost for Student Success
              Julie Nash, Ph.D.

3:15 p.m.  Poster Presentation Winners Announced

3:45 p.m.  Fan Favorite Winners Announced & Closing Remarks

POSTER SESSION & RECEPTION
All posters are displayed in the Grand Ballroom and are arranged by college. A poster location handout is available at the registration table.

JUDGING SESSIONS
Posters will be judged by panels of 3-4 judges. Judging will occur simultaneously in breakout rooms on the first and second floors, accessible via the main lobby of the hotel.

FAN FAVORITE VOTING
Attendees have the opportunity to vote for a poster “Fan Favorite”. Please take time to review all of this year’s posters and then head to the voting table in the Grand Ballroom next to the stage to cast your vote! Voting will close at 3:30 p.m. with winners announced at approximately 3:45 p.m.
JUDGING PANEL CHECK-IN
The Judging Panel check-in will be held in the Junior Ballroom. From the hotel lobby, take the stairwell on the right, which is just after the hotel registration desk (and around the corner). Once at the top of the stairs, take a left, and continue to the very end of the hallway through the glass doors. The Junior Ballroom will be on your left.

STUDENT CHECK-IN FOR THE POSTER PRESENTATION COMPETITION & THE POSTER SESSION
The registration/check-in table is in the foyer just outside of the Grand Ballroom located on the first floor of the Inn & Conference Center. From the hotel lobby, take the hallway on the left, just before the hotel registration desk.

POSTER PRESENTATION COMPETITION
The competition will be held in small group rooms located on the first and second floors of the hotel. A list of presenters and their room location is available at the registration table located in the foyer just outside of the Grand Ballroom and will be posted outside of each breakout room.

- First Floor:
  - Lower Locks Boardroom 1, 2, and the Lowell Boardroom. From the hotel lobby, go past the registration desk and take a right. You will see a small seating area. The corridor to the left of the seating area will lead you to the Lower Locks rooms and the Lowell boardroom.
• Second Floor
  o The Hamilton Rooms, Tsongas Boardroom, and the Junior Ballroom. From the hotel lobby, take the stairwell on the right, which is just after the hotel registration desk (and around the corner). Once at the top of the stairs:
    ▪ Hamilton Rooms 1, 2, and 3 will be on your left
    ▪ Tsongas Boardroom will be on your right.
    ▪ Junior Ballroom is at the very end of the hallway, through the glass doors. Once through the glass doors, take the hallway on your right. The Junior Ballroom will be on your left.

**POSTER SESSION/RECEPTION**
All posters will be displayed in the Grand Ballroom, which is located on the first floor of the Inn and Conference Center. From the hotel lobby, take the hallway on the left, just before the hotel registration desk. Welcoming Remarks, Poster Presentation Winners & Fan Favorite Winners will be announced during the Poster Session/Reception.
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Defendants facing felony prosecutions avoid trial through plea-bargaining in 95% of cases. In sexual offense cases, disposition is attained by plea agreement for 46% to 82% of defendants (Cross et al., 1995; Walsh et al., 2010). Similar to violent offense defendants, sexual offense defendants often plea to a less severe crime, including non-sexual crimes (Johnson, 2009; Letourneau et al., 2012), and public opinion on sex offender prosecution has held that these offenders are treated too leniently by the justice system (Levenson et al., 2007; Quinn et al., 2004). The current project compared public court records for sexual crime indictments (23.67%) with other violent crime indictments (76.33%) within Essex (n = 201), Suffolk (n = 332), and Hampden (n = 258) counties from January 2015 through December 2015. From each record we collected defendants' age, information about their charges, case proceedings, and the parties to the proceedings. For resolved cases we documented sentencing outcomes and whether a plea agreement occurred. We conducted multilevel regression analyses to address three specific research questions: (a) do sex crime defendants differ from other violent defendants in plea frequency; (b) which factors account for likelihood of a plea outcome; and (c) the impact of prosecutorial and judicial discretion on these outcomes. We expect the results of this study to inform practice in the use of plea agreements and their role in the criminal justice system.

Boulia, T., Seagle, C.

Autism Studies

USE OF A CHANGING CRITERION TO INCREASE TABLE WORK FOR A CHILD WITH AUTISM SPECTRUM DISORDER

Advisor: Rocío Rosales
Poster Location: FAHSS 2

Changing criterion designs have been used to increase desired responses and tasks in children with autism spectrum disorder (ASD; Fienup & Doepke, 2008). This project focused on evaluating the effects of a changing criterion design to increase the amount of time required to spend on work related tasks without maladaptive behaviors for an 8-year-old boy with ASD. Examples of challenging behavior include snapping pencils, hitting staff and ripping the worksheet. The procedure consisted of implementation of a changing criterion design within two settings; the participant's home setting and a treatment center for children with ASD. During baseline the participant was required to correctly engage in work related tasks until maladaptive behaviors occurred. Based on baseline data, the criterion in place once training began was for the participant to engage in work tasks for up to one minute with no occurrences of challenging behavior. The criterion was gradually increased in one-minute increments (i.e., one minute, two minutes, three minutes, etc.). Appropriate behavior was reinforced with token delivery and access to play on an iPad. Results to date indicate that by slowly increasing the amount of time required to spend on work tasks before delivery of a reinforcer, the participant was successful in completing these tasks with no or fewer instances of maladaptive behaviors. The information gathered from this project may serve to inform future research and best practice for teaching children with ASD.

Keywords: changing criterion designs, work tasks, maladaptive behaviors, ASD
Burgett, J., Deutsch, A.

*Autism Studies*

**USE OF A CHANGING CRITERION DESIGN TO INCREASE DURATION OF APPROPRIATE PLAY AND DECREASE NONCOMPLIANCE IN A CHILD WITH AUTISM SPECTRUM DISORDER**

*Advisor: Rocio Rosales*

*Poster Location: FAHSS 3*

The purpose of this project was to determine the effects of a changing criterion design (Kazdin, 1982) on the duration of appropriate play and frequency of challenging behavior displayed by a preschool aged child diagnosed with Autism Spectrum Disorder (ASD). The behaviors targeted for reduction included running around the playground equipment and touching other students with his hands or other body parts when not asked to do so. At the start of recess, the instructor gave two verbal reminders to the student (i.e., "Hands to self" and "First playground, then bikes or cars"). A differential reinforcement of other behavior (DRO) procedure was implemented which consisted of setting a timer for a predetermined amount of time; if the participant engaged in any challenging behavior, the timer was reset. If the student played appropriately and did not engage in challenging behavior for the predetermined time, the behavior was reinforced and the student was allowed access to a preferred activity for the remainder of recess. Each session lasted between 15 to 20 minutes. The amount of time the student was required to play appropriately was gradually increased in the following manner: 3, 5, 7, and 10 minutes. The criterion for increasing the duration required for appropriate play was three consecutive trials of meeting the previous criterion. Results to date indicate that the student met the initial duration, but has not yet met the criterion to move on to the next level. Progress throughout the project and possible confounding variables will be discussed.

Key words: autism spectrum disorder, changing criterion design, noncompliance

Candido, T.D., Johnson, M.

*Autism Studies*

**EFFECTS OF A DRI PROCEDURE TO INCREASE PERSONAL SAFETY AND REDUCE WANDERING BEHAVIOR IN AN ADULT WITH AUTISM SPECTRUM DISORDER**

*Advisor: Rocio Rosales*

*Poster Location: FAHSS 4*

Previous research has shown that differential reinforcement of incompatible behavior (DRI) procedures can decrease problematic behavior in individuals with developmental disabilities (Spira, Koven, & Edelstein, 2004). The present project directly evaluated the effect of DRI to increase remaining in a designated area while reducing wandering behavior of a 34-year-old male with Autism Spectrum Disorder (ASD). Wandering was defined as any occurrence of being outside of the assigned cubicle (classroom) without staff permission for any duration of time. The DRI procedure involved reinforcing any behaviors that were incompatible with the problem behavior while withholding reinforcement for the wandering behavior. Initially, the DRI procedure was implemented on a fixed-interval schedule of three minutes. The interval was reset with any occurrence of the wandering behavior. Reinforcement during this intervention was crystal light water. A reversal design was employed to observe the effects of the DRI procedure compared with baseline. A changing criterion design was also employed to evaluate effects of the DRI procedure on wandering behavior while increasing the fixed-interval or time elapse to receive reinforcement. Results to date suggest that the DRI procedure was effective to decrease wandering behavior.
The outcome was socially significant, as individual safety and wellness also increased. Implications of and future directions related to this procedure will be discussed.

**Keywords:** differential reinforcement, reversal design, changing criterion design, wandering, autism spectrum disorder

**Coombs, A., Ciavarri, L.**  
*Autism Studies*  
**EVALUATION OF A GROUP CONTINGENCY PROGRAM TO INCREASE STAFF INPUT OF CLIENT DATA AT A HABILITATION DAY PROGRAM FOR ADULTS WITH AUTISM SPECTRUM DISORDER**  
*Advisor: Rocío Rosales*  
*Poster Location: FAHSS 5*

Group contingencies are behavior management programs that are effective in addressing the behaviors of one or more people, and provide reinforcement or rewards for the group when behavior goals are met (Cooper et al., 2007). In this project, the use of a group contingency was utilized with staff at an adult day program to increase behavior of inputting client data on a weekly basis. The client data was evaluated at weekly meetings by clinical supervisors who made decisions about clients' progress and changes to treatment programs. A group contingency was utilized because they have been demonstrated to be effective when individual contingencies are deemed impractical. They are time efficient and allow for peers to serve as change agents (Cooper et al., 2007). Fourteen classrooms at the day program participated, with a total of thirty-five staff members. A preference assessment determined that a lottery prize of access to a van with a $15 stipend for an outing with their class would be delivered as a reinforcer for meeting the weekly client data entry criterion. All classrooms who met the weekly goal were entered into the lottery and one classroom was designated as the winner each week. An ABA withdrawal design was implemented to assess the impact of the group lottery contingency. Post implementation maintenance probes were conducted six weeks after the intervention ended. Results showed improvement in input of client data for only half of the classrooms. Limitations will be discussed, as well as ideas for future research in this area.

**Keywords:** interdependent group contingencies, dependent group contingencies, staff performance

**Simkevich, K., Pominville, E.**  
*Autism Studies*  
**VIDEO-BASED PREFERENCE ASSESSMENT COMPARISON-WITH AND WITHOUT ACCESS FOR A CHILD WITH AUTISM SPECTRUM DISORDER**  
*Advisor: Rocío Rosales*  
*Poster Location: FAHSS 6*

Preference assessments can help identify potential reinforcers, which can increase the likelihood of successful treatment (Ringdahl et al., 1997). Video-based preference assessments (VBPA) are valuable because they can present features of stimuli that a picture cannot capture. Recent research has suggested that VBPA without access to the chosen activity could yield the same results as a VBPA with access (Brodhead et al., 2017). This can reduce the amount of time it takes to conduct the assessment. The purpose of this project was to compare the preference hierarchies from a VBPA with access to the stimulus and a VBPA without access for a 6-year-old child with autism spectrum disorder (ASD). Five activities were chosen based on recommendations from the child's supervising clinician. A pre-study video-to-activity matching assessment was first conducted to ensure the videos accurately represented the activities to be presented. Following the pre-assessment, the child was given a break and the first
preference assessment began. A multiple stimulus without replacement (MSWO)-VBPA with no access to stimuli was conducted, followed by the MSWO with access to stimuli. Videos of the activities were shown on the screen of an iPad simultaneously and continuously until the child made a choice. The child was then either given access to the activity or the next trial began. Results of each assessment were ranked from 1 (High Preference) to 5 (Low Preference). The resulting hierarchies and duration of each assessment were compared. Results will be discussed in terms of the advantages of these assessments in practice.

Keywords: video-based preference assessment, preference hierarchy, with and without access

Sullivan, E., Kirby, E.
Autism Studies
THE USE OF A STIMULUS PAIRING PROCEDURE TO INCREASE COMPLIANCE ACROSS STAFF AND ENVIRONMENTS IN AN INDIVIDUAL WITH AUTISM
Advisor: Rocío Rosales
Poster Location: FAHSS 7

Developing positive relationships is vital to establish staff members and their attention as secondary reinforcers for their clients. For individuals with autism spectrum disorder (ASD), working with a variety of staff and in varied environments where target skills can be practiced, helps to promote generalization and maintenance of an assortment of essential skills. However, individuals with ASD also often display clear preferences for specific staff members. This can lead to higher rates of task completion with these staff members compared to lesser preferred staff (Jerome & Sturmey, 2008). The high prevalence of challenging behavior in individuals diagnosed with ASD has been evaluated in prior studies, which have demonstrated success in pairing attention delivered by staff who are designated as non-preferred for a learner with tangible items that are highly preferred for that learner (Jerome & Sturmey, 2014). This project utilized a stimulus pairing procedure using only preferred and non-preferred staff to increase the compliance behavior of a single participant, an 18-year-old female with ASD. Two types of staff pairing were used to increase participant compliance: 1) a preferred staff member completed the routine of walking into school with a non-preferred staff member as on observer, and 2) the primary and observer roles of the staff were reversed. After successful completion of the routine during three sessions under each type of pairing the non-preferred staff successfully completed the routine alone free of participant non-compliance across three sessions. Practical considerations of this procedure will be discussed in light of these findings.

Keywords: stimulus pairing, staff pairing, autism spectrum disorders

Whitlow, H., Walk, E.
Autism Studies
USE OF A TOKEN ECONOMY AND DIFFERENTIAL REINFORCEMENT TO INCREASE APPROPRIATE SOCIAL RESPONDING AND INITIATIONS IN A YOUNG ADULT WITH AUTISM SPECTRUM DISORDER
Advisor: Rocío Rosales
Poster Location: FAHSS 8

Token economies have been empirically validated to help increase alternative appropriate behaviors for individuals with developmental disabilities (Iwata & Bailey, 1974). The purpose of the present project was to evaluate the efficacy of using a token economy with differential reinforcement of alternative behavior (DRA) to increase social exchanges without occurrences of vocal stereotypy in a 23-year-old
male with Autism Spectrum Disorder (ASD). Vocal stereotypy was defined as any instance of non-contextual speech, including singing, repetitive phrases unrelated to the current conversation or situation, grunting, and/or yelling. Using a changing criterion design, this project evaluated the percentage of appropriate independent social responses and initiations without vocal stereotypy before and following a training program that consisted of reading the participant a set of rules to indicate when to engage in "TV talk". Reinforcement in the form of token delivery and social praise was provided when the participant engaged in an appropriate social responses and/or initiations. Tokens were initially delivered on an FR-3 schedule of reinforcement and the response requirement was gradually increased in accordance with the changing criterion design. Mastery criterion for advancement was 80% appropriate responding across three consecutive sessions. The participant was given free access to engage in vocal stereotypy for 15 min. in the morning and afternoon, and also during non-academic free-choice activities. Sessions took place three days per week for the duration of the time the participant attended a habilitation day program. Results to date indicate appropriate social responding has improved as a result of the training.

Keywords: vocal stereotypy, token economy, differential reinforcement, autism spectrum disorders

Zylkuski, N., Arcus, D.
Autism Studies
EXECUTIVE FUNCTION, THEORY OF MIND, AND RISK TAKING IN COLLEGE-AGED MALES WITH AUTISM SPECTRUM DISORDER
Advisor: Doreen Arcus
Poster Location: FAHSS 1

There is mixed evidence regarding the overrepresentation of people with Autism Spectrum Disorder (ASD) in the criminal justice system (Cheely, et al., 2012; King & Murphy, 2014). This research examines a related and understudied question: whether aspects of autism increase risk of involvement in the criminal justice system; specifically, whether executive function and theory of mind are associated with engagement in risk behaviors, and involvement with disciplinary and criminal justice systems among college-aged males with ASD. This study is an extension Matar and Arcus (2016), who examined this question in a group of largely neurotypical college-aged males and found that high autism scores and poor executive function predicted less proneness to engage in risk, but that autism scores contributed to a higher probability of law involvement. In the current study, college-aged males with ASD or Asperger Syndrome were tested on measures of autistic tendency, executive function, theory of mind, and proneness to risk-taking behavior. Multiple regression analyses will examine the relationships between these variables to test the hypothesis that autism scores will be associated with lower self reported risk behaviors, while poor executive function and theory of mind will be related to higher.

Vlahakis, J.
Community Social Psychology
CONSTRUCTIONS OF HELEN KELLER: WHERE ARE WE NOW AND WHERE DO WE GO FROM HERE?
Advisor: Cheryl Najarian-Souza
Poster Location: FAHSS 32

Constructions of Helen Keller: Where are we now and where do we go from here? Advisor: Dr. Cheryl Najarian Souza Department: Sociology Abstract: When thinking of the concept of disability, one cannot tell the American story without mentioning the life story of Helen Keller. Although Keller is best known for "overcoming" her "disabilities" of being both deaf and blind, few know the truth behind her life story. As Crow (2000) has argued, Keller is seen as a "miracle child," who triumphed over adversity, but she
was in fact a writer, radical activist, suffragette, and Socialist who is still fixed in the public imagination as an "eternal child." Using a literature review and reading historical books on her life, this project will identify the themes and commonalities of how sociologists and disability studies scholars have written about her life in contemporary times. In an age where people with disabilities are still ruthlessly attacked, mocked, and stereotyped even, most recently, by the now President of the United States, the topic of this research is incredibly salient when thinking of social justice. Major questions to be addressed are as follows: How do contemporary scholars study Helen Keller? What might the ways in which they study her life contribute to the stereotype of what it means to be disabled in American culture? What are the ways in which scholars also resist writing about her as someone who is disabled and who needed to "overcome" her disabilities? Where do we go from here?

Nader, E.
*Criminology & Criminal Justice Studies*

**THE EFFECTS OF ADMINISTRATIVE CONTROLS ON INMATE MISCONDUCT**
*Advisor: Kelly Socia*
*Poster Location: FAHSS 10*

Inmate misconduct is an issue that policy makers, prisons, and researchers continue working to reduce. Growing inmate populations, limited correctional resources, and concerns for inmate safety drive the desire to prevent inmate misconduct. Among the effects of misconduct are physical injuries, emotional trauma, and increased sentencing. Researchers continue to strive to empirically understand the causal structures driving inmate misconduct and victimization in an effort to prevent future occurrences. Building on an important area of criminal justice research, this paper assesses individual and institutional risk factors of misconduct while incarcerated, specifically focusing on the effects of administrative controls on influencing inmate misconduct. Multilevel modeling was conducted using data from the National Survey of Inmates in State and Federal Correctional Facilities (2004). Results indicate that individual level factors, including age, sex, race/ethnicity, history of mental health diagnosis, history of violent offending, and employment history are all significant predictors of inmate misconduct. However, mixed results were found for administrative controls, with coercive controls increasing the likelihood of inmate misconduct and remunerative controls either increasing the likelihood of inmate misconduct or having no effect. The implications of these findings and future directions for research are discussed.

Pierribia, J., Cote, T., Thibodeau, D., San Clemente, N., Keenan, J.
*Criminology & Criminal Justice Studies*

**OPERATION250: A COUNTER VIOLENT EXTREMISM ORGANIZATION**
*Advisor: Neil Shortland*
*Poster Location: FAHSS 9*

Countering violent extremism (CVE) refers to a holistic preventative approach to counterterrorism which seeks to prevent individuals from engaging in, or materially supporting, ideologically motivated violence (White House, 2015). Such efforts seek to take "prevention" up-river, focusing resources on preventing the roots causes for involvement in terrorism rather than efforts to identify, arrest and convict those who have already begun to engage in terrorist actions. As part of a Department of Homeland Security (DHS) competition, undergraduate students at the University of Massachusetts Lowell created "Operation 250" an online and in-class CVE campaign that seeks to educate children (and empower their central gatekeepers; teachers and parents) about the on-going issues of online safety and the risks of encountering extremist material online. The Op250 campaign was a finalist for the DHS Peer-to-Peer competition and has since secured a series of investments with a view of developing Op250.
To date, many CVE programs have been ineffective. By focusing on countering the ideological nature of an extremist organization, or the potential consequences of being involved with such a group, they often ostracize their target audience, minimizing the impact that they can have. Op250 takes a different approach, focusing on the need for upstream education with a view to changing the type of risky online behavior that can lead people to encountering violent extremist material, or individuals which is a well-established risk factor for later involvement in violent extremism.

Nyarko, J., Cluverius, J., Serna, R.
Economics & Political Science/Spanish
Emerging Scholars
SENTIMENT ANALYSIS, PARTY POLITICS, AND PRESIDENTIAL PRIMARIES
Advisor: John Cluverius
Poster Location: FAHSS 18

After the 2016 presidential election, the final result was unexpected based on polling data. Voters take some cues from political elites, so we look for changes in sentiment on social media among elected officials in two key time periods during the 2016 presidential election: one which negatively affected Trump, and one which negatively affected Clinton. Sentiment involves the overall general feeling or propensity to feel either positively or negatively judging from an individual's statements. This is performed from sifting to find certain words that would explain the context. The ability to assess one's sentiment is often an optimal indicator on if that sentiment is likely to shift or remain consistent. In our research we use the Twitter accounts from US legislators and score the sentiment with a certain numerical value. After a difference of means statistical test of the sentiment before and after each event was performed to discern if there is a change in overall opinion for either candidate where we could possibly infer there voting behavior.

Dingle, E.
English (Creative Writing)/Sociology
COMPLEX CARBS FOR COMPLEX CARE: THE VIABILITY OF AMARANTH FOR COMPLEMENTARY FEEDING AND MARKETING METHODS IN LOW- AND MIDDLE-INCOME COUNTRIES
Advisor: Leland Ackerson, Alexandre, Lambert, Anne, Golaz
Poster Location: CHS 12

Malnutrition is, directly or indirectly, the leading cause of all childhood deaths, with a significant cause of malnutrition in young children being inappropriate feeding practices. While breast milk is a crucial source of nutrition for newborn infants, its importance begins to wane for children after six months of age. Amaranth—a nutritionally dense grain—has shown potential as a public health intervention for combatting malnutrition, due to its diverse growing range and low production costs. This research study provides a literature review of amaranth marketing efforts in varying contexts, with added recommendations, in order to provide fodder for an expanded study on how one might market amaranth into the complementary feeding diets of infants aged six to 24 months. Special focus is placed on studying the efforts in East Africa and Mexico.
Fogarty, J., Hochman, C., Durant, B.
*English (Literature)*
**SOUTHEAST ASIAN DIGITAL ARCHIVE - THE HISTORY AND PICTURES OF LOWELL'S ASIAN COMMUNITY**
*Advisor: Sue Kim*
*Poster Location: FAHSS 14*

A picture is worth a thousand words. It's an old phrase, but it remains relevant today in the ever growing world of digitization. Separately, a photo of a family, a child's birthday, the foundation of a local temple are isolated snapshots into individual people's lives. Together, they can reveal the experiences and integration of Lowell's expansive Southeast Asian community. Working with several groups, the Indochinese Refugee Foundation, the Legacies of War Lao Americans, and other nonprofit organizations, we're working on compiling evidence of Lowell's Southeast Asian community into a comprehensive, digital archive. By digitizing photos from attics, basements, walls and desks, we're working to proudly display the history and tradition of over 20,000 of Lowell's Asian inhabitants, who's families have settled here after experiencing war and trauma in their native homeland, yet still managed to create a life here in our city. Together, formulating these individuals pieces into a single comprehensive narrative can benefit both scholars of Language, Sociology, and Cultural Studies as well as championing the proud families and people into an archive that will last generations.

Moore, C., Lynch, P.
*English (Journalism & Professional Writing)*
**SAYDANAR COMMUNITY CENTER ADULT ENGLISH & CITIZENSHIP**
*Advisor: Sue Kim*
*Poster Location: FAHSS 13*

This project has taken place during the spring 2017 semester at the SayDaNar Community Center in downtown Lowell. Participation in this project took place over the course of several Saturday mornings. This project has involved the design and production of class materials and schedules for group English and Citizenship classes for adult Burmese refugees. The crux of this project has been developing effective teaching and collaboration strategies between three student volunteers and a supervising teacher. Over the course of the project, issues of experience and needs of the population served have required a stratified approach to the materials used in class. Initially, student volunteers were required to work independently of the supervising teacher. Student teachers have provided assistance for two levels of English Language Learners. The first level focusing mostly on grammar and vocabulary building, with a strong influence from the N400 questions for prospective citizens. The upper level class focuses on sophisticated vocabulary building, with a much stronger focus on requirements to complete a successful citizenship approval.

Student volunteers have gained invaluable experience working with a refugee population. Operating within a student/teacher dichotomy has produced a firm grasp on the importance of communication, as well as decision making in order to communicate complex ideas between populations who do not utilize the same language. This project has been completed in order to satisfy a service-learning requirement for Asian-American Literature. Because of the material covered in the class, working directly with refugees from South East Asia has added a layer of understanding to the history and cultural identity of the refugee population in our own community.
Nizami, S., Weinstein, Y., Smith, M.

*English/Psychology*

**TEACHING STUDENTS ABOUT EFFECTIVE STUDY STRATEGIES**

*Advisor: Yana Weinstein*

*Poster Location: FAHSS 21*

There are countless studies on effective study strategies, but very few on effective methods of dispensing this knowledge to students. This study sought to test the effectiveness of videos and posters produced on six scientifically supported study strategies: spaced practice, retrieval practice, elaboration, interleaving, concrete examples, and dual coding. The objective of this experiment was to determine whether the materials increased comprehension of the strategies amongst undergraduate students. In the experimental condition, participants were shown videos and given posters on the six strategies. In the control condition, participants were shown videos and given posters on other scientific topics, rather than the six study strategies. Participants in both conditions were asked to indicate how often they used each strategy, gauge their understanding of the strategies, and describe the strategies in their own words before and after viewing the videos and posters. The results demonstrate that participants in the experimental condition showed an increase in perceived and actual understanding of the strategies. These materials appear to be effective for teaching students about the six study strategies.

Saintius, E., Yoon, C.Y., Tran, T., Martinez, A.

*English (Journalism & Professional Writing)*

**RACISM AND PROGRESSION OF ASIAN AMERICANS**

*Advisor: Sue Kim*

*Poster Location: FAHSS 12*

The poster that I will be presenting is for Asian American Literature class. What I am proposing is the influences of Asian Americans in the United States with Office of Multicultural office (OMA), and other classmates: Abi, Thomas, and Erin. OMA serves all students and staffs relating to various races, ethnicities, and different cultures at UML. As we have four students, we have divided into two groups. Erin and Thomas will be presenting about the influences of Asian Americans and what the influences have changed America over time. I will be focusing on before and after the influences in the US. Another group, Abi and I, will focus on racism and discrimination Asians have endured. Furthermore, they will discuss how Asians have progressed in the US from the past until the present. For our audiences to comprehend our information better, my partners and I will briefly talk about history of various immigrants from different countries, how they have ended up coming to the US, what they had to suffer in their home countries, etc. The goal of the poster is to involve people to any clubs or organizations related to Asians. The further intention is that from this opportunity, people would interact with Asian Americans or people who come from different countries more. I wish this poster would take a role as an ice breaker to many people.

Yunes, E.

*History/Political Science*

**THE CONTRADICTIONS OF PLACE**

*Advisor: Robert Forrant*

*Poster Location: FAHSS 16*

The goal of this project is to explore the development in Lowell of a vibrant anti-slavery movement through research in newspapers and private written accounts. Lowell's economy was booming due to the slave-produced cotton of the south and the demand from the south for the cloth produced in city mills. Despite this economic dependency, Lowell had a significantly large population of abolitionists. The
abolitionist newspaper The Liberator, as well as two Lowell-based newspapers, The Voice of Industry and The Middlesex Standard, often showcased works by female and male mill operators that provide proof of the contributions of these individuals to the cause of abolitionism. Within Lowell, the emergence of male and female anti-slavery societies provided a catalyst for controversy within the city. When these organizations invited prominent abolitionists such as George Thompson to Lowell to speak to them, they were met with organized resistance. Despite this, there were financial efforts to support the Underground Railroad and the national anti-slavery movement. St. Anne's Church and several other Lowell religious institutions became stops on the Underground Railroad and ministers routinely preached against the institution of slavery and its spread. The exploration of this history matters because it helps us to put Lowell and its mill history into a richer, more complex historical context. The research points to the fact that despite Lowell's dependency on slave-produced cotton many of its citizens stood firmly against this heinous institution.

McMillan, T.

Music Studies (Instrumental)
THE ECOSONIC PLAYGROUND
Advisor: Elissa Johnson-Green
Poster Location: FAHSS 17

The EcoSonic Playground challenges students to create large-scale musical instrument structures out of recycled materials. Through the process of design and innovation, students will build on prior knowledge in STEAM (science, technology, engineering, arts and math) areas to learn new architectural skills. The project also meets a need for education in sustainability (using repurposed materials) and focuses on integrating music, design thinking, psycho-acoustics and other integrated disciplines. Our mission includes providing free and open access to musical instrument play to under-served populations. Our team plans to bring the EcoSonic Playground project to 3rd & 4th grade students at the Abraham Lincoln Elementary School, which serves a majority immigrant population. The Lowell public school system shares a total annual music budget of $59,000 dollars - with this in mind, we intend to provide the structures and curriculum at no cost. We aim to work with the school faculty to enrich the programs in place through providing open and free access to musical instrument play. Thus far, we have prepared findings on the process of project based learning through our own experience creating these structures. We are excited to collect foundational data on this project where we will compare musical interaction of elementary school children and college aged-students.

Borrero, M.

Psychology/Criminal Justice
USING CHILDREN'S DRAWINGS TO PROBE BELIEFS ABOUT CHILDREN IN FOSTER CARE
Advisor: Doreen Arcus
Poster Location: FAHSS 22

Our impressions of people influence how we respond and interact with them, and research shows that we often form impressions based on very little information. Previous work in our lab examined impressions of children's drawings when the drawings were labelled as created by children in foster care or children not in care, and found that participants who had some connection to foster care (i.e. knew someone in care, had themselves been in care) rated children in care to be less happy, more socially maladjusted, and more likely to have problems in school based on their drawings. However, participants without connection to the foster care system rated children in care only as less happy. As a partial replication, the current study was designed to examine people's impressions of children in foster care as a function of
their connection to the foster care system. In addition, a brief assessment of participants' general knowledge of the foster care system was developed and used to further identify sources of variability in impressions. In a within subject design, 121 undergraduates rated nine original drawings by kindergarten children for traits related to affect, self esteem, sociability, and school readiness. One-third of the drawings, counterbalanced across participants, were subtly labelled as produced by a child in foster care. Results will be presented in the context of previous findings and what is known about children in care.

Byrne, E., Hillier, A., Goldstein, J., Tornatore, L.  
Psychology/Education  
WHAT IS THE LONG TERM IMPACT OF MENTORING FOR UNIVERSITY STUDENTS WITH DISABILITIES  
Advisor: Ashliegh Hillier  
Poster Location: FAHSS 27

Increasing numbers of students with disabilities are entering higher education. Their success can be jeopardized by organizational, social/emotional, and academic challenges if appropriate supports are not in place. Mentoring as an intervention strategy has received increasing attention in the literature. Here we report the data from a mentoring program for UMass Lowell students registered with Student Disability Services, in particular results from a one-year follow-up evaluating the long-term impact of mentoring. Over 50 students have participated in the mentoring program, and 24 participants responded to the one-year follow-up questionnaire. Participants were asked whether they experienced benefits from the program in a range of areas during the semester they were mentored and whether they still felt benefits from the mentoring program one year later. Participants responded to six questions on a Likert scale from 1 (not at all) to 10 (very much so). The most positive ratings were given for university knowledge, followed by feeling more confident as a student. The lowest ratings were given to academic benefits (success in classes, grades, study techniques), with the other categories (social, time management/organization, and motivation) falling in between. These findings provide support for the retention of knowledge gained in the mentoring program and maintenance of positive outcomes over time.

Dillon, B., Roy, S., Arcus, D.  
Psychology  
SCHOOL TO PRISON PIPELINE  
Advisor: Doreen Arcus  
Poster Location: FAHSS 28

Students who are suspended from school are at risk for dropping out of high school and the host of negative developmental consequences that are linked to dropout and that follow them into their adult lives. This association has become known as the School-to-Prison Pipeline because of the especially high risk for involvement with both juvenile and criminal justice systems. Students with disabilities and students of color are significantly over represented in this pathway. Although it is reasonable to assume bias plays a role in the disproportionate assignment of suspensions, correlational data do not provide an appropriate empirical test. As part of a larger study to examine this bias, we are currently analyzing data we have obtained in a pilot study of high school educators. In this phase of our research, we wanted to identify a corpus of student transgressions that educators judged to be of moderate severity and warranting moderate suspensions. Identifying this corpus allows us to create appropriate test stimuli, and comparing these results to our previous research with college undergraduates tells us how perceptions change once individuals are working in the field. We will discuss these findings and how they will be used in the next phase of research in the field, a within subject experimental study of bias by student
disability status and gender across educators, administrators, and school resource officers in Massachusetts and Georgia.

Hirt, E., Prevalus, N., Bamgbose, Y., Haskins, D., Hayes, B.
Psychology
BUILDING BRIDGES: UMASS LOWELL AND LIVING WATERS
Advisor: Susan Thomson Tripathy
Poster Location: FAHSS 31

Building Bridges is a UMass Lowell student project in collaboration with Living Waters Center of Hope, a non-profit, faith-based outreach center that offers support to people who are either living on the street or are low-income. Living Waters helps individuals by serving meals, providing outreach, and assisting with housing. Staff at Living Waters identified the need to give correct and updated information to people, so they can have a place to eat, spend a night, get support, and/or be clean of drugs or alcohol. Building Bridges offered to create a brochure with information about services available in Lowell. The goal for this project is to put a convenient list of resources in people's hands, so they can be informed and find what they need. The brochure will include information about food pantries, domestic violence resources, substance abuse facilities, and other useful information. We hope this project will make a significant impact by connecting people with necessary services as well as fostering more connections between service providers. We plan to distribute this brochure widely to the underserved in Lowell.

Hok, P., Sladkova, J., Kamal, W.
Psychology
PHOTOVOICE: DIVERSITY AND INCLUSION
Advisor: Jana Sladkova
Poster Location: FAHSS 19

Lowell prides itself on being a very diverse and inclusive university. In this study, we wanted to find out how students of different racial and ethnic backgrounds feel about it. We recruited 20 students who were both graduate and undergraduate, international and American, and who were in various majors and different points of their study at UMass Lowell. Participants acted as researchers engaging in participatory action research, exploring their own experiences on campus and engaging with those of their peers. They investigated those experiences through taking pictures. Participants met 9 times throughout the semester and during meetings they actively discussed diversity and inclusion in general and at UMass Lowell in particular and they provided feedback to each other about their photos. Meetings were audio recorded, so that content of discussions can be further analyzed. The culmination of the project was an exhibit of the students' photographs, which included a reception where spectators could interact with the participants about the photos. The exhibit and reception were open to the public. Along with the photographs, students included short narratives of the meaning behind them. Preliminary results of this photovoice project indicate that while some students feel that UMass Lowell is a diverse and inclusive environment, others feel disadvantaged because of their minority background. Some expressed gratitude for the inclusivity at UMass Lowell, while some experienced direct discrimination. All participants have become more aware of their own positions and views as well as those of their diverse peers. This project is a collaboration between the Psychology Department and Digital Media Program.
MacCorkle, M.
Psychology
TRANSITIVE INFERENCE IN THE DOMESTIC DOG (CANIS FAMILIARIS)
Advisor: Matthew Murphy
Poster Location: FAHSS 23

Transitive inference is a type of deductive reasoning in which an individual cognitively infers the relative ranking of several targets. For example, if A is greater than B, and B is greater than C, then A must be greater than C. In previous studies testing for transitive inference, an ordered set of stimuli (A>B>C>D>E) are presented in adjacent pairs and differentially reinforced based on the relative rank (e.g., B+ and C-). After learning the relational task, the subject is tested on the non-adjacent B vs. D pair. The correct selection of B indicates the subject used transitive inference. Transitive inference has been demonstrated in humans as well as many non-human species; however, there is still some debate over what mechanisms allow for this ability. While some researchers propose that a cognitive map or spatial representation is involved, others suggest transitive inference can be explained by simpler mechanisms, such as value transfer theory, symbolic distance effect or reinforcement history. The purpose of the current study was to investigate whether dogs are capable of transitive inference. This is the first study of transitive inference in dogs. Six domesticated dogs complete a 5-item visual transitive inference discrimination task. To control for value transfer, all items in the series are reinforced fifty percent of the time, as opposed to previous designs that reinforce A all the time and E never. I expected the subjects would perform above chance level on the transitive inference task. Results will be discussed.

Tran, S.
Psychology/Biology
THE WESTERN LOWLAND GORILLA: BEHAVIORS OBSERVED IN CAPTIVITY
Advisor: Mary Duell
Poster Location: FAHSS 25

Western lowland gorillas (Gorilla gorilla gorilla) in the wild spend approximately 67-70% of their time foraging and feeding, and a mere 21% resting and/or remaining inactive. In captive environments, however, this foraging and feeding behavior is limited, as 20-25% of their time is spent foraging, while their resting/inactive state increases to 54%. Welfare for captive animals is a major concern for zoos, as boredom, diet changes, space restriction, and/or lack of control in a captive environment may lead to stress and stereotypic behaviors, such as coprophagia, regurgitation and reingestion, sitting alone, and stomach scratching/holding. The presence of humans may also result in these animals exhibiting atypical behaviors, such as making eye contact and smiling. To preserve animal welfare, zoos have provided enrichment factors to stimulate the animals and promote naturalistic behaviors that are typically seen in wild populations.

To examine the behaviors exhibited by western lowland gorillas living in captivity, an observational study on five gorillas-three males and two females-is currently being conducted at the Franklin Park Zoo. The purpose of these observations is to compare the frequency of natural behaviors exhibited relative to the frequency of atypical behaviors. This study also considers behavior of the animals in relation to enrichment factors made available to them. Preliminary results based on currently available data will be presented.
Vasquez, G., MacCorkle, M., Nam, Y.J.
Psychology/Gender Studies
LEARNING CHINESE CHARACTERS WITH DUAL CODING
Advisor: Yana Weinstein
Poster Location: FAHSS 26

Until recently, the number of people learning Chinese as a second or foreign language in the U.S. was on the rise. One reason why learning Chinese may not be popular among American students is because Chinese is one of the most difficult languages to learn. Current strategies for learning Chinese may need improvement, especially for English speakers learning Chinese as a foreign language. We were interested to know if dual-coding would be effective strategy for learning Chinese (Mandarin) as a foreign language. In two experiments, Chinese characters were paired with emoji images and presented on study slides. Learning strategy was manipulated between-subjects (single/dual coding) and character type was within-subjects (match/non-match). We hypothesized that a dual-coding strategy would be more effective than single-coding, and that dual-coding would reinforce and solidify associations or representations that may already be present in the character itself. We predicted character type would have an effect, and that characters that look similar to their image would be remembered more frequently than characters that do not resemble their paired image. Experiment 1 showed no significant effect of dual coding, a significant effect of character type, and no significant interaction effect. In our second experiment, we expanded the vocabulary list to include more difficult words, used both abstract and concrete words, and ran a pilot study to reduce discrepancies about matched versus non-matched words. Results of Experiment 2 will be discussed.

Army, M., Lai, A., Baptista, B., Jaiprasert, S., Rollins, P., Gonzalez, R., Pichardo Doughty, M.
Sociology
DONATING AND DECORATING FOR BRIGHTER DAYS
Advisor: Susan Thomson Tripathy
Poster Location: FAHSS 30

We are a group of students from UMass Lowell working at the largest homeless shelter in the greater Lowell area, Lowell Transitional Living Center (LTLC). LTLC is a ninety bed facility with outreach, social workers, and meals on site. After consultation with staff at LTLC we decided to respond to two different needs at LTLC. First we are going to give the donation center a revamp and make it a more welcoming space for the residents and volunteers. Second, we are responding to the need of products for the spring and summer months such as hygiene products and socks. To attain the hygiene supplies and socks we are going to be running several drives through Sal's Pizza. Fifteen percent of the nights proceeds at Sal's will go towards our hygiene funds. Our long term goal is to make the donation center a more welcoming place to encourage more people to volunteer.

Rodriguez, D., Llewellyn, C.
Sociology, Psychology/Gender Studies
THE REALITIES OF LGBT ASYLUM: FROM INSTITUTIONAL APPROACHES TO INDIVIDUAL EXPERIENCES
Advisor: Cheryl Llewellyn
Poster Location: FAHSS 29

Research on LGBT asylum applicants largely focuses on judicial interpretation and bureaucratic processes, in a system that is filled with racism and homophobia. Much of this research largely ignores the experiences of the individual. This study was created to learn more about LGBT asylum applicants
and their experiences of economic, social, and cultural integration. In order to understand the specific problems for this population, we implemented a participatory action research model in order to put social justice theories into action and avoid the exploitation of an already vulnerable population. The participatory action research model included attending monthly community meetings, in addition to volunteering with a taskforce to help support a specific group of LGBT asylum seekers in Massachusetts. This participatory model led to the construction of an interview protocol detailing their first encounters in the US, financial arrangements upon arrival, feelings towards the legal process, and general experiences of discrimination. While the asylum process is difficult for all populations, we hope to identify issues specific to LGBT applicants that are not accommodated for in the asylum application process. The goal of this research is to advocate for better policies that are inclusive to this population, and bring light to the injustices within the asylum system for LGBT applicants.

Myers, S.
World Languages (Spanish)/History

LA LENGUA ZAPOTECA COMO EJEMPLO DEL PROCESO DE LA REVITALIZACIÓN DE LAS LENGUAS INDÍGENAS EN MÉXICO
Advisor: Maria Matz
Poster Location: FAHSS 34

A significant problem that exists in Mexico today is the death and decline of the it's many indigenous languages. Presently, there are eleven different language families with sixty-eight different groupings among with exist 363 variants. The endangerment of these languages poses a serious threat to the rich cultural diversity that Mexico takes pride in. In order to prevent the death and loss of these languages, there are many forces that are working towards their preservation and revitalization. This paper seeks to analyze the work of these forces from the perspectives of governmental institutions, independent community organizations and from the indigenous communities themselves, the analysis of legislation such as the General Law of Linguistic Rights of Indigenous Peoples passed in 2003 demonstrates that while the government has made efforts to incorporate and preserve indigenous languages, its work has been too general to properly address each language's individual needs. In studying the work of the independent organization CEDELIO (The Center for the Study and Development of Indigenous Languages in Oaxaca), it is clear that smaller local efforts are better suited to not only preserve but also revitalize indigenous languages in Mexico. Finally, a study of Community Radio in Mexico, created and run by Indigenous communities themselves offers the most important and valuable revitalization force that exists. While efforts from all sides are welcome, true language revitalization can only come from the hearts and mouths of its speakers.
AlQadeeb, H., Bui, S., Ehi-Adoghe, O., Mohamed, H.
*Biomedical & Nutritional Sciences*
**REDUCING THE USE OF DISINFECTANTS THROUGH EFFECTIVE CLEANING**
*Advisor: Nancy Goodyear*
*Poster Location: CHS 1*

Cleaning and disinfection reduce the risk of infection by removing infectious agents from surfaces. While disinfectants are known to eliminate bacteria, their overuse has raised toxicological and environmental concerns. Our goal was to determine whether an all-purpose cleaner could effectively replace a disinfectant in some settings. In this study we are comparing a disinfectant and an all-purpose cleaner for their effectiveness on a stainless steel surface using 1) two bacteria (S. aureus, E. coli), 2) two wiping materials (paper towels, microfiber cloths), and 3) standardized wiping cycles (0, 1, 5, 10, 15, 20). A standardized bacterial inoculum is placed onto a small stainless steel coupon and allowed to dry. The product is sprayed onto the coupon and allowed to stand for the recommended time (10 min). A mechanical device is used to wipe the coupon surface for the desired number of cycles, then the coupon is placed into a neutralization broth to stop the activity of the product. After dilution, plating, and overnight incubation, colonies are counted and percent and log10 reductions calculated. Preliminary data shows that the disinfectant achieves a 100% (≥5.00 log10) reduction in both bacteria with both wiping materials at 0 and 1 wiping cycles. When a microfiber cloth is used with the cleaner, 100% reduction can be achieved with more wiping cycles (10 for E. coli, 20 for S. aureus). Additional experiments to be performed include: paper towel testing with the cleaner, additional surfaces (vinyl, laminate), and decreased contact times to reflect real world use.

Polidaneth, E., Rodriguez, J., Bryant-Allen, S., He, G.
*Biomedical & Nutritional Sciences*
**INVESTIGATION OF ANTIBIOTIC RESISTANCE IN MIXED CULTURES**
*Advisor: Guixin He*
*Poster Location: CHS 3*

Bacterial antibiotic resistance is becoming an emerging issue for treatment of hospital-acquired diseases. Determination of bacterial susceptibility to antibiotics in vitro is critical for selecting a proper antibiotic and its dosage for chemotherapy. Single bacterial species for testing antimicrobial susceptibilities and drug resistance mechanisms are very commonly used in vitro studies. However, interspecies effects that may occur when mixed infections are treated with drugs cannot be investigated by this approach. Benzalkonium Chloride (BKC) is a very commonly used disinfectant. It is essential to investigate the interspecies impacts of BKC in a microbial community. Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli are the most common nosocomial infectious agents, and their resistant isolates are increasing in the United States. Here, the effect of BKC against a model microbial community consisting of Escherichia coli, Pseudomonas aeruginosa, and Staphylococcus aureus was studied. The viabilities and susceptibilities of each strain were assessed. The viability of P. aeruginosa was enhanced significantly in mixed culture without BKC but decreased slowly in mixed culture and pure culture with BKC. On the other hand, an early and drastic decrease of S. aureus and E. coli were identified in the mixed and pure culture with BKC, but not in the untreated mixed culture.
This finding suggests that the growth of P. aeruginosa was enhanced by an interspecies effect during co-cultivation with E. coli and S. aureus. Also, the antimicrobial effectiveness of BKC on P. aeruginosa is decreased by co-cultivation with E. coli and S. aureus.

Queiroz, S.
Biomedical & Nutritional Sciences
EVALUATION OF A NOVEL N-HALAMINE TREATED ANTIMICROBIAL FABRIC AGAINST FIVE SELECTED NOSOCOMIAL PATHOGENS
Advisor: Nancy Goodyear
Poster Location: CHS 2

The number of nosocomial infections has been constantly increasing throughout the years, especially due to the rise of multi-drug resistant pathogens. There has been growing concern over the infection risk to patients from contaminated hospital surfaces. This can be due to ineffective disinfection of hospital surfaces, rooms, and medical devices which may enable transmission of various significant hospital-associated pathogens. These pathogens can survive for prolonged periods of time on hospital surfaces, making the environment a continuous reservoir for infectious agents. Implementation of antimicrobial fabrics in the healthcare setting is an easy, original and economical alternative for preventing the spread of infections. The goal of this study was to evaluate the efficacy of the novel N-Halamine treated fabric against common pathogens associated with nosocomial infections. We tested the efficacy of this fabric against methicillin-resistant Staphylococcus aureus, vancomycin-resistant Enterococcus, Acinetobacter baumannii, Candida albicans, and Pseudomonas aeruginosa. A standardized suspension (7.5 x 10^7 CFU/mL) was prepared and the previously mentioned microorganisms were tested in the presence of three different soils, which included PBS, artificial sweat, and 5% serum during a 15-minute contact time. With each test run a positive control, negative control and two test samples were included, and each microorganism was tested in duplicate. The N-Halamine based fabric showed superior antimicrobial properties, as a ≥4log reduction was achieved for all pathogens tested in each soil. Further studies should be performed in an actual hospital setting to see how this fabric performs in a real-world scenario.

Biomedical Engineering & Biotechnology
IMPACT OF ANATOMICAL PARAMETERS ON OPTICAL COHERENCE TOMOGRAPHY (OCT) RETINAL NERVE FIBER LAYER THICKNESS (RNFLT) ABNORMALITY PATTERNS
Advisor: Mufeed Mah'd
Poster Location: CHS 15

Purpose: To evaluate the effect of four anatomical parameters (angle between major superior and inferior temporal retinal arteries [inter-artery angle, IAA], optic disc [OD] torsion, retinal curvature, and central retinal vessel trunk entry point location [CRVTL]) on RNFLT abnormality marks by OCT machines.

Methods: Cirrus OCT circumpapillary RNFLT measurements and Humphrey visual fields (HVF 24-2) of 421 patients from a large glaucoma clinic were included. Ellipses were fitted to the OD borders. Ellipse rotation relative to the vertical axis defined OD torsion. CRVTL was manually marked on the horizontal axis of the ellipse on the OCT fundus image. IAA was calculated between manually marked retinal artery locations at the 1.73mm radius around OD. Retinal curvature was determined by the inner limiting membrane on the horizontal B-scan closest to the OD center. For each location on the circumpapillary scanning area, logistic regression was used to determine if each of the four parameters had a significant impact on RNFLT abnormality marks independent of disease severity. The results are presented on spatial maps of the entire scanning area.
Results: Variations in IAA significantly influenced abnormality marks on 38.8% of the total scanning area, followed by CRVTL (19.2%) and retinal curvature (18.7%). The effect of OD torsion was negligible (<1%).

Conclusions: A natural variation in IAA, retinal curvature, and CRVTL can affect OCT abnormality ratings, which may bias clinical diagnosis. Our spatial maps may help OCT manufacturers to introduce location specific norms to ensure that abnormality marks indicate ocular disease instead of variations in eye anatomy.

Clark, L., Dellogono, M., Chenette, E.
*Biomedical Engineering & Biotechnology*

**12-WEEK TREADMILL PROGRAM ELICITS LOW ENERGY AVAILABILITY WITHOUT CHANGES IN SERUM TESTOSTERONE IN MALE RATS**

*Advisor: Thomas Wilson*
*Poster Location: CHS 4*

**BACKGROUND:** Male endurance athletes have been reported to have lower testosterone concentrations than their sedentary counterparts, referred to as the exercise-hypogonadal male condition (EHMC). Health complications of EHMC may include increased risk of musculoskeletal injury and impaired fertility. Dietary cholesterol supplementation has reportedly increased serum sex hormones in animal models.

**PURPOSE:** Investigate the effects of a treadmill endurance exercise program and dietary cholesterol intake on sex hormones in male rats.

**METHODS:** Male Sprague-Dawley Rats (n=20) were randomized to control group (C) or exercise training group (EX) for 12 weeks. At midpoint, rats were randomized to receive either High-Cholesterol (HC) Diet (n=10) or remain on standard purified diet (n=10). Fasting blood samples were collected at baseline, midpoint, and endpoint. Serum testosterone (T) and leptin were measured via ELISA. Serum lipids were measured via clinical chemistry analyzer. Body weight (BW) and voluntary food intake (EI) were measured weekly.

**RESULTS:** At study midpoint, EX had significantly lower BW (p=0.001), mean EI (p<0.001), and serum leptin (p=0.001) in comparison to C, with no difference between groups in T. At week 12, exercise groups had significantly lower BW (p<0.001), mean EI (p<0.01), and serum leptin (p=0.001) in comparison to control groups. HC diet did not have significant impact upon T in comparison to standard diet.

**CONCLUSIONS:** Despite low energy availability, exercise-induced changes in T may not occur in training programs <12 weeks. Lower EI observed in exercise groups despite greater energy expenditure may indicate that low energy availability in endurance athletes may be inadvertent.

Mohamed, H.
*Biomedical Engineering & Biotechnology*

**THE ANTIMICROBIAL ACTIVITY OF HYDROGEN PEROXIDE HYDROGEL ON COMMON WOUND PATHOGENS**

*Advisor: Nancy Goodyear*
*Poster Location: CHS 16*

Hydrogen peroxide (H2O2) is an environmentally friendly disinfectant. However, it decays rapidly into water and oxygen, limiting its practical applications. By using sol-gel chemistry, H2O2 can be microencapsulated in silica hydrogels, where the H2O2 release rate can be controlled in order to provide...
slow release over several days. This novel hydrogel has a wide range of potential applications, including wound treatment, hand sanitizers, and disinfection of medical equipment. For wound treatment, it could be bonded to bandage material to deliver H2O2 over time to continuously disinfect the wound while it is covered. In this study we tested the antimicrobial activity of 3% hydrogel over 72 hours on 4 wound pathogens: E. coli, S. aureus, Vancomycin-resistant Enterococcus (VRE) and P. aeruginosa. We used the agar well diffusion method in a 37°C humidified environment (35 - 65%) in order to simulate bandaged wound conditions. For all bacteria, the average zones of inhibition (ZOI) were > 30mm, specifically 32.9 mm for E. coli, 33.4 mm for P. aeruginosa, 38.8 mm for VRE, and 40.3 mm for S. aureus. There was no decrease in ZOI across the 72-hour time period. While there are no standardized ZOI interpretive criteria for H2O2 hydrogels, the large zones indicate continued activity throughout the 72-hour period. In conclusion, the hydrogel works effectively against these four bacteria. Further study to simulate the wound environment is suggested.

Healy, B.
Exercise Physiology
THE EFFECT OF CORTISONE SHOTS ON ATHLETIC REHABILITATION IN DIVISION ONE ATHLETES AT THE UNIVERSITY OF MASSACHUSETTS LOWELL
Advisors: Kyle Coffey, Eric, James, Javier Horta
Poster Location: CHS 5

The purpose of this research was to determine the effectiveness, safety, and popularity of cortisone shots in division one collegiate athletes at the University of Massachusetts Lowell. Out of convenience, a desire to obtain as many subjects as possible, and the possibility of creating a highly usable evaluation tool to assess the effectiveness, safety, and popularity of cortisone shots in collegiate athletics, a four-minute survey was constructed and sent via email to the division one athletes. Demographic data and data specifically concerning usage of cortisone shots, reoccurrence of injury, duration of recovery, and severity of injury were gathered and analyzed. Several important conclusions were discovered including a trend that cortisone shots decrease the likelihood of injury reoccurrence, severe injuries are more likely to be treated with cortisone shots, minor and moderate injuries heal faster than severe injuries, and males heal faster and have less injury reoccurrences. Despite establishing many trends and one significant finding, the study failed to determine if males were more likely to have cortisone shots than females, if number of shots had an effect on recovery, or if cortisone shots decreased recovery time. A smaller sample size of 73 viable participants may have been responsible for not determining the above research questions. This study seems to indicate that cortisone shots are beneficial to the recovery of athletic injury, but more advanced research is still needed to verify this conclusion.

Keisling, L., Serna, R., Parrington, M., Doyle, M., Sampson, A., Mehdi, S., Connor, S.,
Exercise Physiology/Psychology
EXAMINING THE NATURE OF LEARNING DIFFICULTIES IN CHILDREN THROUGH EYE-TRACKING TECHNOLOGY
Advisor: Richard Serna
Poster Location: FAHSS 20

Young children and children with intellectual disabilities often have difficulty distinguishing between some figures like letters and numbers with similar features. This may be due to poor attending skills, such as not looking at all features of a figure. To investigate this issue, a two-part study was designed: (a) gather data on potential difficulties distinguishing visual figures and (b) use eye-tracking technology to examine attending skills via tracking precise point of gaze. The first part included 10 preschool children between the ages 4 and 5. They were presented with a computer task in which they had to distinguish
between familiar line drawings (dogs and cats), as well as unfamiliar line drawings that differed by only one feature. The results showed that their accuracy for the familiar line drawings was significantly higher (mean: 88.36%) than their accuracy for unfamiliar, similar figures (mean: 57.86%). Thus, where familiar line drawings were relatively easy to distinguish from one another, similar line drawings were much more difficult. The second part of the study (ongoing) involves collection of eye-tracking data on participants' precise point of gaze when looking at and selecting the similar figures. For example, do participant not attend to the critical features of the similar line drawings that distinguish them from one another? Once eye-tracking data is collected and compared to selection accuracy, conclusions about child attending skills can be drawn, and specific teaching methods on how to remediate attending skills can be created and implemented.

Olivar, P.F., Davidson, J.
Exercise Physiology/Psychology
A PLACE OF COMFORT: ANALYZING PERSON-ENVIRONMENT CONGRUENCE AS IT RELATES TO STUDENT SATISFACTION
Advisor: Judith Davidson
Poster Location: FAHSS 35

"Through Their Eyes" was a project that paired doctoral students studying qualitative research methods with an undergraduate First-Year Writing course. Over the Spring 2016 semester, graduate students collected data in the form of interviews and visual data on the transitional challenges facing entering UMass Lowell undergraduates. As an Emerging Scholar (2016-2017), I reviewed the entire database of materials, identifying one specific theme, "a place of comfort" that is the focus of this presentation. I define this term as a physical place, in which students feel no sense of obligation to external responsibilities. This is a place students seek out when cognitive or emotional overload is looming, a feeling undergraduate students know all too well. Based upon my analysis, the significance of finding this place is paramount; however, the process of allocation one place to one student is a complex task - one some universities may not see as beneficial. However, the data collected in various forms such as drawings, face-to-face interviews, class essays, etc. suggests that the search to find this place serves a crucial role in students' adjustment to their academic life. In this study, students who reported having found this place of comfort also report a higher feeling of satisfaction towards the university. The findings of this work suggest that universities should invest in resources that enable students to identify their own places of comfort.

Robichaud, E., Cahill, A., Roa, K., Clark, L., Wilson, T.
Exercise Physiology/Spanish
INFLUENCE OF SERUM FERRITIN ON AEROBIC EXERCISE CAPACITY IN FEMALE INTERCOLLEGIATE DISTANCE RUNNERS
Advisor: Thomas Wilson
Poster Location: CHS 6

BACKGROUND: Iron is an essential nutrient involved with oxygen transport to skeletal muscle during endurance exercise. Serum Ferritin (sFer) is used as a clinical indicator of storage iron. sFer may be low in both the presence or absence of anemia diagnosis. Theoretically, iron depletion (low sFer) without anemia should not impair oxygen carrying capacity. However, several studies report impaired exercise performance and adaptation in iron-depleted athletes due to altered enzyme activity and extraction of oxygen. To our knowledge, there is minimal literature comparing maximal aerobic capacity in female intercollegiate distance runners with iron depletion versus normal iron status. PURPOSE: The purpose of this study was to investigate whether sFer concentration influences maximal aerobic exercise capacity
during an incremental treadmill running test. METHODS: Female intercollegiate distance runners (n=13) were recruited for participation in the study. Blood sample collection and maximal exercise testing were performed during on two separate days. Maximal aerobic capacity (VO2max) was measured via indirect calorimetry during treadmill running with a metabolic cart. sFer was determined via ELISA kit, and low sFer was defined as <20 ng/mL. RESULTS: 38% of subjects measured had low sFer (n=5/13). Subjects with low sFer achieved significantly lower mean VO2max (49.8+2.7 mL/kg/min) than subjects with normal serum ferritin (55.7+5.1 mL/kg/min, p=0.019.) CONCLUSIONS: Iron depletion may attenuate maximal aerobic capacity in trained female distance runners and consequently impair aerobic exercise performance.

Thoulutsang, T.
Exercise Physiology
ANGKOR DANCE TROUPE
Advisor: Sue Kim
Poster Location: FAHSS 15

Dance is a way of expression, and a way to demonstrate a culture. Angkor Dance Troupe is an example of an organization that uses dance as a way to demonstrate their culture through dance. During the Pol Pot reign (1963 - 1981), there was a huge genocide, which was perpetuated by Pol Pot and his cabinet. During this genocide, Pol Pot was motivated to start Year Zero, which is a way to start a new era in Cambodia. To make a new era, Pol Pot made a plan to eradicate anything cultural such as dancing and arts by killing people. The main target was the dancers, teachers, artists, intellectuals, etc. Many dancers, teachers, artists, intellectuals, etc died during the big genocide that wiped out two million innocent Cambodian people, but a few fled to the United States, especially in Lowell. In Lowell in 1986, Angkor Dance Troupe founder, Tim Thou, and a group of Cambodian refugees who had a passion for Cambodian dance decided to make Angkor Dance Troupe for the purpose of bringing back a culture that almost died during the Pol Pot era. In the span from 1986 - present, Angkor Dance Troupe, is nationally recognized as one of the most accomplished Cambodian performing arts group that is based in the United States. I decided to do my service learning at Angkor Dance Troupe because I have a passion for dance, which stemmed back in my elementary years. I use to participate in Tibetan dance, and when I heard about ADT, it enticed me because I have a passion for dancing. My culture is also dying because of the Chinese government, but I am motivated to help a reviving culture.

Center, L., Chew, C.F., DiPerri, J., Ogola, G., Vaughan, A.
Nursing
CARDIOVASCULAR HEALTH PROMOTION FOR SENIORS AT THE COUNCIL OF AGING IN BILLERICA, MASSACHUSETTS
Advisor: Alison Basmajian
Poster Location: CHS 7

Purpose: The purpose of this project was to promote cardiovascular health and management for seniors age 65 and older in the town of Billerica, Massachusetts.

Background: The mortality rate in the town of Billerica Massachusetts is an alarming rate of 229 which is well above the state average of 201.6. Cardiovascular hospitalizations were higher at 1,939 compared to 1,536.8 over a three year period in the state of Massachusetts (2013). Billerica is home to 12.2% of seniors age 65 and older.
Method: We implemented an engaging and interactive PowerPoint presentation promoting cardiovascular health for seniors at the Council of Aging (COA) in the town of Billerica. The program specifically targeted four topics related to cardiovascular disease including nutrition, blood pressure, exercise, and tobacco use. The visual aids consisted of a medication planner, nutritional label displays and posters. In addition, resource information was provided and an interactive group exercise activity "chicken dance" was conducted. Visual aids and audio were age-appropriate for our target population.

Results: The seniors eagerly participated in the discussion and activity. Participants verbalized understanding of the risk factors for cardiovascular disease and the measures needed to incorporate and manage cardiovascular health. Positive feedback was received from seniors and staff of the COA, welcoming a return visit.

Conclusion: The COA would benefit from yearly education promoting cardiovascular health for their existing and new senior members.

Chew, C.F.
Nursing
UNDERSTANDING THE ACCULTURATION EXPERIENCE OF INTERNATIONALLY EDUCATED NURSES
Advisor: Jennifer Wilber
Poster Location: CHS 10

Purpose: The purpose of this paper is to understand the acculturation experience of internationally educated nurses (IENs) in transitioning to nursing practice in the United States.

Background: Nursing shortage has been a concern in the United States for the past three decades. Currently, it is intensified by the aging population, aging nursing workforce, and restricted nursing programs enrollment. By 2022, American Nurses Association estimates that 1.1 million more registered nurses are needed to fill the vacancies created by job growth and retirement (AACN, 2014). Recruitment of IENs is one of the strategies to ameliorate the nursing shortage issue.

Method: A literature review of the topic is conducted. Research articles are selected based on keyword.

Results: IENs' challenges in transitioning to the host country includes language and communication difficulties, licensing and contract barriers, workplace discrimination, underutilization of nursing skills, inadequate orientation, and professional and familial role changes.

Conclusion: Challenges and barriers faced by IENs might hinder or delay successful acculturation and smooth transition to nursing practice in the host country. Improvements can be made by more stringent international recruitment policies, orientation tailored to IENs' needs, non-discriminatory practice at work, and through IENs' continuing education to expand professional role.
Eang, A., Cowley, M., Holland, K., LaRochelle, R., Sheehan, E.
Nursing
PROMOTING HEALTHY SEXUAL BEHAVIORS IN LAWRENCE YOUTH
Advisor: Alison Basmajian
Poster Location: CHS 8

Purpose: To address the high rate of sexually transmitted infections (STIs) in youth ages 13-24 in the city of Lawrence by implementing an educational program promoting healthy sexual behaviors.

Background: Chlamydia was the most common sexually transmitted disease among Lawrence youth ages 15-19 with a rate that is 207% higher than the state rate. Additionally, the rate of Chlamydia has been steadily increasing by 17 percent during the past five years. In 2009, 50% of Lawrence High School students reported being sexually active. In addition, 18.2% of middle school students were also sexually active. Alarmingly, only 74% of students at Lawrence High School reported having education on HIV/AIDS and only 56.5% of students received proper condom use education.

Method: The target population were young adult parents that were in a Young Empowered Parents (YEP) program. The project was divided into three parts consisting of a PowerPoint presentation on Chlamydia, hands-on activity demonstrating proper use of condoms, and lastly an open discussion.

Results: The audience was able to verbalize the signs and symptoms, prevention, treatment, and complications of Chlamydia. They also correctly identified local testing locations. Active engagement and participation was observed in 100% of attendees. Participants reported an increased confidence with discussing healthy sexual behaviors with current and future sexual partners.

Conclusion: An increased need for sexual health education for this target age population in the Lawrence community was identified.

Mottola, E.
Nursing
ENGAGING HIGH RISK YOUTH IN CIVIC ENGAGEMENT AND LEADERSHIP PROGRAM
Advisor: Ainat Koren
Poster Location: CHS 9

Research has established the positive impact of community service, community and school engagement, positive youth and adult relationships and enhanced self-image on reducing youth risk behavior. Citizen for Citizen (CFC) in Taunton and Fall River offered a workshop for teens entitled: Civic Engagement and Leadership for teens during 2015-2016. The purpose of this program is to help disenfranchised youth find and shape their voices, build self-efficacy, practice leadership skills, critical thinking, and create concrete plans to improve and change their personal lives and their communities. An exploratory qualitative method was employed to examine the impact of photovoice combined with Civic Engagement and Leadership program participation on eleven high school students in Southern Massachusetts. An interview guided focus group was audio recorded and transcribed verbatim. The data was then coded and the themes were summarized. Having teens express their views on the daily goals of the Civic Engagement and Leadership program is allowing CFC to study the impact the curriculum might have on the lives/perceptions of the participants. The individuals involved had the opportunity to share their opinions, knowledge and experiences with the Civic Engagement and Leadership program in their community and affect future program development. Focus group analyses showed that teens experienced concerns about gender and race discrimination, and crime rates in their community. The teens
experienced empowerment, identity awareness, and community awareness through the workshop and photovoice activity. Participants also expressed their desire for civic engagement.

Shrestha, L.  
*Pharmaceutical Sciences*  
**ROLE OF HIGH FAT DIET IN IMMUNE TOLERANCE DURING INFLAMMATORY BOWEL DISEASE**  
*Advisor: Taras Lyubchenko,  
*Poster Location: CHS 11*  

Inflammatory Bowel Disease (IBD) is an immunopathological condition affecting nearly 1.4 million Americans. Crohn's Disease (CD), a variant of IBD where abnormal immune responses develop in the gut-associated lymphoid tissue (GALT). The loss of peripherally induced immune tolerance (anergy) by resident GALT B cells towards the gut microflora due to dietary changes may contribute to CD, but has not been studied. Studies of other inflammatory autoimmune diseases such as Rheumatoid arthritis (RA) demonstrated that anergic B cells play important pathogenic roles. Subsets of anergic B cells were identified in both mice (B220+CD23+CD93+IgMlow/-) and humans (CD19+CD27-IgD+IgMlow/-). These B cells are potentially autoreactive, but do not normally exhibit autoimmune responses. Anergic B cells maintain tolerance through a unique B cell receptor signaling inhibitory mechanism, and we hypothesize that the alteration or loss in tolerance contributes to the disease onset. According to the central hypothesis of this study, peripherally induced immune tolerance of GALT anergic B cell subsets towards gut microbial and food antigens is compromised in CD. This study will identify and quantitatively compare anergic B cell subsets in the GALT of mice with experimentally induced CD that are fed high fat diet to control animals on low fat diet. Furthermore, alterations in the anergic BCR signaling inhibition profile associated with peripheral immune tolerance will be compared between the two experimental groups. The loss of immune tolerance by anergic B cells in CD will be determined statistically through the Immune Tolerance Status Index (ITSI) previously developed and validated in our laboratory.

Jutras, J., Thind, H.  
*Public Health (Health Sciences)*  
**FACTORS ASSOCIATED WITH HPV VACCINE UPTAKE**  
*Advisor: Herpreet Kaur Thind  
*Poster Location: CHS 13*  

Introduction: Human Papillomavirus (HPV) is the most common sexually transmitted infection; about one in four Americans are currently infected with HPV. HPV is known to cause a variety of different cancers, the most prominent being cervical cancer. HPV vaccination is recommended for girls and boys 11 to 12-years-old. However, the national coverage is only 63% for girls and 50% for boys. The purpose of this literature review is to identify the barriers to HPV vaccination.

Methods: Literature search was conducted using MEDLINE, Academic Search Premier, CINAHL, ERIC, PsycARTICLES, and PsycINFO databases. The search terms used were "human papillomavirus or HPV," "human papillomavirus vaccine," "papillomavirus," "human papilloma," "vaccine or vaccination," or "immunize or immunization." Search was restricted to articles published between 2000 and 2017 in English. Of the 17,100 articles retrieved, 39 eligible studies were included for this review.

Results: Males, individuals from low socioeconomic status and minority populations are less likely to be vaccinated. The main factor associated with non-vaccination is lack of knowledge, i.e. individuals who
didn't know that HPV can lead to cancer and that boys also need to be vaccinated. Parents perceived their children to be too young for the vaccine. They have concerns related to vaccine safety and the perception that vaccine can promote early sexual initiation. Other barriers to vaccination are costs and lack of recommendation from health care providers.

Conclusion: There are several predictors of HPV vaccination. These factors need to be addressed to improve vaccination rates in the US.

Sadeghi, H.
*Work Environment (Epidemiology)*

**MEDITERANEAN DIETARY PATTERN AND BLOOD PRESSURE IN AFRICAN AMERICANS; JACKSON HEART STUDY**

*Advisor: Katherine Tucker*

*Poster Location: CHS 14*

Background: It is predicted that the number of hypertension cases will reach 1.6 billion by 2025 worldwide. Among all ethnicities non-Hispanic African Americans were reported with the highest death rates during 2000 to 2013 (Mensah 2016). As diet can play vital role in mediating blood pressure, we are assessing the effect of Mediterranean Diet on hypertension among African American adults participating in the Jackson Heart Study in Jackson, Mississippi and its suburban, semi-rural, and rural areas.

Methods: Our data are from the Jackson Heart Study with 4939 participants, aged 35 to 84 years (3123 females and 1816 males). We will calculate the Mediterranean score as done previously, by summing scores based on intake of specified foods. Positive scores are given for intake of legumes, whole grains, fish, vegetables, fruits, MUFA:SFA ratio, and olive oil. Whereas, negative scores are given for high intake of meat, poultry and dairy. Alcohol intake is scored positively for a limited range of 300 ml/d -700 ml/d. Partial correlation coefficient analysis will be used to assess the relationship between the Mediterranean Dietary Score and the baseline blood pressure, adjusting for possible confounders including age, sex, BMI, and physical activity.
FRANCIS COLLEGE OF ENGINEERING

Essigmann, M., Shu, Y., Li, Z.
Chemical Engineering
SYNTHESIS AND CHARACTERIZATION OF LOW MELTING TEMPERATURE LEAD-FREE TIN/INDIUM (Sn/In) NANOSOLDER MATERIALS FOR ELECTRONICS ASSEMBLY AND PACKAGING
Advisor: Zhiyong Gu
Poster Location: COE 5

The microelectronics industry has for decades relied upon soldering material composed of a lead-tin (Pb/Sn) eutectic alloy because of its low melting temperature (183 °C). However, lead is an extremely hazardous material and has caused toxicity issues in countries where consumer electronics waste was transported. Emerging worldwide nanotechnology research has shown that the tin-indium (Sn/In) nano-scale alloy exhibits a eutectic melting point as low as 115 °C, which is substantially lower than lead-free replacements as well as the previously used lead-based solders. This is due to the small particle size at the nano-scale level, which depresses the melting temperature of the alloy significantly lower than that of the bulk material. In this project, Sn/In nanoparticles were synthesized utilizing a polyol method to produce nanoparticles with extremely small diameters (<30 nm) and uniform sizes. The nanoparticle diameter and size distribution were controlled by varying the reaction reflux time and amount of polymer used (polyvinylpyrrolydone or PVP). The synthesized particles were characterized by measuring their size and morphology using scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Energy-dispersive spectroscopy (EDS) and differential scanning calorimetry (DSC) were utilized to analyze the composition of the particles and the melting temperature of the material. These low melting temperature Sn/In nanosolder particles have promise as low temperature soldering materials for a variety of applications, such as flexible electronics and LEDs.

Nallar. M., Wong, H.W.
Chemical Engineering
SYNERGETIC EFFECTS BETWEEN CELLULOSE AND HIGH DENSITY POLYETHYLENE DURING CO-PYROLYSIS
Advisor: His-Wu Wong
Poster Location: COE 4

The increasing amount of municipal solid waste (MSW) causes an increased concern for the humanity. Growing global population needs to secure food, energy and water resources, and with decreasing amount of available land, landfills of the waste do not constitute a long-term solution. Biomass and plastics are the two most dominant components of MSW, and a method that can concurrently convert both waste streams into energy or useful products will be beneficial for humanity. Pyrolysis is one of the simplest ways to convert waste into high-value products. When biomass is pyrolyzed alone, however, it forms pyrolysis oil with high oxygen content, which causes low heating value, thermal instability and corrosiveness. Plastic wastes, which are rich in hydrogen and low in oxygen, could be helpful for enhancing the quality of pyrolytic oil. Many studies have shown that co-pyrolysis of biomass and plastics provides oil with higher yields and caloric value than the one produced from biomass pyrolysis alone. Despite this promise, mixed results regarding their interactions are reported in the literature, and the fundamental interactions between biomass and plastics during co-pyrolysis are still not well understood. As a result, there is a need to unravel the interactions between biomass and plastics at the molecular level. In this research, a hypothesis that the synergy between the two components depends on the coupling of the mass transfer and chemical kinetics is tested to resolve the contradictory results in the literature. An
experimental apparatus was constructed to allow fast pyrolysis of cellulose, high density polyethylene, and their mixtures. The samples with the same composition but different mixing patterns are investigated at 500ºC. The differences of the product yields and distributions are observed.

**Dutta, S., Strack, G.**  
*Civil & Environmental Engineering*  
**RAPID, ELECTROCHEMICAL DETECTION OF ARSENIC AND MERCURY IN WATER USING SMNPS (STRUCTURALLY MODIFIED NANOPARTICLES)**  
*Advisor: Pradeep Kurup*  
*Poster Location: COE 8*

Heavy metals are known carcinogens that lead to serious health concerns. Among several ions, arsenic and mercury are considered highly toxic in nature; hence, expeditious and precise detection of these metal ions has become a critical issue. In order to achieve this, a new highly sensitive sensor comprised of carbon paste coated with a nanoparticle film was developed. The sensor was constructed by distributing structurally modified nanoparticles on a disposable screen-printed electrode. The nanoparticles provide nucleation sites for arsenic and mercury deposition; and therefore, enhances the rate of metal ion reduction on the surface of the electrode. After the target ion is reduced onto the electrode, square wave stripping voltammetry (SWSV) is used to oxidize the analyte and produce detectable current. Coupling SWSV with SMNP-modified electrodes resulted in enhanced sensitivity, decreased detection limits (below the maximum containment level (MCL)), and high precision and accuracy. In addition, the total measurement time is less than 1 minute, which enables the rapid analysis of multiple sites. One advantage of this sensor is, it can rapidly detect low concentration of arsenic and mercury on-site. To demonstrate this, laboratory tests were performed in a range of water matrices, for example, ground and pore water. The samples were obtained, through an association with the Massachusetts Department of Environmental Protection, from a range of contaminated sites to demonstrate the applicability of the sensor for real world applications.

**Strauss, M.**  
*Civil & Environmental Engineering*  
**STORMING AND PERFORMING: REAL-TIME NITROGEN AND TSS REMOVAL IN AN ACTIVE CONTROL WET POND**  
*Advisor: Edward Hajduk*  
*Poster Location: COE 6*

Wet ponds have traditionally been viewed as less effective means for pollutant reduction than other stormwater control measures. Under this definition, the wet pond is a passive storage system governed by a fixed control structure designed to achieve a target quantity objective. Due to advances in internet accessible controller systems, continuous monitoring and adaptive control (CMAC) is now a viable, cost-effective option for stormwater control. This technology allows infrastructure to be monitored and controlled in real time to respond to forecasted weather.

This presentation will share results from the first year of a CMAC stormwater pond retrofit at the headwaters of Sligo Creek (Montgomery County, Maryland), where CMAC has been recognized as an "enhancement of an existing BMP (Best Management Practice)" and has been approved by both state regulatory agencies for pollutant removal credit. The wet pond was retrofit with actuated valves controlled by cloud-based software. The software uses real-time National Weather Service forecast information to determine the timing and expected volume of incoming storm events. In advance of the storm, the outlet valves close and only Sligo Creek baseflow passes. During and after the storm, the pond
retains up to approximately 15,000 cubic meters of runoff volume. After the retention period is over, the software sends a signal to open the valves. Two continuous sensors measuring Nitrate and TSS are deployed in the pond as a research extension of the project. Increasing the retention time allows for removal efficiency exceeding expected pollutant removal rates for wet ponds.

**Sullivan, C., Strack, G.**
Civil & Environmental Engineering  
**BISMUTH-BASED SENSOR FOR THE DETECTION OF LEAD AND CADMIUM IN WATER**  
*Advisor: Pradeep Kurup*  
*Poster Location: COE 7*

As demonstrated in the recent public health disaster in Flint, Michigan, which exposed as many as 12,000 children to dangerous levels of lead in drinking water, heavy metals pose a major threat to human health and the environment. Current heavy metal detection methods require expensive laboratory-based devices, highly skilled operators, and hazardous chemicals; these factors result in high costs and long wait times. To address these limitations, we have developed an environmentally-friendly bismuth sensor that detects lead and cadmium in drinking water and the environment, in less than five minutes. Bismuth electrodes provide increased deposition of lead and cadmium, facilitating detection limits close to or below the EPA drinking water standards. A nontoxic reagent was used to control pH and minimize sample inferences. Using electrochemically deposited bismuth films, detection limits of ~10 ppb were achieved for lead and cadmium and linear relationships were observed over a range of 0 to 100 ppb. Finally, the effects of common ions in drinking water, specifically iron, calcium, and copper, were studied.

**Gandhi, P.**  
Electrical Engineering  
**ACOUSTIC ANALOGS FOR THE CHARACTERIZATION ROOM ELECTROMAGNETICS**  
*Advisors: Kavitha Chandra, Charles, Thompson*  
*Poster Location: COE 10*

In indoor wireless communication the radio channel is comprised of the direct and diffuse multipath components. As in the acoustics case these diffuse components are the result of non-specular and random scattering. This state-of-affairs is particularly problematic for short-range millimeter wavelength radio system. The Eyring model has recently been shown to be effective in modeling the electromagnetic power decay profile in rooms. In this work temporal decay rates of the energy in coupled spaces is considered. The role which inter-room transmission and energy absorption play on the power decay profile will be examined.

**Hu, L.**  
Electrical Engineering  
**HARDWARE ACCELERATED RENDERING OF THE WAVE EQUATION**  
*Advisors: Kavitha Chandra, Charles, Thompson*  
*Poster Location: COE 12*

The rendering of realistic dynamics of physical systems in real time is an important problem for virtual reality environments. When users interact with their surroundings in such an environment using touch or voice activated interfaces, the physical system must react appropriately to emulate a realistic experience. This research investigates the design of such a cyber-physical system considering the rendering of wave dynamics generated from numerical analysis of the one-dimensional wave equation. The numerical analysis is performed using the upwind finite-difference method. The results are transferred to a computer
graphics card using the OpenGL programming standard, to achieve hardware-accelerated rendering of the wave motion in space and time.

**Hussein, L.**
*Electrical Engineering*
**A PARTICLE-FILTERING MODEL FOR TRACKING SENSOR MEASUREMENTS**
*Advisor: Kavitha Chandra*
*Poster Location: COE 9*

In this research, the problem of tracking changes in activity as measured by a set of sensors is investigated. The dynamic system being tracked is modeled as a first order Markov process, the parameters of which are to be tracked. A particle filter is implemented to track changes in the parameters and generate a trigger signal when the expected parameter value changes beyond a specified threshold.

**Misiunas, N.**
*Electrical Engineering*
**SYNTHESIS OF NON-UNIFORMLY SPACED ANTENNA ARRAYS USING DATA-DRIVEN PROBABILISTIC MODELS**
*Advisor: Kavitha Chandra*
*Poster Location: COE 11*

The activation of antenna elements located at random positions on a linear aperture with constant currents so as to collaboratively transmit or receive in preferred directions is investigated. The objective is to synthesize arrays with reduced active element count whose responses are robust. This is accomplished by capturing inter-element spacing relationships returned from a computational model. An analytical model derived for the probability distribution of independent element positions over the aperture whose response matches a modified Dolph-Chebychev array serves as a baseline for model evaluation. A metaheuristic algorithm, the firefly algorithm, is used to computationally determine the optimal positions, where each firefly models an array with finite number of elements and the algorithm emulates the exploratory and convergent behavior of a swarm of fireflies. Multiple ensembles from the computational model yield a set of viable arrays which exhibit low variance in side lobe level. Analysis of the distribution of antennas over the aperture and the correlation amongst inter-element spacings drives development of a predictive regression model. This model utilizes a directed graph where the vertices represent spacings or sums of spacings and the edges are weighted by correlation values. An algorithm is developed which determines the optimal spacing to empirically sample and the sequential path of predictions to synthesize a complete array. The mean and variance of the responses of arrays synthesized in this manner approach that of the firefly algorithm, demonstrating that the model is robust and that fewer elements are required than under the independent sampling assumption of the analytical model.

**Aghighi, F.**
*Mechanical Engineering*
**DYNAMIC CHARACTERIZATION OF POLYMER FABRICS**
*Advisor: Alireza Amirkhizi*
*Poster Location: COE 18*

The research objective of this project is to study the aging characteristics of polypropylene (PP) fabrics used in parachutes under dynamic loadings. A new experimental setup was designed and fabricated to enable testing of polymeric fabrics at medium strain rates (~1 to 10 /s). The effect of various geometric design parameters on the dynamics of the loading setup was studied numerically. Using a high-speed
camera, the strain along the length of strip samples was determined as a function of time. The stress in the sample was derived indirectly based on the observed motion of the loading head assembly. A correlation between aging history and the stress/strain data obtained using the application-relevant loading conditions will be established and utilized for estimating the reliability of aged parachutes. The same test setup and protocol can be applied to other polymer fabrics, fibers, and flexible samples.

Aguilar, J.
Mechanical Engineering
DIRECT MEASUREMENTS OF AMMONIA STORAGE ON SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEMS USING RADIO FREQUENCY METHODS
Advisor: Hunter Mack
Poster Location: COE 13

In order to meet the US EPA NOx limit of 0.2 g/bhp-hr for heavy-duty trucks and bus engines, selective catalytic reduction (SCR) technology became the prevalent strategy to reduce nitrogen oxides (NOx) emissions. In the SCR process, NOx reacts with ammonia (NH3) formed from urea (diesel exhaust fluid), which is injected into the exhaust gas upstream of the catalyst to convert NOx to N2 and H2O. Maximum NOx conversion efficiency is achieved by optimizing NH3 storage on a catalyst wash-coat. However, improvements to NOx and NH3 sensor technology is needed to make such systems possible. As a result, this research study focused on a technique to directly detect and measure NH3 storage in a catalyst by using a radio frequency (RF)-based approach. In addition, most SCR technology uses a closed-loop system which provides higher NOx conversion efficiency vs. open loop. However, existing NOx sensors are cross-sensitive to ammonia. Thus, at the event of an ammonia slip, the NOx sensor is unable to distinguish between NOx and NH3. Additional ammonia sensors only detect slip after the catalyst. By implementing direct NH3 measurements on the catalyst using an RF sensor, ammonia slip may be reduced, potentially eliminating the need for an ammonia slip catalyst (ASC) downstream of the SCR.

Dardeno, T.
Mechanical Engineering
MODEL MAPPING, STRAIN EXPANSION, AND DAMAGE DETECTION AS A METHODOLOGY FOR MONITORING FEMORAL IMPLANT INSERTION DURING CEMENTLESS TOTAL HIP ARTHROPLASTY
Advisor: Peter Avitabile
Poster Location: COE 14

When a young, active, or heavy person requires hip replacement surgery, orthopedic surgeons typically opt for cementless technology which allows the bone to heal directly to the prosthesis. After removing the femoral head, the surgeon reams the femur to an area slightly smaller than the implant and then press-fits the implant into the femoral canal. Residual stresses from the press-fit are required for implant stability and the magnitude of these stresses is critical. An implant is properly seated when the stresses are high enough to prevent micromotion of the implant but low enough to avoid femoral fracture. No device exists to objectively assess implant stability intraoperatively. Surgeons must rely solely on their clinical experience to determine when proper seating has occurred. I propose to develop a methodology for the design of a real-time interface that will monitor insertion of a cementless femoral implant using vibration analysis with analytical modeling coupled to strain measurements from the implant.
Hashim, M., Amirkhizi, A.
Mechanical Engineering
MECHANICAL BEHAVIOR OF CARBON FIBER REINFORCED POLYMER UNDER DYNAMIC LOADING USING SPLIT HOPKINSON PRESSURE BAR
Advisor: Alireza Amirkhizi
Poster Location: COE 19

Carbon Fiber Reinforced Polymer Composites (CFRP) generally demonstrate highly variable modulus and strength based on fiber direction. This presents significant challenges when attempting to identify their mechanical properties. Study of how these materials absorb and release energy is critical when the material is subjected to dynamic loading conditions throughout its life span. The mechanical response (load-deformation relationship and failure) of all materials are sensitive to the rate at which they are loaded. Unlike metals, which have been studied extensively over a wide range of strain-rates, only a limited amount of information is available on the strain-rate dependency of fibrous composites (Gilat et al., 2002). We are currently experimentally studying the dynamic loading behavior of CFRP based on various specimens cut in the longitudinal and transverse directions. The samples are of cylindrical form, having different fiber directions and volume fractions. Traditionally, composites are tested at strain-rates varying from $10^{-1}$ to $10^{-5}$ /s to see how their mechanical properties are effected. We will use Split-Hopkinson Pressure Bar, or Kolsky Bar, experiments for determination of the dynamic properties at strain-rates in the range of $10^2$ to $10^4$ /s. The SHPB setup has been used to investigate the dynamic behavior of metals. However, in recent years there has been an interest in determining dynamic elastic and failure properties for materials such as ceramics, composites, rocks and concrete via SHPB testing (Li et al., 1999).

Joffre, D.
Mechanical Engineering
UNDERWATER LOCALIZATION ENHANCEMENT USING ACOUSTIC BRAGG SCATTERING
Advisors: Christopher Niezrecki, Peter, Avitabile
Poster Location: COE 15

The detection of underwater threats is especially important to the U.S. Navy. Detection arrays are used to localize sound sources in the surrounding ocean by calculating the relative angle between the source and the detection array. Currently, detection arrays must be several times larger than the wavelength of the frequencies of interest. As the required frequency of detection continues to decrease, array panels must become even larger, requiring expensive redesigns and inhibiting ship or submarine operations. A technique is needed to improve the frequency range of passive arrays without increasing the array size. This research is studying the possibility of using Bragg scattering to reduce the size of detection arrays. Bragg scattering occurs in material with organized, periodic inclusions, such as a detection array with stiffening ribs. As the source wave propagates through the array, reflections from the ribs creates additional signals with smaller wavelengths than the source signal. These smaller wavelength signals can be used to determine the angle between the source and the array. Because the wavelengths of these signals are smaller, the panel size may be reduced. Research is currently being conducted to analyze a prototype array with periodically spaced ribs. The existence of Bragg scattered waves in the prototype has been verified, and current research efforts intend to characterize the effect of frequency and incident angle on the Bragg wave response. Once the pattern of Bragg scattering in the prototype is understood, an algorithm can be built to optimize the localizations of underwater threats.
Keane, O., Möller, J., Reynaud, E., Schmidt, D., Song, J.
Mechanical Engineering
IMPACT STRENGTH OF POLYMER NANOCOMPOSITES FROM A CBDO-BASED COPOLYESTER
Advisors: Emmanuelle Reynaud, Daniel Schmidt
Poster Location: COE 17

Eastman's Tritan is a family of CBDO-based copolyesters designed to offer a "tough" alternative to polycarbonate in food-contact and medical applications. In this effort, two grades of Tritan, TX1000 (very slightly crystalline) and TX2000 (amorphous) have been compounded with Cloisite 20A, a montmorillonite clay modified with quarternary ammonium salt, at target 0, 0.125, 0.25, 0.5, 0.75 and 1 vol% inorganics content. In some compositions, mineral oil was used as a process aid. Actual inorganics levels were determined using Thermogravimetric Analysis. The resultant polymer nanocomposites were subjected to: IZOD impact testing (~3.4 m/s impact) in accordance with ASTM D256, and and drop testing in accordance with a slightly modified ASTM D3763 (3 samples per composition were tested, instead of 5) at 3.5 m/s, 6.5 m/s and 10 m/s. IZOD impact strength was observed to increase slightly with lower clay contents, and then decrease greatly at higher clay contents for both the TX1000 and TX2000 PNC series; however, the TX1000 and TX2000 did not show this transition at the same clay loading. In instrumented drop testing, clay content was not observed to have a significant effect on TX1000 PNCs; however, it negatively affected some TX2000 PNC formulations.

Morris, J.
Mechanical Engineering
RESONANCE MODE SHAPES OF A MICRO-STRUCTURED ACOUSTIC METAMATERIAL
Advisor: Alireza Amirkhizi
Poster Location: COE 20

Creating a metamaterial with a tunable micro-structure can allow for the manipulation of its acoustic properties; i.e. its transmittance, reflectance, and absorbance. This is accomplished by introducing a mass-spring system into a 3-D printed hollow unit cell with tunable spring stiffness and mass, such that the band structure of the cell can be altered to accommodate a target frequency or band. In order to determine the resonance mode shapes of the unit cell, we can analyze the surface displacements and tractions on each of the cell's surfaces to observe trends that correlate to mode shapes. With this information, the cell's band structure can be modified to place a band gap at the target frequency to increase material reflectance or an internal resonance mode at the target frequency to increase material absorbance. The transmission of the cell can be reduced by using either of these methods or a combination of the two using layers of differently tuned unit cells.

Najafian, S., Stapleton, S.
Mechanical Engineering
LINEAR ELASTIC MODELING OF SANDWICH PANELS USING ENHANCED FINITE ELEMENTS
Advisor: Scott Stapleton
Poster Location: COE 16

Sandwich panels are widely used for the realization of lightweight and high stiffness structures. currently, Finite Element (FE) modeling is the most popular way to predict the behavior of sandwich structures. However, to achieve accurate convergence and capture the material behavior of sandwich structures more elements are required, which results in longer computation time. A new method to model sandwich panels with only one element through the thickness has been represented by combining analytical models with
finite elements models. Two models were derived; the Quadratic and Algebraic models which assume the panel as a beam with perfectly bonded core and facesheets in cylindrical bending. Both were compared with a traditional 2D dense mesh Finite Element model to check the global and local accuracy by investigating the stress fields. It has been illustrated that the analytical models capture the global behavior well but with some deviation for higher stiffness cores. However, it should be considered that a converged solution has been achieved with the analytical model using many fewer elements obtaining similar results like in the 2D-FE model. This caused a huge reduction of computational time when applied to highly detailed substructures.
GRADUATE SCHOOL OF EDUCATION

Emerson, R., Lohmeier, J., Colombo, M.
Education (Research & Evaluation in Education)
CHALLENGES OF EVALUATING LARGE AND MULTIFACETED EDUCATION PROGRAMS
Advisor: Jill Lohmeier
Poster Location: GSE 6

The Preparing Excellent Teachers of All Language Learners (PETALLS) program provides professional development opportunities for administrators, K-12 pre-service and in-service teachers and paraprofessionals in order to improve teaching of English Language Learners (ELLs) in select urban high schools in Massachusetts. My poster presentation will focus on the unique challenges faced while evaluating such a large and multifaceted program. For instance, one challenge has revolved around the use of structured observations. Structured observation as a qualitative data collection method is not novel; however, with increasing emphasis on teacher assessment and evaluation, observations in educational settings have - and will continue to be - a sensitive method fraught with challenges. We have to create minimal disruption when observing classrooms and we also have to determine the appropriate length of stay in a classroom. If an evaluator stays in a classroom for too long, the teachers assume that their teaching practice is being evaluated and expect formal feedback. We have also had to grapple with the decision of whether to be non-participant or participant observers. Other challenges in evaluating a large program include: high turnover rate among school administrators, transfer of teachers out of state making it difficult to assess the impact of professional development on teaching practice etc.

The presentation will include some useful ways of dealing with the challenges of evaluating large education programs such as the use of participatory evaluation approaches where stakeholders are involved in all aspects of the evaluation. Further, given the nature and scope of the program, it has been crucial to exercise culturally competent approaches to evaluation, especially within the classrooms, and to use multiple evaluation methods to triangulate results.

Farmosa, E.
Education (Research & Evaluation in Education)
MAKERSPACE EVALUATION
Advisors: Sarah Kuhn, Jill, Lohmeier
Poster Location: GSE 1

In recent years, universities and other educational institutions have started to recognize the potential the maker community and the impact it can have on education through the development of digital tools, the community resources, and the maker mindset (Martin, 2015, p. 31). There has been a rapid increase in makerspaces, but little research or evaluation has been conducted. There has also been a shift in what is expected of undergraduate engineers, and as the curriculum changes to better suit those needs, makerspace spaces have started to play a bigger role. This program evaluation was focused on evaluating an engineering makerspace at public four-year research university. This makerspace was opened in fall 2015 and the use of the space has been growing rapidly. For the first part of the evaluation, interviews were conducted with faculty who use the space in order to gather information on the mission, goals, and use of the space. The second part of the evaluation focuses on the students' current use of the space and what they would like to see going forward. Through the evaluation of an engineering makerspace at public four-year research university several issues arose: use if the makerspace, the importance of the space to curricular decisions, and the appeal of the makerspace in recruitment initiatives. Martin, L. (2015). The promise of the Maker Movement for education. Journal of Pre-College Engineering
Oh, B.
*Education (Research & Evaluation in Education)*

**ENHANCING PROGRAM SUSTAINABILITY THROUGH FORMATIVE EVALUATION APPROACH**

Advisor: Jill Lohmeier  
Poster Location: GSE 2

A formative evaluation is one of main influential approaches to program evaluation since Cronbach first introduced the concept in the 1960s. Cronbach (1980) argued that evaluation should be embedded within many circumstances and the engagement of stakeholders. This paper describes a formative evaluation of the Research Experience for Undergraduates (REU) programs aimed at encouraging students from low-income communities to pursue the study of science and engineering at the graduate level and to prepare them for careers in related fields. Our evaluation focuses on the strategies used to recruit and retain students as well as the challenges and strengths of the program. Results from one focus group interview with faculty and graduate student mentors administered after the first year of implementation highlighted a need for a significant alteration to one REU program. Addressing both changes in a program as well as unforeseen challenges can be an important yet difficult process to initiate with the program's Principal Investigator (PI). It is important to investigate the benefits of certain approaches to program recommendations that will elicit positive change without weakening the PI/evaluator relationship. Evaluator analysis and recommendations enabled the PI to alter program development to increase the interactions between the undergraduates and graduate mentors in the second year. By sharing our experiences of two REU program evaluations, we hope to provide a good example of how positive PI recognition of evaluation feedback can significantly improve program effectiveness and inform program success and sustainability.

Ramey, J.
*Education (Research & Evaluation in Education)*

**EVALUATING THE COUNSELING COMPONENT OF A WRAPAROUND SPECIAL EDUCATION PROGRAM**

Advisor: Jill Lohmeier  
Poster Location: GSE 3

Wraparound, a philosophy of care with a definitive planning process, is utilized to build constructive relationships and support networks among students and youth with emotional and behavioral disabilities and their families. The HOPE program, housed in X Grammar School, provides a range of support and inclusion opportunities designed to meet the individual social-emotional and behavior needs of students in grades K-8. This program continues to evolve since its inception 18 years ago-transitioning from the past "opportunity rooms," or most restrictive environment to its current state of a more-restrictive educational setting and looking forward to the future. The ultimate goal of the program is to provide these students with the access to the curriculum in the least restrictive environment possible.

This evaluation presents an in-depth description, analysis and synthesis of the counseling aspect of the HOPE program as it is occurring and recommendations for future implementation. Qualitative data was gathered through both formal and informal interviews and quantitative data is currently being gathered depicting progress toward Individualized Education Plan goals specific to counseling. Preliminary analysis of findings suggests that the symbiotic relationship between the Licensed Independent Clinical
Social Worker and outside clinicians/agencies is important for multiple reasons, most importantly obtaining the proper diagnosis for students. Short term and long term outcomes are also investigated as well as cost benefits of this program. The findings and implications for future evaluations of similar programs will be discussed.

Ferullo, L.

*Leadership in Schooling*

**ENGAGING WOMEN AND MINORITIES IN THE FIELDS OF SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) THROUGH INFORMAL AFTER SCHOOL INTER-DISCIPLINARY PROGRAMS**

Advisor: Jill Lohmeier
Poster Location: GSE 4

Improving K12 students' opportunities to learn and perform in mathematics and science has been of major concern for several decades and more recently there has been focus on promoting STEM careers among females and minorities. In the fall of 2015, a pilot program titled Teaching a Computer to Sing (TACTS) was piloted at an urban middle school in a Massachusetts mill town. Data from the TACTS inter-disciplinary after-school program provides insight into possible causes of and solutions to threats to the external validity of results from K12 institutions that could skew future development of informal opportunities to engage female and minority adolescents in the predominately male-dominated fields of Science, Technology, Engineering, and Mathematics (STEM). I will provide suggestions and strategies for evaluating culturally similar informal education programs that offer an inclusive approach, in an effort to generalize findings. These types of after-school programs are essential to the growth of interest in STEM learning among female and minority adolescents; therefore, it is necessary to provide an accurate portrayal of results for future success.
Parasitism is uncommon in Phylum Rotifera, with social parasitism being the most exceptional. To date, it's only known in the rotifer Acyclus inquietus. Female A. inquietus live permanently within colonies of the host rotifer, Sinantherina socialis. A. inquietus feeds on its embryos and juveniles, thereby using the colony as a source of shelter and food for the parasite, and protection for the parasite's eggs. Upon hatching, the parasite's larvae leave the colony to settle within a separate colony, and undergo rapid metamorphosis to the adult stage. The host does not show distinct behavioral changes as the parasitic larvae move or metamorphose within the colony. The unresponsiveness was hypothesized to be correlated with the parasite's integument, which based on incidental observations of the adult, is textured similarly to the host, i.e., integumental mimicry. Here, I used scanning and transmission electron microscopy to determine if the parasite's integument is similar to the host's integument, which would explain the host's lack of response. I revealed that the larval integument has an unusual ridge-like pattern that is oriented transversely across the body, but after metamorphosis, the rotifer's integument has both transverse and longitudinal ridges. The longitudinal ridges are very similar to what is present in the host species. I therefore hypothesize that the ridge-like patterns present in A. inquietus are a form of morphological mimicry of their host.

Variation in jaw size is observed in both evolutionary and disease processes, but mechanisms generating this variation are still not completely understood. Avians are good models for studying jaw size because of the great diversity in beak morphology. Particularly, duck and quail exhibit large differences in jaw size, which make them a suitable system to study how jaw size varies during development. We have previously shown that differences in jaw size occur very early in development. In fact, duck and quail jaw primordia are distinct from the very earliest formation of the first pharyngeal arch. This initial difference in jaw size is associated with differences in patterning of the brain and anterior head. Comparison of Otx2, Fgf8, Shh, and Krox20 expression in duck and quail HH10 embryos highlights differences in fore- and midbrain size and shape. Differences in brain regionalization affect the morphology of the stomodeum (primitive mouth), around which the first pharyngeal arch forms. Thus, brain regionalization may influence the initial size of the jaw progenitor population. To test this hypothesis, we conducted a series of experiments to inhibit Wnt signaling, which is involved in early head patterning, using a Dkk1 bead on chick embryos. We have attempted to alter fore- and midbrain size by expanding Dkk1 levels anterior to the node in HH5-6 embryos. Application of Dkk1 soaked beads to HH5-6 embryos can shift Otx2 expression in the anterior neural tube of HH10 embryos. These data suggest that early developmental alterations to brain patterning also have implications for the regulation of jaw size. Furthermore, the length of the stomodeum has increased with increased Dkk1 levels, suggesting it helps regulate brain and jaw size evolution.
Nadile, E.  
Biological Sciences  
INTRODUCTORY BIOLOGY: THE IMPORTANCE OF INTRINSIC MOTIVATION, SELF-EFFICACY AND SELF-REGULATION IN ACADEMIC SUCCESS  
Advisor: Naomi Wernick  
Poster Location: COS 8

Research suggests that intrinsically motivated and intellectually curious students, who utilize metacognitive strategies, tend to be more academically successful (Pintrich & De Groot, 1990). It has been demonstrated that high self-efficacy is associated with greater course engagement and motivation (Linnenbrink & Pintrich, 2003). This study further investigates the role of academic motivation, self-efficacy, and metacognition in the academic success of first-year college students in an introductory biology course. The Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, 1991) was utilized to evaluate these factors. Exam and final course grades were used as indicators of success. We hypothesized that students who received an A or a B as their final course grade would initially demonstrate relatively high extrinsic motivation. However, as the semester progressed, these students would become more intrinsically motivated and would employ improved metacognitive strategies to succeed. In contrast, we hypothesized that students who received a C, D, or an F as their final course grade would originally demonstrate relatively high intrinsic motivation and would gradually become more extrinsically motivated in order to improve their grades. These students might also be less metacognitively aware due to a focus on grades rather than concept mastery. Our results indicate that over the course of the semester, A/B students in comparison with C/D/F students increased their self-efficacy (A/B, n=61; C/D/F, n=50; p<.001), self-regulation (A/B, n=58; C/D/F, n=49; p<.05), and intrinsic motivation (A/B, n=62; C/D/F, n=49; p<.05). Furthermore, over the semester, C/D/F students experienced a decline in intrinsic motivation, self-regulation (n=49; p<.05), and self-efficacy (n=50; p<.05). References Linnenbrink, Elizabeth A., and Paul R. Pintrich. "The Role of Self-Efficacy Beliefs in student Engagement and Learning in the classroom." Reading & Writing Quarterly 19.2 (2003): 119-137. Pintrich, Paul R. "A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)." (1991). Pintrich, Paul R., and Elisabeth V. De Groot. "Motivational and self-regulated learning components of classroom academic performance." Journal of educational psychology 82.1 (1990): 33.

Am, B.  
Biology  
MOTIVATIONAL QUALITIES AND LEARNING STRATEGIES FOR PRE-HEALTH STUDENTS IN COMPARISON WITH NON PRE-HEALTH STUDENTS IN AN UNDERGRADUATE INTRO-LEVEL BIOLOGY COURSE  
Advisor: Naomi Wernick  
Poster Location: COS 15

This study examined differences in student motivation and learning strategies between pre-health and non pre-health students in Principles of Biology I (Fall 2016). Pre-health is a common career path undergraduate students pursue and includes fields such as medicine, dentistry and optometry. The study's hypothesis states that pre-health students are more motivated and exhibit greater use of learning strategies than non pre-health students. To measure these qualities, the Motivated Strategies for Learning Questionnaire (MSLQ) was utilized. Participating students completed the survey at the beginning and end of the course; these were designated as pre-survey and post-survey respectively. The following MSLQ sub-categories were analyzed: control of learning beliefs, extrinsic motivation, intrinsic motivation, help-seeking, organization, peer learning, self-efficacy, time & study environment, and self-regulation. Survey results were analyzed using Microsoft Excel, and the following descriptive statistical functions were performed: mean, median, and mode; in addition, t-tests were performed to determine whether differences
observed between data sets were significant. In regards to final grades, pre-health students achieved a higher average (81.57; n= 44) than non pre-health students (77.84; n= 42; p<0.05). At both the beginning and end of the semester, pre-health students (n= 45) exhibited higher extrinsic and intrinsic motivation than non pre-health students (n=42; p<0.05). Finally, at the start of the semester, pre-health students had higher self-efficacy (5.52; n= 45) than non pre-health students (5.06; n= 42; p<0.05). In conclusion, these results support our hypothesis and follow the trend that pre-health students are more motivated than other students in completing introductory biology coursework.

Barbeau, A., Pelletier, M., Szymczak, K., Gaines, P.
Biology (Biotechnology)/Psychology
DEVELOPING A MODEL OF MACROPHAGE DIFFERENTIATION AND M1 VS. M2 CLASS SWITCHING FROM EX VIVO CULTURED PRIMARY BONE MARROW PROGENITORS
Advisor: Peter Gaines
Poster Location: COS 5

Macrophages are innate immune cells that respond to injury or infection by secreting pro-inflammatory cytokines, and by killing pathogens via phagocytosis and subsequent production of reactive oxygen species (ROS). To repair tissue damage following inflammation, macrophages then release anti-inflammatory cytokines and phagocytose debris. These distinct pro- and anti-inflammatory functions of macrophages are regulated by alternative states, or "classes", termed M1 and M2, respectively. Abnormal functions of macrophages in either state compromise tissue regeneration and tissue recovery after injury. In order to understand M1/M2 functions, we aim to elucidate the molecular mechanisms governing the macrophage phenotypic class switch during wound healing. To accomplish this, we have generated macrophages from ex vivo cultured bone marrow, during which we have induced the cells toward either M1 or M2 phenotypes. Imaging flow cytometry analyses revealed M1 macrophages exhibit upregulation of CD11c, which was absent in M2 and unstimulated macrophages. By comparison, those induced to the M2 class expressed MGL1/2 and CD206, both known cell surface markers of M2 macrophages. Importantly, M1, M2, and unstimulated macrophages all exhibited similar expression levels of macrophage cell surface markers CD11b and F4/80. Additionally, upregulation of inducible nitric oxide synthase in M1 cells was observed by immunoblotting assays, consistent with ROS production data. Our results suggest that ex vivo-derived murine macrophages can be successfully generated and activated into M1 or M2 phenotypes. Future studies will confirm the functional capacity of these macrophages as well as their capacities to regulate inflammatory and/or healing responses in injured skeletal muscle.

Collias, A., Konow, N., Tijs, C., Biewener, A.
Biology
MUSCLE FIBER LENGTH CHANGE IN RAT MEDIAL GASTROCNEMIUS IN THE STANCE PHASE OF GALLOPING
Advisor: Nicolai Konow
Poster Location: COS 1

The lower hind limb muscles in terrestrial vertebrates are likely specialized for meeting the varying mechanical demands of ground-based locomotion. The mechanical action of one such muscle, the medial gastrocnemius (MG), is well studied for bipeds but less so for quadrupeds. We used fluoromicrometry to measure MG muscle fiber length changes as five rats galloped uphill, level and downhill on a treadmill. These slopes were expected to elicit different levels of force production and changes in muscle fiber length as the muscle would need to act as a brake, strut, or motor, respectively. Muscle fibers were expected to lengthen and dissipate energy, acting as a brake on the decline. On the level, muscle fibers were expected to remain near-isometric, letting the Achilles tendon elastically cycle mechanical energy.
between strides. Muscle fiber shortening was expected to be greatest on an incline, allowing the muscle to act as motor to perform mechanical work. Consistent with these hypotheses, we found that MG muscle fibers lengthened on a decline to dissipate energy in early stance and shortened on the incline. However, our results do not support the hypothesis of near-isometric contraction for a strut-like action during level galloping. The unexpected, yet minor fiber shortening on the level supports prior suggestions that the rat Achilles tendon may be overbuilt for elastic energy cycling. Fiber shortening may be necessary to generate additional work as forelimb muscles likely dissipate energy in comparison to hind limb muscles. Future research will aim to identify those fore and hind limb interrelationships.

Dowrey, T., Schwager, E., Fish, J.
Biology (Biotechnology)/Business
MOLECULAR MECHANISMS UNDERLYING VARIATION IN SEVERITY OF SATB2-MEDIATED CRANIOFACIAL DISEASE
Advisor: Jennifer Fish
Poster Location: COS 16

Individuals with similar mutations often exhibit disease phenotypes that show significant variation in severity. This concept of phenotypic penetrance is thought to have a genetic basis, however, additional roles may exist for stochastic developmental variation. Mutations in Satb2 are associated with variable penetrance in craniofacial and other bone anomalies. To test the role of stochastic factors in generating phenotypic variance in bone development, we manipulated Satb2 expression in mouse osteoblast cell lines and evaluated differentiation at days 0, 3, 10 and 17. RNA and protein were extracted at each time point and analyzed via qPCR and western blot. Differentiation at each time point was also measured by alizarin red staining. Initial results suggest that increasing Satb2 levels correlate with active osteogenesis and may increase levels of other osteogenic promoting genes. We are using CRISPR to generate isogenic cell lines that vary only in Satb2 dosage, and to investigate the effects of specific Satb2 mutations on molecular variation and osteogenic differentiation. Our single cell analyses (RNA FISH and IHC) also indicate that Satb2 levels are highly variable from cell to cell, even in WT cell lines, suggesting that the cell cycle may contribute to variable expression. Our future work aims to understand how variable Satb2 activity is from cell to cell, and how that variability contributes to tissue morphogenesis and variation in disease severity.

Kurker, V.
Biology/Environmental Health
CLIMATE CHANGE: A CHANGE IN PERSPECTIVE FROM AMERICAN AND AFRICAN PARTICIPANTS
Advisor: Juliette Rooney-Varga
Poster Location: COS 11

Climate change has become an important topic in global politics due to its negative impact on humans and ecosystems. If humans neglect to reduce their carbon emissions in the upcoming years, the effects of catastrophic climate change will become unavoidable, causing sea level rise, extreme weather patterns, and reduced supplies of drinking water and food. It is important for people to understand the complexities associated with addressing climate change, such as mutual agreements between nations to reduce carbon emissions. The World Climate simulation allows participants to role-play as delegates representing national governments from around the world as they try to create policy addressing climate change. The simulation has been implemented in many countries around the world and different settings such as universities and businesses. This study aims to compare and contrast the learning outcomes of participants from the United States and the African nations of Kenya, Nigeria, South Africa, Senegal, Ivory Coast, and Morocco; we hypothesize that the African nations will show more willingness to act on the knowledge
they have obtained. Participation in the simulation in both African and American settings delivered gains in knowledge, motivation, and affect in people with regards to climate change. After participating in World Climate, people show a greater understanding of the science behind climate change in addition to the political process. They also expressed feelings of empowerment to make a change in the world by addressing climate change on a personal and community level.

Merkuri, F., Phamduy, C., McMenamin, S., Fish, J.
*Biology (Biotechnology)*
**INVESTIGATING DEFECTIVE BMP SIGNALING AS THE CAUSE OF NAGER SYNDROME**
*Advisor: Jennifer Fish*
*Poster Location: COS 2*

Nager syndrome is a member of a class of disorders called the acrofacial dysostoses, which are characterized by structural malformations of the face and limbs. Recent genetic analyses suggest that most cases of Nager syndrome are caused by haploinsufficiency of SF3B4, a component of the U2 pre-mRNA spliceosomal complex. SF3B4 has also been shown to inhibit BMP-mediated osteogenic and chondrogenic differentiation. Therefore, skeletal anomalies associated with Nager syndrome may be due to either defects in splicing and/or defects in BMP signaling. To test the role of SF3B4 in both of these processes, we have manipulated Sf3b4 levels both in vivo (chick embryos) and in vitro (mouse osteoblasts) models. We have found Sf3b4 expression in the developing chick head and osteoblasts, similar to previous reports in other model systems. To elucidate how Sf3b4 mediates variation in osteogenesis, we are examining single cell gene expression of genes in the BMP pathway in WT and Sf3b4 over-expressing MC3T3 cells. Additionally, we are using the avian retrovirus RCAS (A) to mediate RNA interference against Sf3b4 in the developing chicken embryo.

Michel, C., Dolan, K., Fish, J.
*Biology*
**ASYMMETRIC FGF8 EXPRESSION AND TISSUE INTERACTIONS CONTRIBUTE TO JAW ASYMMETRY IN DISEASE**
*Advisor: Jennifer Fish*
*Poster Location: COS 13*

Fgf8 is a secreted signaling factor that contributes to the growth and development of many tissues, including the limbs and jaw. Using an allelic series of Fgf8 mutant mice to generate embryos with 5 distinct genotypes and Fgf8 dosages, we investigated the effects of reductions in Fgf8 dosage on size and symmetry of the jaw and limbs. Bone length was measured and compared left versus right in limbs and isolated dentaries of WT, heterozygote, and mutant neonatal skeletons. Mutant mandibles are smaller and much more variable in size than WT or heterozygote mandibles and exhibit directional asymmetry, with the left side more severely affected. In contrast, no apparent asymmetry was observed in the limbs, however, mutant limbs are smaller than in the other genotypes. We compared the size of the left and right mandibular arches at E10.5 and found that mutants are smaller than WT or heterozygote individuals and all genotypes exhibit some degree of asymmetry, with the mutants being more severely affected. These data suggest jaw development is more susceptible to reduction in Fgf8 dosage than is limb development. Asymmetric jaw defects are a common cause of developmental diseases, such as cleft palate, and may result from early asymmetries in gene expression and interaction between other tissues. At E9.5 and E10.5, Fgf8 is expressed asymmetrically in the heart, which develops in close association with the jaw, and may therefore contribute to directional asymmetry in this tissue. We have placed beads coated with enzyme inhibitors (SU5402) on presumptive heart field of HH5-8 chick embryos to test if similar
asymmetrical effects to that of the mutant mice occur. If so, this would suggest that tissue interactions between the heart and endoderm influence symmetry of jaw defects.

Milot, A., Pelletier, M., Gaines, P.
Biology (Biotechnology)

ABERRANT PRODUCTION OF NEUTROPHIL EXTRACELLULAR TRAPS IS CAUSED BY OVEREXPRESSION OF EITHER LAMIN A OR C, CRITICAL COMPONENTS OF NUCLEAR MATURATION DURING NEUTROPHIL DIFFERENTIATION
Advisor: Peter Gaines
Poster Location: COS 3

Lamin A and C are nuclear intermediate filament proteins that contribute to the nuclear lamina. Mutations in LMNA, which encodes both isoforms (A and C), are associated with a broad range of laminopathies, congenital diseases affecting tissue regeneration and ageing. Neutrophils are white blood cells that act as the first line of defense to infections, which rapidly migrate to wounds or other trauma within minutes of damage. Among their functions in innate immune responses, neutrophils exhibit a unique form of apoptosis known as NETosis, a process whereby neutrophil extracellular traps (NETs) are released from stimulated cells that trap the invading pathogens. The trapped pathogens are killed due to proteolytic enzymes that decorate the released DNA. Importantly, we have shown that neutrophils overexpressing either lamin A or C exhibit abnormal nuclear lobulation, a critical feature of maturing neutrophils. We hypothesize that these cells with abnormal nuclear structure will exhibit deficient NETosis. To test this hypothesis, we are using a murine promyelocyte cell line called MPRO cells that overexpress either lamin A or C (MPRO-LmnA or MPRO-LmnC), or contain an empty expression vector as a control (MPRO-MT). To detect NETosis in the mutant vs. control cells, we have simulated them with three known stimulators of NETosis, and discovered using fluorescence microscopy and a dye known to detect NETosis, Sytox Green, that cells overexpressing either lamin exhibit defective NETosis. These results will be presented along with continuing studies to detect NETosis by imaging flow cytometry and immunofluorescence for known markers of NETosis.

Nazaire, C., Schwager, E., Fish, J.
Biology (Biotechnology)

INVESTIGATING ALTERNATIVE SPLICING AS A REGULATOR OF DEVELOPMENTAL VARIATION
Advisor: Jennifer Fish
Poster Location: COS 6

Variation is inherent in development, but the mechanisms that generate variation are not well understood. One mechanism to generate variation from a single genome is the alternative splicing of genes after translation. Recent research shows that genes involved in splicing are implicated in disease. For example, mutations in the splicing factor Sf3b4 cause defects to the skull and limbs. Sf3b4 defects of the hand are phenotypically similar to defects in signaling factors such as Shh, suggesting that splicing may regulate developmental signaling. Since subtle differences in developmental signaling are associated with morphological transitions in evolution, we hypothesize that differences in alternate splicing may mediate these minor differences. SHH and BMP are important signaling pathways in limb and jaw development. We are investigating if differences in splice variants of genes involved in the SHH and BMP pathways exist in the developing limbs and jaws of mice and chicken. We have found species-specific differences in Shh splice variants in developmentally equivalent stages of mouse and chick limbs. These splice variants were amplified by PCR and separated from one another using agarose gels. Some of the bands that appeared were sequenced, and a novel splice variant of Shh was found in the limb bud of stage HH21.
chick. Our data suggests that alternative splicing may be involved in the development of limb. Future work will test the functional role of these splice variants.

Nguyen, B., Tran, S., Le, D., Nguyen, B., Bloom, D.  
Biology  
FUN IN THE SUN: ENCOURAGING OUTDOOR ACTIVITY AT THE HOUSE OF HOPE  
Advisor: Susan Thomson Tripathy  
Poster Location: FAHSS 33

House of Hope is a family-oriented shelter that provides support and care for homeless families and aims to ultimately place them in permanent housing. During our community service work at House of Hope, we recognized an opportunity for the kids to play outdoors as spring is approaching. After speaking to House of Hope representatives, they noted that renovating the backyard space may be a chance to not only involve the kids but also their parents. We plan to create outdoor games and activities and revamp the outdoor space available in order to encourage the kids to play outside. To improve the outdoor space, we plan on painting the picnic tables as places for the parents to sit while observing their kids. A sandbox will be obtained through funding from the Sociology Department, while House of Hope will provide us with paint, sand, and sandbox toys. By improving the outdoor space at House of Hope, we hope that both the kids and their parents will be able to spend more time outdoors together. We hope that this project will be able to be maintained by the residents at House of Hope for long-term sustainability.

Piper, K., Pelletier, M., Gaines, P.  
Biology (Biotechnology)/Philosophy  
IDENTIFYING ROLES OF LAMIN A/C IN MACROPHAGE DEVELOPMENT AND FUNCTION  
Advisor: Peter Gaines  
Poster Location: COS 4 

A-type lamins are intermediate filament proteins associated with inner nuclear membranes that provide nuclear structure to a cell. Mutations of the LMNA gene, which encodes the two isoforms of A-type lamins, Lamin A and C, cause premature ageing known as progeria, plus muscular dystrophy. Both diseases are phenotypically related by muscle wasting, which is caused by a dysfunction of muscle cells but also influenced by inflammation regulated by macrophages, a white blood cell component of the innate immune system. Interestingly, macrophages exhibit increased expression of Lamin A and C during differentiation. We hypothesize that increased lamin A or C expression during macrophage differentiation is important to macrophage functions, in particular those that regulate inflammation that influences muscle atrophy and/or repair. To test this hypothesis, we have generated a macrophage model cell line that overexpresses lamin A or lamin C. Since these cells exhibit abnormal nuclear maturation at the monocyte cell stage, which may be critical to their capacity to escape capillary beds prior to their differentiation into muscle-resident macrophages, we are testing the mutant cells for chemotaxis and activation of inflammatory responses. We are also testing a nutraceutical that is a known antioxidant, Tart Cherry Extract (TCE), to determine if differentiating macrophages are influenced by TCE and may be suppressed in their inflammatory responses activated by damaged or diseased muscle. Our studies may provide important insight into how we can control macrophage functions in inflammatory responses due to muscle damage.
Saint-Louis, R.
Biology/STEM Teaching
ASSESSING THE ROLE OF SONIC HEDGEHOG SIGNALING IN JAW SIZE
Advisor: Jennifer Fish
Poster Location: COS 14

Sonic Hedgehog (SHH) plays a critical role in jaw development, where it affects proliferation and outgrowth. In humans, abnormal expression of SHH can cause defects in jaw size, including micrognathia, cleft lip and/or palate. Yet it is unknown how differences in SHH signaling may contribute to species-specific differences in jaw size in normal development. To test the hypothesis that species-specific differences in SHH signaling is associated with differences in jaw size during development, we took advantage of three avian species, duck and quail, which vary in relative jaw size. We examine the regulation of the SHH pathway through several critical genes including Patched-1, a negative regulator of SHH signaling, and Gli-1, a SHH signaling effector. We first compared protein and mRNA levels in chicken, duck, and quail mandibles at HH21, HH24, and HH27. To test if chicken, duck, and quail mandibular mesenchyme responds to SHH signaling in a species-specific manner, we isolated mandibles from HH21 embryos and cultured them in media containing differing concentrations of exogenous SHH protein. After 24 hours of culture, we evaluated the response to SHH signaling by measuring Gli-1 levels via RT-qPCR. Our data indicates that avian have species-specific patterns of SHH pathway regulation in jaw development, with differences in Patched-1 especially prominent. Future experiments will test the functional role of Patched-1 in jaw size by manipulating its expression in jaw development.

Spinney, Q.
Biology
GLOBAL SURVEY OF TROPICAL FLESHY FRUITS AND AVIAN FRUGIVORES IN THE TROPICS
Advisor: Johanna Choo
Poster Location: COS 9

In all biomes, animals depend on plant primary productivity for food. Thousands of studies examine the diets of vertebrates in many fields such as frugivory, field biology, seed dispersal ecology, herpetology, mammalogy, and ornithology. Various methods used to collect dietary data include observations of fecal droppings, nest observations, gut examination, and dietary determination using blood isotopic analysis. Despite the vast data collected on ecosystems worldwide, there is very limited literature that compiles vertebrate dietary data and uses this database to analyze the distribution of vertebrates and their correlation with their respective biomes. We have not found any published works that compiles this data from literature on tropical birds of the world. Our work examines the diversity of fruit eating birds and the diversity of plants bearing fleshy fruits within tropical zones. Our presentation will showcase how a database on avian dietary diversity in the tropics helps us understand the relationship between the global diversity of tropical plants that produce fleshy fruits and their avian seed dispersers. We will also overlay climate (rainfall and temperature) data with our data on tropical plant and bird distributions on a world map to examine how the distribution of rainfall may influence tropical plant distributions, which in turn, could affect the existence of animals that depend on fruits produced by plants. We believe that this work has relevance to furthering our understanding of tropical ecosystems and can contribute to information that would be useful to conservation of fragile tropical biomes.
Walsh, K.

*Biology*

**BIOMATERIALS**

*Advisor: Gulden Camci-Unal*

*Poster Location: COS 12*

Dr. Gulden Camci-Unal's research laboratory works to solve problems in life sciences and medicine using engineering approaches. The overall goal of the research being conducted is to control and modulate cellular behavior for directing repair and regeneration of tissues through the use of diverse tools from many fields of science including chemistry, cell biology, materials science, microfabrication, and engineering. Current accomplishments include development of multicellular and compartmentalized tissue mimetics for clinical applications including endothelialization of cardiovascular tissues, regeneration of bone, and invasion of tumors.

Specific areas of research within the lab are things such as next generation functional biomaterials for regenerative engineering, new tools for origami-inspired tissue engineering, and organ-on-paper models, paper-based biomaterials and medical devices to detect gradients of oxygen, nutrient, and small molecules, in vitro disease models for personalized medicine, and low-cost point-of-care diagnostics to solve problems in global health. The ultimate goal of this lab is to improve human health and quality of life.

Martin, J.

*Biomedical Engineering/Biotechnology*

**TERAHERTZ IRRADIATION OF BIOLOGICAL CELLS**

*Advisor: Cecil Joseph*

*Poster Location: COS 33*

Application of terahertz (THz) technologies in medical and defense applications is rapidly increasing. As applications continue to be developed and realized, there will be a need for further analysis of THz radiation-induced effects in biological systems, as research on such responses is currently limited. Thus far, investigations on such effects have yielded evidence that, under certain irradiation parameters, THz frequencies (0.1 - 10THz) can influence biological processes, such as DNA replication and transcription as well as protein recognition and binding. While the photon energy of THz radiation is too low to directly break chemical bonds, it is postulated that THz radiation may induce resonance effects (as opposed to thermal effects) in biomolecules which disturb the dynamics of critical biological processes. The aim of this project is to test the underlying assumptions of the biophysical interaction which occurs between THz radiation and biological molecules. Preliminary data from THz irradiations performed on both bacterial cells and mammalian cells under various irradiation conditions is presented. While evaluation of preliminary data only includes analysis of cellular viability and proliferation, future research will include performing full transcriptome analysis to examine alterations induced in gene expression. Further prospective work will also include applying molecular dynamics simulations for modeling the interaction of THz radiation with biomolecules.
Rotifers are microscopic (<2mm) aquatic invertebrates that generally live a planktonic lifestyle. However, some species are sessile and produce extracorporeal secretions that form tubular sheaths around their bodies. These tubes are morphologically diverse: some are gelatinous matrices, some are hardened pipe-like structures, and others are composed of pellets mounted on a gelatinous base. The morphology of these tubes seems to be independent of the phylogenetic distance since animals from different taxonomic groups may build similar tubes while species in the same group may have very different tube formations. To date, there is no information on the chemistry or ultrastructure of these tubes, nor do we really comprehend their functions. Here, I utilize electron microscopy to provide the first characterization of tube ultrastructure and gain insights into their potential evolutionary histories. My data shows that all tubes, independent of type, have an inner mucoid gel-like matrix that is probably secreted from glands in the foot. The ultrastructure of this mucus coat differs between species but ultimately functions as a scaffold for other types of secretions such as the hardened pipes (which come from specialized glands in some species) or pellets (which are formed in specialized organs and include suspended particles). Based on these results, I hypothesize that the gel matrix has evolved more than once, and that later modifications in the form of pipes and pellets also represent independent evolutionary events.

Davies, K., Ryan, D.
Chemistry
PRODUCTION OF NAPHTHALENE FROM CARBON DIOXIDE AND METHANOL BY PHOTOCATALYSIS USING NANOSTRUCTURED COBALT
Advisor: David Ryan
Poster Location: COS 17

Research performed by our research group has discovered that when methanol and carbon dioxide are exposed to visible light overnight in a glass reaction chamber containing nanostructured cobalt particles, naphthalene is the sole product. Previous work had shown that the same setup using water instead of methanol produces an array of normal alkane hydrocarbons, and we had hypothesized that starting with a simple carbon-containing liquid might produce a different range of normal alkanes. Instead, a double-ring structured compound was obtained. Naphthalene is the simplest polycyclic aromatic hydrocarbon, as well as being a precursor to many other compounds. Commercially, it is removed from coal tar, and to a lesser degree, petroleum, during the refining and distillation steps. This research demonstrates the ability of a green chemistry technique to produce a single product under conditions that are simple and low cost. It also highlights the important role nanostructured metals can play in photocatalysis.

Giarrosso, A., De La Cruz Calcano, C., Keats, J., Apel, S., Bracamonte-Moreno, T., Marshall, J., Morose, G.
Chemistry
CONTINUED RESEARCH ON ALTERNATIVE BLENDS TO METHYLENE CHLORIDE IN PAINT STRIPPING
Advisor: Gregory Morose, Jason, Marshall
Poster Location: COS 18

Methylen chloride (MC) is a liquid solvent used as the active ingredient in many paint stripper products. Unfortunately, MC is an inhalation hazard and a probable carcinogen according to the U.S.
Environmental Protective Agency. Despite its toxicity, MC is still used because it is inexpensive and
effective. No current commercially available alternative paint strippers can match MC cost or
effectiveness. With the help of the EPA People, Prosperity and the Planet (P3) grant, the Toxics Use
Reduction Institute used the Hansen Solubility Parameters in Practice software to create a solvent blend to
replace MC. Replacing MC has long been a goal in the field of green chemistry, but no one has found a
suitable commercial replacement. Most researchers have looked for a 1:1 solvent replacement, but no
chemical was as effective. The research method used for finding a replacement for MC in this project was
to find a solvent blend with similar solubility characteristics as MC by using the solvent optimizer
function within HSPiP. A specific database of potentially safer solvents was created for this project to
help select solvents with lower toxicity. The by changing the target HSP value for the solvent optimizer
were identified that were potentially safer, low cost, and effective. Performance testing on wood,
masonry, and metal substrates showed that formulated solvent blends of methyl acetate, dimethyl
sulfoxide, and thiophene worked comparably to MC based paint strippers and significantly better than
other existing alternatives. Having found a successful methodology for identifying safer and effective
solvent blends, there is optimism that other toxic solvents used for various consumer and industrial
products can be replaced with safer materials.

Moss, D., Perkins, R., Hernandez, A.
Computer Engineering
METEOR SPECTROSCOPY DATA INQUIRY VIA WEATHER BALLOON TECHNOLOGY
Advisor: Silas Laycock
Poster Location: COS 35

Previously, the only way to discover the composition of comets was to send a probe to collect a physical
specimen, vaporize it into plasma, then observe its UV spectra. Since meteor showers are cometary
material that burn up in the atmosphere, being able to analyze the meteor trail at high altitude would allow
for easier repeatable analysis. This Engineering Capstone team has joined with students from Physics,
Astronomy, and Education to develop a sensor payload prototype using a high altitude balloon. The
Engineering team has designed a navigation system-including long, medium, and short range location-as
well as wireless information flow and a timed cutter circuit. The central control for the main body of the
platform is a Raspberry Pi processor, which will use an attached GPS board to obtain location, and an
APRS board to communicate that location on the amateur radio frequency. At medium range, an Arduino
mini will communicate with a handheld radio to aid in location. At short range, a handheld RF receiver
will activate a speaker and light display. A cutter circuit has been designed to sever the payload from the
balloon once preferred altitude has been attained.

Cleghorn, K., Gamache, R.
Earth, Environmental & Atmospheric Sciences/Physics
THE USE OF PAIR IDENTITY AND SMOOTH VARIATION RULES TO CHECK
ASYMMETRIC ROTOR MOLECULES ON THE HITRAN DATABASE
Advisor: Robert Gamache
Poster Location: COS 19

The concept of families of transitions was introduced by Brown and Plymate [1] to study the structure of
variations in collision-broadened half-widths. Several other studies [2, 3] have used the families of
transitions and partner transitions idea to analyze line shape parameters. In 2011, Ma et al. [4] developed
theoretically what they termed pair identity and smooth variation rules. These rules were developed for a-
type transitions of water vapor and are applicable under certain constraints to the line position, intensity,
half-width, line shift, and temperature dependence of the half-width. Here families of transitions were
extended to include wavenumber, frequency, intensity, air and self-broadened half-widths, pressure shift
due to air and temperature dependence and the pair identity and smooth variation rules are extended to consider other types of transitions. These rules are applied to water vapor transitions on the 2012 HITRAN database [5]. The rules are then tested on other asymmetric rotor molecules on HITRAN.

References:

Federico, N.
Earth, Environmental & Atmospheric Sciences (Geoscience)
IMPACT OF ROAD SALTS AND THE POSSIBLE OXIDATION OF IRON FROM ABANDONED RAILROAD TRACKS OF REEDY MEADOW MARSH, IN LYNNFIELD, MASSACHUSETTS
Advisor: Lori Weeden
Poster Location: COS 22

Road salt use in Massachusetts can lead to increased oxidation of water-covered, abandoned railroad tracks. This study examines the monthly variability of dissolved ions commonly linked to road salt, in water collected in the Reedy Meadow drainage basin. Road salt ions in solution were found to predictably change with local changes in water discharge. Dissolved iron, normally not associated with oxidation, remained relatively stable. In addition, to understand the complexity of iron oxidation in different solutions, a study regarding iron oxidation rates in NaCl and CaCl2 was completed. The overall impact of road salt use in the Reedy Meadow drainage basin with specific reference to iron oxide accumulation is limited to local concentrations near abandoned railroad tracks.

Fontaine, S.
Earth, Environmental & Atmospheric Sciences (Geoscience)
CHEMICAL ANALYSIS OF ORE MINERALS USED AT PALMERTON, PA, ZINC SMELTER
Advisor: G. Nelson Eby
Poster Location: COS 21

For over a 100 years zinc ores were processed at Palmerton, PA. Because of environmental contamination due to this process the area is now an EPA superfund site. In this study we determined the major and trace element contents, using Instrumental Neutron Activation Analysis (INAA), of the various ore minerals that fed the Palmerton smelter. The minerals are sphalerite (ZnS), galena (PbS), willemite (Zn2SiO4), franklinite (ZnFe2O4), and zincite (ZnO). A significant portion of the ore was derived from the Sterling Hill and Franklin Furnace mines in New Jersey which are world famous for both the abundance of mineral species and the occurrence of a variety of fluorescent minerals. Comparison of major and trace element compositions of the ore minerals to the ore feed from the New Jersey mines shows that the feed largely consisted of willemite and franklinite. Willemite contains significant amounts of As while
Franklinite contains significant amounts of Sb, indicating that these minerals were the major sources for these elements. The sulfide minerals contain significant amounts of Cd and galena is the major host for Se and Hg. Sphalerite and galena were the major sources for Cd, Hg, and Se. The difference in elemental occurrence and abundances for the different ore minerals provide fingerprints that can be used to identify the specific ore mineral contributors to the contamination in the Palmerton area.

Lynch, B., Crowell, S., Zaccheo, S., Pernini, T.
Earth, Environmental & Atmospheric Sciences/Mathematics
QUANTIFYING THE CARBON FOOTPRINT OF PARIS USING REMOTE SENSING OBSERVATIONS
Advisor: Frank Colby
Poster Location: COS 27

Understanding the complex temporally and spatially varying carbon dioxide (CO2) emissions in urbanized areas is crucial to identifying causes of climate change and how they can be addressed. While many studies have been conducted to better quantify urban CO2 (and other pollutant) fluxes, there are still many open questions about the interpretation of these measurements and how emissions scale with population, as well as how to attribute concentrations measured in urban environments to anthropogenic and natural sources and sinks. After deployment for six months (November 2015-April 2016) in Paris, France, data from the Greenhouse gas Laser Imaging Tomography Experiment (GreenLITE™), an observing system that combines laser-based differential absorption spectroscopy measurements with tomographic techniques to create a two dimensional map of CO2 concentrations, was interpreted and analyzed. An evolution equation for CO2 mixing ratio within the Planetary Boundary Layer (PBL) was applied to identify and separate sources and sinks of CO2. Results from this analysis directly verify the impacts that wind speed and direction have on CO2, namely dilution and enhancement. Preliminary analysis characterized the relationships between CO2 and nitrogen dioxide (NO2) and ozone (O3). GreenLITE™ proves to be an accurate measuring tool for CO2, but further interpretation and analysis of data is necessary to estimate the emissions of Paris. Further investigation will include the comparison of surrounding weather stations to verify wind data. The entire time period will also be examined.

Renaud, C., Gamache, R.
Earth, Environmental & Atmospheric Sciences/Mathematics
LINE SHAPE CALCULATIONS IN SUPPORT OF EXOPLANET ATMOSPHERE RESEARCH
Advisor: Robert Gamache
Poster Location: COS 20

Line shape parameters for hydrogen broadening of water vapor are needed to understand remote sensing measurements of planetary and exoplanet atmospheres. The existence of water vapor in exoplanet atmospheres indicates a possibility of life. In order to obtain the needed line shape parameters, semi-classical calculations based on the Modified Complex Robert-Bonamy (MCRB) formalism were made. The intermolecular potential for the calculation is comprised of electrostatic, atom-atom (expanded to order 20 and rank 4), induction, and London dispersion terms. The trajectories were determined by numerical integration of the Hamilton's equations. The average over the Maxwell-Boltzmann distribution of velocities was performed by integration over 35 velocities corresponding to the temperature range 75K - 27000K. The formalism is complex valued yielding the half-width and line shift from a single calculation. The calculations are reported at 7 temperatures from 200 to 700 K. The half-width temperature dependence coefficient n was determined with T0=296K. Twenty-three iterations were completed where the atom-atom parameters were adjusted to better match the measurements of Brown and Plymate [JQSRT 56, 263, 1996]. To ensure the quality of the data being fit, Family of Transitions and
Ma Rules [Mol. Phys., 109, 1925, 2011] curve fitting methods were utilized. This research will provide
the scientific community with the data necessary to continue spectroscopic measurements of exoplanet
atmospheres.

Soucy, A., Eby, G.N.
Earth, Environmental & Atmospheric Sciences (Geoscience) /Mathematics
USING ELEMENTAL ANALYSIS TO IDENTIFY SOIL CONTAMINANTS FROM THE
PALMERTON, PA, ZINC SMELTERS
Advisor: G. Nelson Eby
Poster Location: COS 23

During their 100 years of operation the Palmerton, PA zinc smelters emitted a variety of metals that led to
significant environmental degradation. The ore mineral feed to the smelters consisted of sphalerite,
galena, willemite, franklinite, and zincite. We collected twenty-four soil samples from an area
surrounding the Palmerton zinc smelters to determine if it was possible to identify the specific ore mineral
components that led to the contamination. One group of samples was from Lehigh Gap, close to the
smelter, and the other group was from a mountaintop traverse along an east-west trending ridge line just
south of the smelters. Instrumental Neutron Activation Analysis (INAA) was used to determine the
concentrations of 39 elements. Plots of element concentrations versus distance from the smelter showed
that As, Sb, Se, Cd, Hg, Zn, Fe, Cr, Co, and Sc co-varied. The relationship between these elements was
investigated using factor analysis. Two factors explained 81% of the variance. The first factor accounted
for 45% of the variance and consisted of As, Sb, Se, Cd, Hg, and Zn. This factor reflects the contributions
of sphalerite and galena. The second factor contributed 36% of the variance and consisted of As, Fe, Cr,
Co, and Sc. This factor was related to the oxide ore minerals, franklinite and zincite. The samples
collected in Lehigh Gap, the remediated area proximal to the smelters, exhibited differences in elemental
patterns when compared to those collected along the mountaintop traverse. We hypothesize that these
remediated samples are largely influenced by the mineral component franklinite which has relatively high
amounts of Fe and strong positive correlations with Sc and Cr; whereas the mountaintop samples are
largely influenced by the sulfide minerals that exhibit strong positive correlations between Hg, Sb, and
Se.

Everett, M., Eby, G.N., Rivera, E., Karavas, S., Garcia, E.
Environmental Science (Environmental Studies)/English (Creative Writing)
VOLTAGE FLUCTUATIONS AND HYDRATION STRESS IN YUCCA ELEPHANTIPES
Advisor: G. Nelson Eby
Poster Location: COS 26

Many large plants and trees show a sustained voltage (potential) difference between their xylem and the
surrounding soil. This sustained voltage was thought to be environmental and not related to the plant or
the result of sap streaming potential (the potential difference caused by the movement of sap). However,
recent research has determined that the sustained voltage difference seen in large plants and trees is due to
a pH differential between the xylem of the plant and the surrounding soil. Building on this idea, our
research endeavors to determine if specific stressors on a plant will result in an identifiable pattern of
voltage fluctuation. We used eight Yucca elephantipes to track the voltage of plants during hydration
stress (both over and under-watering). All plants show a regular pattern of diurnal voltage fluctuations.
However, the over and under watered groups' mean voltage both deviated from that of the control group.

It may be possible to use these deviations to develop more precise watering schedules in large-scale,
water-intensive agricultural practices, particularly in the face of drought conditions. Future research
involves moving this study to a field setting in which we will investigate the voltage output of plants subjected to other environmental stressors, such as pests or disease.

**Jendrock, L.**  
*Environmental Science (Environmental Studies)*  
**NUCLEAR FORENSICS: THE TRINITY CASE**  
*Advisor: G. Nelson Eby*  
*Poster Location: COS 25*

In 1945, the first detonation of a nuclear weapon occurred near Socorro, New Mexico (the Trinity test). The arkosic sand at Ground Zero was fused to produce a green glass (and locally a red glass) called Trinitite. The purpose of this study is to utilize bulk chemistry in order to differentiate elements contributed by the arkosic sands from those contributed by the nuclear detonation. Glasses were separated by hand-picking and Instrumental Neutron Activation Analysis (INAA) was used to determine elemental composition of both the trinitite glasses and the sands at the Trinity site. Arsenic, Br, and Zn were depleted in the glasses, indicating that these elements were volatilized by the nuclear detonation while Mo, Ba, Zr, U, and Ag were significantly enriched. La, Ce, Nd, and Sm were slightly elevated in the glasses suggesting the addition of fission products. Factor analysis revealed that while Ba varies with the rare earth elements in the glasses, it did not vary with them in the arkosic sands. This difference confirmed that Ba had an anthropogenic source. Factor analysis also made it possible to separate the elements into four groups: (1) Mo, U, Ag, and Zr derived from the bomb itself, (2) Cr, Ba, La, and Yb appeared as fission products, (3) Sc and Co which may be related to the infrastructure, and (4) Ni, which was used to coat the core of the weapon. The bulk chemical analysis successfully differentiated element compositions of the glasses and arkosic sands, and factor analysis aided in determining the contributions of each component to the Trinitite glass.

**McKee, B.**  
*Environmental Science (Environmental Studies)*  
**UNDERSTANDING ZIKA: AN ENVIRONMENTAL APPROACH TO EVALUATING THE POTENTIAL CONSEQUENCES OF CURRENT EVENTS AND DECISIONS**  
*Advisor: Lori Weeden, Maria, Matz*  
*Poster Location: COS 24*

A comprehensive understanding of the present ecological, social, and political conditions must be reached before actions are taken that permanently alter the natural environment. This research evaluates the available methods used to prevent the spread of the Zika virus in terms of human health risks and potential environmental impacts. It was found that socio-economic conditions can make certain locations more vulnerable to the virus, and Puerto Rico is cited as an example. This arbovirus is transmitted by mosquitoes. Although most symptoms are mild, there is potential for permanent neurological damage to occur, especially in unborn children. Current concentrations of the virus in Puerto Rico are displayed graphically. Methods of preventing transmission including wearing proper clothing, sleeping under mosquito nets, and draining standing water are evaluated. Organic insecticides such as Bti are found to be effective when breeding locations are known, but ineffective against adult mosquitoes. Man-made organophosphates such as Naled are extremely effective, but threaten other insects such as bees and are potentially harmful to other organisms, including humans. Due to both health and environmental concerns, as well as a general distrust of the federal government, Puerto Ricans have protested to prevent the uses of Naled in their territory. It was found that there is a significant lack of study regarding the potential ecological impacts of pesticides. Recommendations are made for increased research in this area to facilitate the creation of ethical responses to future outbreaks.
Cheng, J.
*Mathematics (Probability & Statistics)*
**MINI-MAX LOCAL LEARNING**
*Advisor: Kavitha Chandra*
*Poster Location: COS 28*

While global learning fits a distribution over the whole dataset, local learning is a more practical methodology for real-world dataset with complicated structure. It is argued that it is difficult if not possible to obtain a general and accurate global learning. To avoid the model selection problem, local learning's adoption of different ways to construct classifiers is getting more popular. It does not aim to estimate a density from data as in global learning. In fact, it even does not intend to build an accurate model to fit the observed data globally. Therefore, local learning is more direct which results in more accurate and efficient performance. The best mean squared finite sample error bounds derived from the algorithms with local minimax local learning. The purpose of the research is to find out which features are influencing the graduation rate within a certain neighborhood, thus enabling the development of study advice that tailor to individual students. College advisors may be able to give students personalized recommendations in order to increase graduation rate. Students are labeled into groups so that targeting advice are efficient for them and cost saving for colleges.

Heywosz, T.
*Mathematics/STEM Teaching*
**ASTRONOMY ROADSHOW EDUCATION PROGRAM IN HAITI**
*Advisor: Silas Laycock*
*Poster Location: COS 30*

Haiti has experienced years of political and economic unrest that were recently accentuated by natural disasters such as the 2010 earthquake and Hurricane Matthew in 2016. As a result, many facets of life in the country differ greatly from life in the United States especially in education and schooling. Much of the instruction in the country is traditional and based on rote memorization of facts. The Active Astronomy Roadshow travelled to Haiti for the third time in March 2017 to introduce students and instructors at our partner school, St. Marie des Agnes in Les Cayes, to inquiry-based STEM learning. Using astronomy as a vehicle for a variety of STEM topics, the Roadshow led students in a solar system activity designed to teach students about gravity and orbits, a lesson on building rockets with a discussion on famous rocket scientists representing diverse backgrounds, and a lander project developed to help students understand the engineer-design process and budgeting. At night, the Roadshow also hosted a night viewing session to help engage older students in STEM topics and illustrate the importance of education to parents. To aid teachers in implanting similar activities, a teacher seminar was conducted, focusing on the activities implemented over the week and planning future lessons. Back in the United States, similar activities are planned to be implemented in Massachusetts schools and additional outreach activities plan to be made. Future trips to Haiti hope to include a greater focus on technology and data collection.
Baumgart, A.
Department of Physics
LARA: A HIGH-EFFICIENCY GAMMA DETECTION ARRAY AT UMASS LOWELL
Advisors: Partha Chowdhury, Kim Lister
Poster Location: COS 36

The Lowell Array for Radiological Assay (LARA) is an array of high-resolution Germanium detectors assembled to detect characteristic gamma rays from radio-isotopes. The frame was designed to be portable, to enable use in various locations such as the particle accelerator or research reactor on campus. The array consists of six liquid-nitrogen-cooled high-purity Ge detectors, along with their individual bismuth germanate scintillation veto detector envelopes for suppressing unwanted Compton scattered gamma rays, and providing improved signal-to-noise for the photopeaks in the spectra. The use of multiple detectors enables detection with higher efficiency, and the ability to study geometry-dependent events. Current analog electronics allow for precise signal processing and detection of coincident events. One application has been to study and characterize current and future medical isotopes that are produced at a high-energy proton linear accelerator facility at Brookhaven National Laboratory. The samples are shipped to UMass Lowell, where LARA is used to determine the abundance of short- and long-lived radio-isotopes as well as any contaminants in the sample, through detailed measurements of their gamma-ray intensities and half-lives. Another application of LARA has been to study the gamma signatures of both fresh and semi-depleted Uranium-235-enriched reactor fuel elements from the research reactor. Future planned upgrades for LARA include digital signal processing. The combination of such sophisticated detectors coupled to the accelerator and reactor facilities on campus makes UMass Lowell a unique place for both fundamental and applied research in nuclear science and nuclear astrophysics.

Bowen, B., Zwanikken, J.
Physics/Mathematics
SHAKING CYLINDERS INTO ALIGNMENT
Advisor: Johannes Zwanikken
Poster Location: COS 29

I examined the properties of a new, non-ergodic system of confined cylinders, and the conditions that maximize the probability that a particular steady-state occurs. I observed that an ensemble of cylinders being shaken in a box would line up parallel to the direction of shaking, if the difference between the cylinder length and the length of the side they line up parallel to, was sufficiently small. To determine the optimum frequency to shake the box, I considered the steady-state conditions in which the cylinders would be the least chaotic, specifically, if they oscillated as if they were experiencing simple harmonic motion. The model agrees with simulations. Furthermore, using data from simulations of this system, a correlation between the frequency and a time-averaged alignment parameter was found to be Gaussian, where the width of the peak decreased as the difference between the cylinder length and the parallel box length increased. The inspiration for this experiment was the potential applicability to the dynamics of liquid crystals or even active matter like the tobacco mosaic virus.
**Jermain, P.**  
*Physics*  
**TERAHERTZ FORM BIREFRINGENT OPTICAL COMPONENTS**  
*Advisor: Cecil Joseph*  
*Poster Location: COS 31*

Terahertz (THz) technology has seen a number of advances in the past few decades, and has applications ranging from diagnostic imaging to materials characterization. This creates the need for a variety of THz optical components which can be used to build new measurement systems. An apparatus was constructed by stacking layers of Mylar in order to achieve a periodic grating structure with dimensions smaller than the sub-millimeter wavelength of THz radiation. This device displays form birefringence at THz frequencies and radiation transmitted through the structure will emerge with a modified polarization. The fabrication process is simple and inexpensive, and lacks the need for any sophisticated materials. An Effective Medium theory was applied in order to understand the electromagnetic properties of this stratified material. To aid in designing an instrument with the desired characteristics, software was written that allows the user to input parameters and view the performance of the system as a function of frequency. This performance can then be adjusted by altering the geometric attributes and material composition of the device. There are several potential uses when applied to THz radiation, such implementation as a polarizer/phase shifter, a frequency filtering element, and as a wave plate.

**Martin, R., Zwanikken, J.**  
*Physics*  
**SIMULATION OF ACTIVE POLYGONS IN 2 DIMENSIONS**  
*Advisor: Johannes Zwanikken*  
*Poster Location: COS 32*

Many phases of matter are being studied in the field of Soft Matter beyond the standard categories of gas, liquid and solid. The rules that govern these phases are often well understood in thermal equilibrium, but do not apply to dissipative or active systems of self-propelled particles. We study the dynamics of 2-dimensional active polygons by means of simulation techniques, to characterize the formation of structure and substructures in driven ensembles, and search for a theoretical framework that relates these phases to the dynamical properties of the particles.
Entrepreneurs represent valuable assets to any society. They contribute to the economy of nations by creating new ventures and job opportunities. The question of what drives individuals to become entrepreneurs has received much attention by entrepreneurship scholars. However, the entrepreneurship literature is lacking with regard to IT cognitive and emotional factors that can significantly influence individuals to become entrepreneurs. In this study, we propose a theoretical model that extends theory of planned behavior by incorporating the technological role into established entrepreneurial models. In particular, the proposed model explains how general computer self-efficacy and computer anxiety determine entrepreneurial intention. Investigating the IT role in this context will provide practical insights that can be communicated to policy makers in order to reinforce the mindset of entrepreneurs. We plan to replicate established hypotheses and test novel ones using a unique design that has potential methodological contribution.

Patients not showing up for clinical appointments (No-Shows) is a huge drain on the healthcare resources and costs several millions nationwide. The dataset chosen for analysis is called "Medical Dataset No Shows" which consists of information related to medical appointments made. The structure of the dataset shows - 300,000 medical appointment records and 15 variables. The purpose of this analysis is to predict whether a patient would show up for his appointment or not and to investigate why patients miss their scheduled appointments. The analysis would be done using a combination of several data mining models. It would offer a strategic approach to understand the business domain, explore the data, fitting different models and extracting useful information from it. Using various algorithms, models would be built and fitted on the training data and then the target variable will be predicted on the testing data. The CRISP-DM (Cross-Industry Standard Process for Data Mining) approach will be adopted to provide a solid framework to ensure potentially-useful deliverables for medical practice. This study aims to analyze the patient no-shows in detail and recognize if there are any key patterns to this type of "no-show" behavior. Certain important findings would include the days of the week which shows higher rate of "no-show", if biographical details like age and gender play an important role, whether the waiting period and reminders to the appointee have an impact on the show/no-show rate and many other if-then type of inferences would be drawn to answer the question as to why many patients do not show up for their scheduled appointment.
Mai, T.
*Business Analytics*

**MATCHING LOVE INTEREST WITH DATA ANALYTICS**

*Advisor: Asil Oztekin*

*Poster Location: MSB 4*

Finding a right person to be with the rest of our lives is becoming more and more challenging and time consuming. This study presents Interest Matching System (IMS) which predicts human behavior in term of love interest and determines the success of future dating opportunity based on speed dating experience. Data is collected by two professors in Columbia Business School, Ray Fisman and Sheena Iyengar, for their paper "Gender Differences in Mate Selection: Evidence From a Speed Dating Experiment". This matching system applies both supervised and unsupervised machine learning methods to predict the success of being asked for a second date and to provide recommendations for some potential target matches.

Mazza, K., Sirsikar, R., Vaudo, C.

*Business Analytics*

**A HOLISTIC ANALYSIS OF FACTORS INFLUENCING WOMEN'S PERFORMANCE AT SUMMER OLYMPIC GAMES**

*Advisor: Asil Oztekin*

*Poster Location: MSB 1*

A focused look into the impact of social, economical, political, health, climate, and education factors of female athletes' home countries that may influence the women's performance, or lack thereof, in the summer Olympic Games. The dataset in use was created by merging published data from multiple sources, primarily the International Olympic Committee and the World Bank. This study will concentrate on a representative set of nations and how the various factors may affect medal counts.

Wu, Z., Shinde, A., Saha, S., Das, R., Guo, Y.

*Business Analytics*

**DATA MINING FOR DATASET "RISE AGAINST HUNGER***

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*Poster Location: MSB 3*

Rise Against Hunger (Formerly Stop Hunger Now) is organization driven by vision of a world without hunger. We have data from them and in our study, we are going to do the data mining project in analyzing the given dataset of "Rise Against Hunger". This dataset contains 233,274 records with 260 attributes on hungers situations. For the study, we would use IBM SPSS, R, Microsoft Excel and Python data mining tools for Pre-processing and Data Modelling in order to get the best model for predicting the numbers of hengers development. We will leverage the CRSIP-DM (Cross Industry Standard for Data Mining) process to ensure a proven framework to our study. A correctly formatted confusion matrix will be created for evaluating the performance of each models so that we can get the best model for our study. This project will be exploratory research where in our objective is to find meaningful information from the data set which can help Rise Against Hunger for their noble cause.