

# 19<sup>th</sup> Annual Celebration of Undergraduate Research at UNC Chapel-Hill

## Panel Sessions - Frank Porter Graham Student Union

### Session I: 1:15 PM - 2:15 PM

#### **Panel 1: Force, Character, and History in 3203**

**Moderator: Barbra Ambros**

1:15-1:25 — Dylan Caskie (English & Comparative Literature) - The Fate of the Couple in Post-1945 Cinema

**Advisor:** Rick Warner

**Abstract:** This project is a study on the trajectory of the romantic couple in post-1945 (“modern”) cinema and the new roles that time, memory, and nostalgia play. My project rests on the work of the philosopher Gilles Deleuze who proposes that this modern cinema is marked by a growing trend where time takes on a more significant role than does narrative. My project features films from France, Italy, Hong Kong, and the United States released between 1959 and 2013 whose narratives are largely dominated by a romantic couple. I compare the role that time plays in the romance narratives of the selected modern films with comparison to those of classical narrative-driven cinema. Because of disruption in the classical mode of causal time, these modern romantic couples are unable to maintain their relationships and ultimately fall apart.

1:25-1:35 — Denton Ong (History) - Civil Liberties in the Time of Influenza

**Advisor:** Benjamin Waterhouse

**Abstract:** During the Spanish influenza epidemic of 1918-19, municipal governments across the United States implemented restrictive measures in an attempt to curb the spread of the deadly disease. Examples include shutting down public meetings, closing schools and churches, requiring people to wear flu masks, and banning spitting in public. These policies were often based on faulty science and sometimes met stiff resistance. These municipal anti-flu laws were important to the development of civil liberties in the United States, and an example of policies restrictive to civil liberties during the First World War.

1:35-1:45 — Justin Cole (Peace, War & Defense) - The Impact of Superheroes on Political Views

**Advisor:** Cori Dauber

**Abstract:** Ever since the success of Bryan Singer's X-Men and Sam Raimi's Spider-Man at the turn of the century, there has been an explosion in superhero movies. Because of this, it is important to remember that these films do not consist solely of mindless action sequences, but also promote political views. Specifically, *The Dark Knight* (2008) portrays torture and mass surveillance as effective means of preventing terrorist attacks, *Iron Man 3* (2013) argues that the threat of terrorism has been overblown, and *Captain America: Civil War* (2016) depicts restraints imposed by the United Nations upon the United States as harmful to international security, thus denouncing global governance and endorsing the notion of American exceptionalism. Because of the psychological appeal of superheroes stemming from their mythological, religious, and literary roots and the less overt nature of the persuasive content, this thesis examines the extent to which these three superhero movies can affect political views regarding the justifiability and efficacy of American policies during the war on terror. To do so, I conducted a media effects experiment in which the political views of participants were

measured before and after watching the superhero movies. My findings suggest that a substantial majority of viewers changed their views on certain policies during the war on terror. These findings raise important questions regarding the impact and ethics of incorporating political opinions into popular films.

1:45-1:55 — James Messmer (History) - The Final Judgement: John Bale's Apocalyptic Justification of Protestantism

**Advisor:** Brett Whalen

**Abstract:** This research examines the role of apocalyptic thought as a means to legitimize Protestant Christianity in the sixteenth century through the efforts of John Bale, a former Carmelite monk turned English Protestant. Apocalyptic thought held a controversial place in the minds of sixteenth-century Protestant reformers. Some, like Martin Luther and John Calvin, were hesitant to interpret the Book of Revelation due to concerns of the text's reliability. However, Bale embraced apocalyptic thought as a way to prove that the Protestant brand of Christianity was purer than that promoted by the Roman Church. Bale had several strategies to make his point. First, he traced all ecclesiastical history from the time of Christ on earth to his present day and concluded that the Protestants of his day could trace their beliefs directly back to those of the Apostles in the first century. Next, Bale interpreted passages of Revelation to conclude that beliefs specifically tied to the Roman Church were tenets created by Antichrist and thus had no place in a true Christian society. Finally, Bale used his understanding of the direction of history to conclude that English Church represented God's chosen church on Earth and that the English people held a special place in the events of the End Times. This research helps to shed light on an understudied figure of the English Reformation whose apocalyptic writings proved to be hugely popular in England at the time of his writing.

1:55-2:15 — **Questions**

2:15-2:30 — **BREAK**

## **Panel 2 : Energy and Space in 3205**

**Moderator:** Nita Eskew

1:15-1:25 — William Larsen (Geology) - Geochemistry of Springs and Streams on San Cristobal Island, Galapagos

**Advisor:** Xiaoming Liu

**Abstract:** Weathering on ocean islands serves as a substantial source of trace elements and nutrients to the surrounding marine environment. Rare earth elements (REEs) are used as geochemical tracers of weathering processes as well as proxies for paleo-ocean conditions in oceanic sediments. We measure dissolved load concentrations of major cations and trace elements in springs and streams on San Cristobal Island, which has a steep precipitation gradient on the windward side from wet highlands to arid conditions near the coast. Samples were collected during May and June of 2017, filtered through 0.45m membranes, and analyzed using an Inductively Coupled Mass Plasma Spectrometer (ICP-MS). Most stream samples showed flat REE patterns when normalized to the underlying bedrock, showing that the bedrock weathering signature predominates. High-elevation springs exhibited an anomalously high Ce concentration after normalization, however, showing that some other factor such as pH or clay mineralogy is affecting the REE signature. Selected samples were filtered through .02m membranes to further investigate the effect of particulate size on Ce fractionation.

1:25-1:35 — Lucas Perlman (Physics & Astronomy) - Calculations of Neutrinoless Double Beta Decay in a Limited Model Space

**Advisor:** Jonathan Engel

**Abstract:** Two-neutrino double beta decay, which is observed in many known isotopes, like germanium-76, is a process by which two neutrons in an unstable nucleus become protons by means of emitting two electrons and two antineutrinos. On the other hand, neutrinoless double beta decay is a process, not yet observed, that involves only the release of electrons, because the antineutrino emitted by the first neutron is absorbed by the second, which is only possible if the neutrino is its own antiparticle. The questions of whether neutrinos are indeed their own antiparticles is one of the most important in nuclear and particle physics. The quantum mechanical nuclear operator governing neutrinoless double-beta decay is hard to work with in large model spaces, but it is possible to construct an effective operator that is that gives approximately the same results in a limited space (which is easier to work with) as the full operator does in a large realistic model space. In this paper we investigate the procedure for working in the limited model space.

1:35-1:45 —Tatum Auvil (Physics & Astronomy) - An Analysis of Advanced, Modular Nuclear Reactor Designs and Suitability for Large-Scale Deployment in the American Electricity Market

**Advisor:** David McNelis

**Abstract:** Select Generation IV-classified nuclear reactor designs (high-temperature gas-cooled reactors, molten salt reactors, and liquid metal fast breeder reactors) intended for the American electricity market will be analyzed and compared on a basis of technological feasibility, safety, cogeneration potential, proliferation risk, and other physical design features. As these designs are all currently in conceptual phase, comparisons of these commercial designs with pre-existing experimental reactors (like Oak Ridge National Lab's 1960's Molten Salt Reactor Experiment and Tsinghua University's experimental pebble-bed HTGR) will be made. In conclusion, the advanced reactor design most suitable for large-scale, near-term (~2040) commercial deployment in the American market will be determined. Of course, this sort of analysis will rely on a multitude of highly turbulent social and political factors, but emphasis will be placed on the following: reactor technology, regulatory dynamics, cogeneration potential, and relevant economic factors such as required capital investment and levelized cost of electricity. The advantages and disadvantages of implementation of the selected design with respect to energy diversity and independence, cost, estimated greenhouse gas reduction potential, and suitability for coexistence with intermittent renewable sources will be addressed.

1:45-1:55 — Elena Kovalik, (Physics & Astronomy)

Modeling Graphene Plasmon Dependence on Layering and Fermi Energy

**Advisor:** Scott Warren

**Graduate Student Contributors:** Kaci Kuntz

**Abstract:** In the past decade, graphene has emerged as an optoelectronic material with unique optical and electronic properties. These properties are highly tunable through its plasmon resonance, which can be controlled through tuning structure geometry, thickness, and carrier concentration. Graphene's plasmon tunability has the potential to be used in novel biological and ecological sensors, optical devices, and microelectronics. Here, we explore control of the optical response of a graphene nanomesh in the infrared regime through number of layers and applied fermi energy with finite-difference modeling. We report increasing plasmon depth and blueshifted plasmon resonance frequency with increasing layer count and fermi energy, characterizing a new range of plasmon variability.

1:55-2:15 — **Questions**

2:15-2:30 — **BREAK**

## **Panel 3 On Health in 3206B**

**Moderator: Marsha Penner**

1:15-1:25 — Alex Sirois (Psychology & Neuroscience)

White Matter Connectivity in Veterans with Comorbid Post-Traumatic Stress Disorder and Traumatic Brain Injury

**Advisor:** Aysenil Belger

**Abstract:** It has been estimated that up to 50% of combat veterans who suffer from traumatic brain injury also suffer from comorbid post-traumatic stress disorder. The combined effects of this comorbidity may result in problems such as chronic hyperarousal, excessive fatigue and insomnia, irritability, social withdraw and depression. Veterans have also experienced executive dysfunction and behavioral disturbances exhibited through dis-inhibition, substance abuse, and problems controlling anger. This research used diffusion tensor imaging (DTI) to evaluate whether white matter connectivity in the frontoparietal and frontostriate pathways correlates with frontal lobe impairment or improved functioning as a result of being exposed to a mobile-technology based therapy called Cognitive Apps for Life Management (CALM). Twenty veterans diagnosed with comorbid post-traumatic stress disorder and traumatic brain injury were assigned to a CALM treatment group, and were subsequently compared to twenty members of an active control group. It was hypothesized that veterans who showed little improvement in executive functioning would also show reduced white matter connectivity or integrity.

1:25-1:35 — Bailey Burt (Business Administration)

Does Sperm From Male Factor Infertility Affect Aneuploidy of Blastocyst or Pregnancy Rate During In Vitro Fertilization (IVF)?

**Advisor:** Sung Tae Kim

**Faculty/Postdoc Contributors:** Bill Meyer, MD, Sung Tae Kim, PhD, HCLD

**Abstract:** This study is to correlate blastocyst aneuploidy or pregnancy with sperm characteristics during IVF. We analyzed 794 non-male factor and 337 male factor IVF cases. Male factor infertility was defined if sperm concentration is  $<10 \times 10^6/\text{ml}$ . Azoospermia due to previous vasectomy was excluded. Retrieved oocytes were fertilized by intracytoplasmic sperm injection (ICSI) method and embryos were cultured in the incubators at 37 degrees C with 6.5% CO<sub>2</sub> and 5% O<sub>2</sub>. Trophectoderm biopsy was performed on day 5 to day 7. Preimplantation genetic screening (PGS) from biopsy was performed by using array CGH method until 2015 and next generation sequencing (NGS) method from 2016. Pregnancy was tested by serum hCG level (5 mIU/ml) after 9 to 11 days post embryo transfer (ET). The statistical analysis was performed using a t-test. A p value of  $<0.05$  was considered statistically significant. For the non-male factor group (n=794), euploid rate of blastocysts was 54% (728/1,347). The euploid rate from oligozoospermia (n=280) and azoospermia (n=57) was 52.1% (223/428) and 55.7% (49/88), respectively. The pregnancy rate of non-male factor, oligozoospermia, and azoospermia was 66.2% (357/539 ET), 69.1% (125/181 ET), and 69% (29/42 ET), respectively. In conclusion, pregnancy rate and aneuploidy rate of blastocyst is not associated with reduced sperm concentration. In addition, testicular sperm from non-obstructive azoospermia does not affect both pregnancy or aneuploidy rate.

1:35-1:45 - Logan Smith (Psychology & Neuroscience)

Does Experimentally Inducing Different Moods Change Ratings Using Checklists?

**Advisor:** Eric Youngstrom

**Undergraduate Co-Authors:** Emma G. Choplin

**Faculty/Postdoc Contributors:** Eric A. Youngstrom

**Abstract:** Many factors including affect, psychopathology, and personality traits have been shown to have an effect on how an individual evaluates another person and subsequently rates him or her on a questionnaire. In an effort to explore this evaluation process, we hypothesized that experimentally inducing happiness, sadness and anger would cause a change in rating compared to a neutral control group, with anger induction producing the largest increase in ratings of bad behaviors. A total of 139 young adult participants completed a pretest about their best friend's behaviors, containing items from the Adult Behavior Checklist (ABCL) and then were assigned to one of four mood manipulation conditions in which they wrote about an interaction with their best friends. They completed the ABCL as a posttest. In an analysis with mood group (e.g., happiness) as the independent variable, ABCL post-test score as the dependent variable, and ABCL pre-test score as a covariate, we found evidence that the mood manipulation was successful in that the participants' ratings of their best friends changed as a function of their assigned condition,  $F(3, 134) = 4.24, p = .007$ . This finding has implications for diagnosis when a clinician is gathering information about a client from an informant such as a caregiver. It seems particularly important to take into account the informant's mood when making decisions using the information that is provided.

1:45-1:55 - Alex Schulte (Health Policy & Management)

Rural Medicare Patient Payment Responsibility at Federally Qualified Health Centers (FQHCs) and Rural Health Clinics (RHCs)

**Advisor:** George Pink

**Faculty/Postdoc Contributors:** Kristie Thompson, MA; Denise Kirk, MS; George H. Pink, PhD

**Abstract:** FQHCs and RHCs are both federally-designated, safety net facilities that play a vital role in improving access to health care for underserved populations, including rural communities. Appropriate access to care often leads to better health outcomes and lower costs. The purpose of this study is to investigate differences in rural Medicare patient payment responsibility at FQHCs and RHCs, which is calculated as the sum of the patient deductible and coinsurance amounts. There are different federal regulations used to calculate patient payment responsibility based on the classification of the facility where the patient received care. Additionally, some FQHCs and RHCs are affiliated with larger healthcare organizations (i.e. hospitals), which could influence the amount patients are responsible to pay (depending on charge amounts or use of sliding fee scales). If patient costs are too high, it may cause them to postpone or forgo care, which could lead to adverse future outcomes. A quantitative, multivariate regression analysis (using Stata14 software) will be performed. The model will include facility type/affiliation, ownership, location, and other county-level variables to analyze their effects on patient payment responsibility. The study includes all Medicare claims generated from Jan.-Dec. 2014 in the U.S. or its territories. Data will be obtained through an agreement between the Centers for Medicare and Medicaid (CMS), the Federal Office of Rural Health Policy, and the Sheps Center at UNC.

1:55-2:15 — **Questions**

2:15-2:30 — **BREAK**

## **Panel 4 Models and Technology in 3408**

**Moderator: Courtney Rivard**

1:15-1:25 — Sweta Karlekar (Computer Science)

Detecting Linguistic Characteristics of Alzheimer's Dementia by Interpreting Neural Models

**Advisor:** Mohit Bansal

**Graduate Student Contributors:** Tong Niu

**Abstract:** Alzheimer's disease (AD) is an irreversible and progressive brain disease that can be stopped or slowed down with medical treatment. Language changes serves as one of the first signs that a patient's cognitive functions have been impacted. In this work, we use Natural Language Processing (NLP) techniques to classify and analyze the linguistic characteristics of AD patients using the DementiaBank dataset. We apply three neural models based on CNNs, LSTM-RNNs, and their combination, to distinguish between language samples from AD and control patients. We achieve state-of-the-art classification accuracy on this task without any feature-engineering. More importantly, we next interpret what these neural models have learned about the linguistic characteristics of AD patients, via analysis based on activation clustering and first-derivative saliency techniques. We then perform novel automatic pattern discovery inside activation clusters, and consolidate AD patients' distinctive grammar patterns. Additionally, we show that first derivative saliency can not only rediscover previous language patterns of AD patients, but also shed light on the limitations of neural models.

1:25-1:35 — Joshua Bakita (Computer Science)

Verifying Scheduling Policies of an Embedded CUDA GPU

**Advisor:** Frank Don Smith

**Abstract:** Embedded systems augmented with graphics processing units (GPUs) are seeing increased use in safety-critical real-time systems such as autonomous vehicles. The current black-box and proprietary nature of these GPUs has made it difficult to determine their behavior in worst-case scenarios, threatening the safety of autonomous systems. In this work, we use a new testing framework to analyze GPU execution traces and validate if the internal scheduling policies of the black-box hardware and software match what has been assumed in prior work. This work specifically focus on NVIDIA CUDA devices due to their current use in industry.

1:35-1:45 — Caroline “Cami” Goray (Information Science)

The Impact of Social Norms on Users' Smartphone Notification Management Strategies

**Advisor:** Ryan Shaw

**Abstract:** There are paradoxical stories about the role of notifications for smartphone users. On the one hand, notifications can empower us to remain "in the loop" and can help us connect with others through digital platforms. On the other hand, they are criticized for contributing to phone addiction as they pull us away from our immediate surroundings and real life human interaction. I investigate the tension users feel between these trade-offs. Using Erving Goffman's model of impression management as a theoretical lens, I explore how two groups of users, international students and native U.S. students, manage their smartphone notifications. Additionally, I examine how they negotiate boundaries with technology. Data was collected from semi-structured interviews and participant diary study observations. 14 UNC-Chapel Hill undergraduate and graduate students participated. The findings illuminate what expectations and pressures users consider when reacting to their notifications as well as how they perceive their control in a world of constant connectivity. The findings may contribute suggestions for future smartphone notification design.

1:45-1:55 — Isabel Uzsoy (Computer Science)

Using Algorithmic Approaches to View Photo-Generated Models

**Advisor:** Jan-Michael Frahm

**Graduate Student Contributors:** True Price

**Abstract:** As imaging and graphics technologies continue to improve, we can render digital recreations of scenes from around the world, like the Eiffel Tower in Paris and the Trevi Fountain in Rome, with increasing intricacy. In order to present these models to wider audiences, I have worked on developing software that automatically creates a virtual “flythrough” video, thus showing a viewer the most important aspects of the scene. The models I use are actually constructed from sets of photographs;

using more photos gives better models. The method represents the cameras that generate a graph from the original scene image and determines a plausible motion path to traverse all the important viewpoints of the model. I used Dijkstra's algorithm to find an initial, basic path for traversing the input images. I made the initial path through the graph more efficient by requiring a certain degree of visual dissimilarity between the points added to the graph before the path is calculated. The output visualization renders the model from the viewpoints defined by the nodes of the graph and uses Hermite splines to smoothly interpolate between them. To scale the approach to large scenes with many registered cameras, I have investigated using clustering algorithms to group similar camera views and calculate a single, representative view to be used in the visualization.

1:55-2:15 — **Questions**

2:15-2:30 — **BREAK**

## **Panel 5 On Environment in 3102**

**Moderator: Vicki Richardson**

1:15-1:25 — Sydney Bezanson (History)

The "C" in the Name: Religion and Student Activism in the Campus Y at the University of North Carolina, 1930-1990

**Advisor:** Malinda Maynor Lowery

**Abstract:** This paper explores the relationship between religion and student activism, focusing specifically on the Campus Y's social justice projects from 1930 to 1990. It reveals that Christian student activism at UNC often reflected trends nationally while responding to crises specific to the university community. It shows secularization of the Campus Y by the 1980s was a gradual and sometimes incomplete process that resulted in new possibilities for social justice.

1:25-1:35 — Haley Moser (Geography)

Impacts of Extreme Flooding on Hydrologic Connectivity and Water Quality in the Atlantic Coastal Plain and Implications for Vulnerable Populations

**Advisor:** Diego Riveros-Iregui

**Abstract:** Hurricane Matthew brought extreme flooding to eastern North Carolina, including record regional flooding along the Lumber River and its tributaries in the North Carolina Coastal Plain. Situated in a region dominated by large-scale crop-cultivation and containing some of the highest densities of concentrated animal feeding operations (CAFOs) and animal processing operations in the U.S., the Lumber River watershed is also home to the Lumbee Tribe of American Indians. Most of the tribe's 60,000+ members live within the 3,000 km<sup>2</sup> watershed where they maintain deep cultural and historical connections. The region, however, also suffers from high rates of poverty and large disparities in healthcare, education, and infrastructure, conditions exacerbated by Hurricane Matthew. We summarize ongoing efforts to characterize the short- and long-term impacts of extreme flooding on water quality in (1) low gradient streams and riverine wetlands of the watershed; (2) in surficial aquifers, which provide water resources for the local communities, and (3) in public drinking water supplies, which derive from deeper, confined aquifers but whose infrastructure suffered widespread damage following Hurricane Matthew. Our results provide mechanistic understanding of flood-related connectivity across multiple hydrologic compartments, and provide important implications for how hydrological natural hazards combine with land use to drive water quality impacts and affect vulnerable populations.

1:35-1:45 — Jessica Hoffman (Environmental Science)

## The Small Molecule Antipsychotic Aripiprazole Potentiates Ozone-Induced Inflammation in Airway Epithelium

**Advisor:** Ilona Jaspers

**Graduate Student Contributors:** Adam Speen, Meghan Rebuli, Hye-Young Kim, Ned Porter, Ilona Jaspers

**Abstract:** Exposure to ozone (O<sub>3</sub>) has well described adverse health effects. While pre-existing respiratory disease has been identified as a factor enhancing O<sub>3</sub>-induced health effect susceptibility, the potential for drug-pollutant interactions to sensitize populations is not well understood. In the airway, inhaled O<sub>3</sub> can interact with lipid-rich airway lining fluid to generate reactive oxysterol species capable of inducing inflammation. Therefore, drugs that modify cholesterol synthesis may have deleterious biological effects in the presence of O<sub>3</sub>. Chemical analysis studies establish that small molecule antipsychotic drugs, like Aripiprazole (APZ), can elevate circulating 7-dehydrocholesterol (7-DHC) levels by inhibiting 7-dehydrocholesterol reductase, an enzyme involved in cholesterol biosynthesis. 7-DHC is a highly reactive target for lipid peroxidation and increased oxidative stress. Our results show that APZ, at clinically relevant concentrations, increases 7-DHC levels and potentiates O<sub>3</sub>-induced pro-inflammatory cytokine expression in airway epithelial cells. Similar potentiation can be seen with other small molecule antidepressants and -agonist drugs. Additionally, we find that ozonized 7-DHC enhances IL-6 and IL-8 expression more than ozonized cholesterol. Overall, we describe a potential mechanism for a drug-pollutant interaction between APZ and O<sub>3</sub>, which poses significant adverse public health implications considering the prevalence of O<sub>3</sub> exposure and APZ use.

1:45-1:55 — Sarah Wright (Environmental Science)

An Investigation of North Carolina Brewing and Sustainability

**Advisor:** Amy Cooke

**Abstract:** North Carolina has been increasingly known for its breweries, 243 as of 2017. The range of brewery sizes varies enormously, but a major commonality is the attention paid to resource management and sustainability. By developing an index encompassing environmental concerns, economic sustainability, and ethical concerns, it has become clear that many brewers and brewery owners constantly use sustainability factors to influence their decision making in every aspect of their business. There are challenges, though, of course. As the market for craft beverages continues to grow, the number of breweries rises as well. With increased supply-chain stress due to climate change and other environmental risk factors, talking about and pursuing sustainability is more important than ever. With this index as a resource, brewers will have more information about sustainability expectations and options that are being utilized by others in the NC brewing community and consumers will be able to make more informed decisions to align purchasing habits with their values.

1:55-2:15 — **Questions**

2:15-2:30 — **BREAK**

## **Panel 6 Undergraduate Research Consultant Team Projects in 3209**

**Moderator:** Tanya Shields

Amy Alam (Psychology & Neuroscience)

Facilitating Navigation through Documents by Individuals with Low Vision

**Advisor:** Peter Gordon (Psychology and Neuroscience)

**Undergraduate Co-Authors:** Kalleen Kelley, Kate Oldham, Anna Ostrowski, Natasha Vernooij

**Undergraduate Contributors:** Kalleen Kelley, Kate Oldham, Anna Ostrowski, Natasha Vernooij

**Abstract:** This project investigated ways of facilitating navigation through documents by individuals

with severely impaired vision (low vision). The research project will focus on the target case of facilitating use of an outline while conducting a deposition by a lawyer with retinitis pigmentosa. RP causes severe narrowing of the visual field such that an individual with the condition may be able to see clearly in the very center of the visual field but cannot pick up any information from the periphery of the visual field. Without peripheral vision it is impossible to take advantage of the organizational information in an outline. Instead, an individual with a very small visual field must start reading the outline at some point and search forward a word at a time from that point. A similar problem occurs when text-to-speech synthesis is used in screen readers; conversion of text-to-speech begins at one place in the text and proceeds serially from that point. In both situations the ability to navigate to regions of text that are most informative is greatly reduced, making it very difficult to use notes to help in an ongoing task. The project investigated ways in which current tools for assistive technology provide relevant accommodations for low vision and it obtained usability data from individuals with low vision. Novel integrations of existing technologies were created and preliminary assessments were made of their usability by individuals with low vision.

India Benson (Anthropology)

The Effects of Physical Activity, Psychosocial Stress, and Sleep Quality on Inflammation

**Advisor:** Mark Sorensen

**Co-Authors:** Darien Campisi, Carissa Cueva, Mallory Happ, and Sydney Puerto-Meredith

**Undergraduate Contributors:** Darien Campisi, Carissa Cueva, Mallory Happ, and Sydney Puerto-Meredith

**Graduate Student Contributors:** Gioia Skeltis and Jacob Griffin

**Abstract:** This study investigates the additive effects of physical activity level, psychosocial stress, and sleep quality on inflammation in 32 undergraduate college students at UNC Chapel Hill. Health profiles will be generated by a hybrid of questionnaires, monitoring devices (heart rate, sleep and physical activity), and biomarkers (salivary cortisol levels, CRP) and will be used to (1) examine the relationship between lifestyle factors and cardio-metabolic risk, and (2) assess the accuracy and reliability of health questionnaires as they pertain to observed health measurements. Recruitment criteria will be roughly equal numbers of subjects (8 per group) based on age, academic year, and whether they consider themselves to be a runner (e.g. 8 freshman ages 18-19, 8 sophomore ages 19-20, 8 junior ages 20-21, 8 senior ages 21-22). Each group will be comprised of 4 subjects who consider themselves to be runners, and 4 who do not consider themselves to be runners, using the question "Do you currently consider yourself to be a runner?" Data collection is still in progress; however, completion is estimated to occur by the end of April 2018. Our presentation at the Undergraduate Research Symposium will include an explanation of the URCT experience through the perspective of our primary investigator and undergraduate students. This research was supported by the Office for Undergraduate Research at UNC Chapel Hill.

Morgan Donnelly (Exercise & Sport Science)

Predictive Model of Attendance in Minor League Baseball

**Advisor:** Nels Popp

**Undergraduate Co-Authors:** Elizabeth Farley

**Undergraduate Contributors:** Isabella Dokell

**Graduate Student Contributors:** Javonte Lipsey

**Abstract:** This study aims to understand and measure the specific factors that contribute to fan attendance for the Durham Bulls Baseball Club, AAA affiliate of the Tampa Bay Rays. Data collected by the Bulls and from outside sources, including factors such as weather, day of the week, time, promotions, and competing events, are analyzed using regression analysis to understand which factors have a significant effect on fan attendance. These findings contribute to the predictive model that is

built to give the Durham Bulls a calculated prediction of game attendance. This predictive model is a useful tool for both researchers and practitioners, as it helps to understand the consumer behavior for the Minor League Baseball Club, and it provides useful information, which the Bulls can use for strategic sales, scheduling and management purposes.

## **Session II: 2:30 - 3:30 PM**

### **Panel 7 Thought, Message, and Movement in 3203**

**Moderator: Layna Mosley**

2:30-2:40 — Sarah-Gray Lesley (English & Comparative Literature)

Rethinking Aphra Behn: Systems of Free Thought in Behn's Later Works

**Advisor:** Reid Barbour

**Abstract:** The inclusion of Aphra Behn as the only woman in a list of respected libertine thinkers in Anthony Collins' 1713 *A Discourse on Free-Thinking* calls into question traditional narratives of Behn's status amongst her contemporaries, as well as her immediate legacy on the literary and philosophical English community. There remains much evidence from her collaboration and communication with her fellow male writers that she was a respected and even sought-after member of a more broadly defined free-thinking community. In my honors thesis, sponsored by a summer undergraduate research fellowship and the O. B. Hardison Jr. Scholarship in the Humanities, I analyze sources that include but are not limited to: her praise of Thomas Creech's translation of Lucretius' *De Rerum Natura*, her translations of her French contemporary, Fontenelle, and her astute *Essay on Translated Prose*, in which she presents her work on translation theory and Biblical accommodation. Through critical studies of these texts as a contribution to a larger seventeenth-century intellectual network, my thesis engages with Behn as a critical reader and contributor to Restoration political, theological, and literary discourse.

2:40-2:50 — Ali Dunlap (Journalism & Mass Communication)

Visual Metaphors in Opioid Health Messaging

**Advisor:** Allison Lazard

**Graduate Student Contributors:** Elizabeth Adams

**Abstract:** In the United States there have been unprecedented increases in opioid drug use and related deaths in recent decades. Health communication campaigns can impact perceptions about the harmful effects of opioids, but they must be engaging to do so. Visual metaphors - artful deviations that visually link to abstract concepts - are one way to increase audience engagement. We sought to assess visual metaphors as a strategy to effectively communicate the harms of opioid use. **Methods.** We conducted a one-way experiment comparing opioid messages with a visual metaphor with opioid messages without a visual metaphor. Outcomes were beliefs, negative affect, effectiveness, quality, message strength, and cognitive elaboration. To assess the impact on stigma, both message conditions were compared to a no message condition. Participants were 220 U.S. adults recruited from Amazon Mechanical Turk. **Results.** People who saw opioid messages with visual metaphors ( $M=2.51$ ,  $SD=1.04$ ) reported experiencing significantly greater negative affect ( $F=8.20$ ,  $p=.005$ ) than those who saw messages without a metaphor ( $M=2.10$ ,  $SD=.97$ ). Including a visual metaphor did not significantly impact the other perception outcomes or stigma (all  $p > .05$ ). **Conclusion.** Messages with visual metaphors led to greater negative affect, which can be a critical first step for message engagement about serious health topics.

2:50-3:00 — Marigny Kirschke-Schwartz (Peace, War & Defense)

## Standing in the Gulf: Politics, Covert Operations, and the Failures of Clinton's Iraq Policy

**Advisor:** Sara Castro

**Abstract:** Much of the literature surrounding the 2003 invasion of Iraq focuses on the faulty intelligence on Weapons of Mass Destruction (WMDs) that was used to help justify the war. Not enough attention is given to the twelve years the United States proclaimed its intention to remove Saddam from power. The primary goal of this thesis is to evaluate the origins, implementation, and overall shortcomings of the policy of “regime change” that became an official goal of the Clinton administration during 1998, but was pursued through a little known covert action program in the years prior. Through personal interviews with CIA field officers, aides to President Clinton, and other specialists on the region, along with evaluation of congressional records and news articles, this thesis analyzes the policies of a time period in which most of the government records and documents are still classified. I will analyze how a policy of regime change became a policy of liberation, and how neither policy was made a top priority in either of President Clinton's terms.

3:00-3:10 — Mary Drummond (Sociology)

Beyond Segmented Assimilation: Signaling Ethnolinguistic Identity with Language Preference

**Advisor:** Ted Mouw

**Abstract:** According to ethnolinguistic identity theory (ELIT), immigrants weigh the social value of their ethnolinguistic community, and make decisions as to whether or not they will attempt to improve their community's value, depending on two factors: 1) if they have sufficient motivation to improve their status, and 2) if they have the agency to do so. Studying the variables that influence immigrants' decisions to prefer their heritage languages over English, I investigate how immigrants construct their ethnic identities in ways consistent with ELIT. Much of the recent literature studying immigrant incorporation into the United States focuses on the ways in which immigrants weigh the economic costs and benefits of expressing certain ethnic markers. While useful, this segmented approach to assimilation overlooks the meaningful, non-economic aspects of identity formation that immigrants undergo. I conduct complex regression analyses using Wave 1 of the Children of Immigrants Longitudinal Study (CILS) – a set of data that has frequently been used to defend segmented assimilation theory – and find support for ELIT as a possible alternative in explaining the variation in heritage language preference within immigrant communities.

3:10-3:30 — **Questions**

## **Panel 8 Modes of Being, Modes of Diversity in 3205**

**Moderator:** Leslie Hicks

2:30-2:40 — Ryan McCord (Public Policy)

The Successes and Shortcomings of Implementing Environmental Health Related Policies in Health Care Facilities: The Case of Malawi

**Advisor:** Jamie Bartram

**Undergraduate Co-Authors:** Frances Reuland

**Graduate Student Contributors:** Nikki Behnke Faculty/Postdoc

**Contributors:** Ryan Cronk, Lydia Abebe, John Tomaro, Irving Hoffman, Benjamin Meier, Jamie Bartram

**Abstract:** Establishing and maintaining safe, sufficient and effective Environmental Health (EH) conditions in health care facilities (HCFs), largely through water, sanitation and hygiene interventions, is critical to preventing and controlling infections and disseminating environmental health education. Malawi has recently drafted an EH policy with specific targets for HCFs, but there has been incomplete

and unequal implementation of the policy. This study assesses the barriers and successes of implementing this and other EH related policies in Malawi's HCFs. Through 48 interviews with EH officials from Malawi's Ministry of Health, with representatives from the national level to the community level, we evaluate the implementation of these policies using Contextual Interaction Theory (CIT). Identified barriers include: limited economic support for and prioritization of the EH department; inadequate community mobilization; insufficient knowledge of policies and up-to-date EH issues by EH officials; gaps in the EH working system leading to lack of supervision and reporting; and poor coordination with external actors leading to inefficient use of external resources to address existing service gaps. Respondents offered several solutions to these barriers, which we consider for feasibility based on previous applications in other settings. Further research is needed to propose cost-efficient and setting-specific solutions to strengthen the implementation process within Malawi and elsewhere.

2:40-2:50— Marisa Sclafani (Global Studies)

Puerto Rican Youth Caregivers in the United States

**Advisor:** Elizabeth Olson

**Abstract:** This presentation focuses on the Puerto Rican caregiving population in the US, and specifically youth caregivers. Youth caregivers are often hidden from social support discourse and services. They are children and young people who assume caring responsibilities for family members or guardians. I am interested in researching the Puerto Rican population because they make up the second largest group of Latinos residing in the States and traditionally hold family caregiving values. Current research on Puerto Ricans in the US shows that more live in poverty, lack home ownership and lack health insurance than the overall American-Latino population and the US general population. This presentation suggests the need for more research on Puerto Rican youth caregivers. With informal caregiving being a common characteristic of Latino families, it is important to understand and identify youth who are taking on extra responsibly in the home so that opportunities can exist to support them.

2:50-3:00 — Nicholas Witham (Biomedical Engineering)

Functional Actuation of Mandrel Formed Twisted Coiled Polymer (TCP) Muscles in Organic Temperature Ranges

**Advisor:** Kenneth Donnelly (Biomedical Engineering)

**Undergraduate Contributors:** Bryan Labra

**Abstract:** Mandrel formed TCP muscles are an existing, but under researched form of thermally actuated artificial muscles, which are made by coiling a highly twisted monofilament plastics such as Nylon 6/6 (sewing thread) helically. An increase in temperature causes the fiber to shrink axially and expand radially. The radial expansion causes fiber untwisting, which compounds in a much larger tensile actuation (TA) and tensile stress (TS). To cause expansions, TCP muscles can also be coiled in the opposite direction of their fiber twist. These heterochiral fibers can be used to counteract length changes of the homochiral muscles caused by ambient temperature changes. Currently, the maximum contraction of 49% for mandrel formed TCP muscles has taken place at a 5.1 spring index and has achieved a 1 MPa stress over a 70K temperature range (25°C to 95°C). Human muscle have an average TS of 0.35 MPa and TA greater than 40%. To make viable TCP muscles to be comparable with human muscle, which have an average TS of 0.35 MPa and TA greater than 40% that actuate over body temperature range of (33.2°C to 38.2°C) the contraction must be improved by 1143% and the stress can be reduced by 65%. The main goal of this study was to conduct an isometric test where the muscles are heated from 33.2°C to 38.2°C and contract while tensioned by a 1.75g (most likely 2g) weight to determine if the muscle made from 0.25mm diameter monofilament can contract 40% its length while exerting a stress of 0.35 MPa.

## **Panel 9 Undergraduate Research Consultant Team Projects in 3209**

**Moderator: Drew Coleman**

Brinley Lowe (Journalism & Mass Communication)

Women in Political Technology

**Advisor:** Daniel Kreiss

**Co-Authors:** Brinley Lowe, Abbey Rogers, Gabrielle Micchia, Haley McDougal, Jenni Ciesielski, Jordan Townsend, Kate Frauenfelder, Meredith Martinez, Meredith Randolph, Samantha Paisley, Sumner Park

**Graduate Student Contributors:** Holly Roberts, Kirsten Adams

**Abstract:** To date, there has been a lack of studies on the experiences of women in the growing area of political technology. There is reason to suspect, although there has not been research to-date, that the political technology domain is as challenged in terms of gender diversity as its commercial counterparts. Industry data, for instance, shows that men account for roughly 80 percent of Facebook, Twitter, Google, and Microsoft's employees. A potential gender disparity in political technology practitioners has important implications for democracy. As the role of technology in political campaigns becomes increasingly important, diversity will help ensure that campaigns represent the public and engage women politically. Analyzing a comprehensive dataset (N=876) of all staffers working on Democratic and Republican primary and general election presidential campaigns from 2004-2016, in this paper we document the employment patterns of women working in political technology. We also conducted a series of open-ended and semi-structured qualitative interviews with female practitioners in this dataset to learn about their experiences working in political technology. Through these interviews, we aimed to understand the workplaces that these women encountered on campaigns, the mentor relationships they have had and their importance, if they have felt supported in their careers, and the barriers to women's advancement in political technology (or the key variables behind their success.)

Pragnya Dontu (Chemistry)

Dance and Diabetes

**Advisor:** Jordynn Jack (English and Comp Literature )

**Undergraduate Co-Authors:** Maebelle Mathew, Akhila Boyina, Destiny Ho, Shweta Bhatnagar

**Graduate Student Contributors:** Nicole Huntley

**Abstract:** Beyond its extensive physiological consequences, diabetes patients often suffer from a lack of confidence, a distorted, often negative body image, as well as a host of consequences that contribute to high distress levels. As such, alternative modalities of treatment that address the psychological perceptions of diabetes patients rather than physiological effects, such as dance, may prove effective in aiding patients to better manage their diabetes. This pilot study focuses on which particular styles of dance prove to be the most beneficial for management or empowerment for diabetes patients. The 8-week study consists of patients that volunteer to learn four different styles of dance. The study is preceded and followed by surveys, which include questions about social support, the participants' personal ideas about dance experience and expression, and their diabetes-related distress and empowerment. In addition, observations of the participants mood and body language throughout the dance workshop were collected by the investigators. The four dance styles, Bollywood, Zumba, Modern and Latin, were each chosen in order to explore a range of emotions and internal modes of expression within the patients. The purpose of this survey and intervention-based study is to

explore the effects of various styles of dance on empowerment levels, as well as diabetes management efficacy for patients.

Thaddeus Creech (Chemistry)

Desferoxamine Coated Suture to Improve Tendon Healing Strength

**Advisor:** Paul Weinhold

**Undergraduate Co-Authors:** Alex Brown, Blake Mauro, Drew Pierce, Jim Raynor

**Abstract:** Hypoxia-inducible factor-1alpha (HIF-1 alpha) is a transcription factor that leads to coordinated expression of genes associated with angiogenesis, glucose transport, matrix metabolism, and cell proliferation. This study investigates the delivery of the HIF-1 regulator, desferoxamine (DFO) via a suture, as a means to improve healing outcomes in hypoxic tissue injuries. The development of an angiogenic suture coating will provide a tool to spatially direct blood vessel formation where hypovascularity diminishes healing outcomes. To measure the release of the DFO from the coated suture by elution, we developed an assay to measure the in vitro release of DFO from a coated suture using spectrophotometry at 426 nm. In order to avoid the effects of heating on the material properties of the suture, we are in the process of implementing a new crosslinking method which utilizes glucose and exposure to UV light to crosslink the DFO-coated gelatin. Once an extended period of DFO release is achieved in vitro, a rat Achilles tendon repair model will be used to evaluate the in vivo performance of the DFO-coated suture relative to a control suture coated only with gelatin. The tensile strengths of the DFO-coated gelatin sutures were evaluated alongside gelatin-coated sutures, sutures soaked in deionized water, and control sutures. Statistical tests were run using the resulting failure maximum loads (N). The tests detected no significance between the groups, which agrees with our expected aim.

3:10-3:30 — **Questions**

## **Panel 10 History, Politics, and the World in 3408**

**Moderator: Janice Bardsley**

2:30-2:40 — Mary Grady Bell (History)

The Nationalist Meanings of 20th Century Olympic Games: Conflicting National Identities and Memories in Mexico, Germany, and America

**Advisor:** Lloyd Kramer

**Abstract:** In 1896, Pierre de Coubertin established the modern Olympic Games to foster global "mutual understanding with a spirit of friendship and fair play," according to the International Olympic Committee. Despite his hopes, the Games have long been used as political attempts to create coherent, modern images of host nations. Host nations have used media as diverse as architecture and newspapers to introduce themselves to a global audience and to create common national identities. Opposing groups within these host nations have also used the world stage of the Olympics to air their grievances, though. As seen in the portrayal of conflicting strains of nationalism in the Olympics of Mexico City 1968, Munich 1972, and Atlanta 1996, the international media provided confirmation or denial for one of these narratives. Analysis of international newspaper, magazine, and TV accounts proves that in Mexico City and Atlanta, conflicting views of the host nation developed internally, and the international press validated one of these views; in the Munich Games, the international press struck down the idealized view of the German nation and inspired fractures from within the nation. In all three scenarios, the "winner" of this nationalism contest was defined by who succeeded in drawing the most international support.

2:40-2:50 — Emily Venturi (Political Science)

## Migration Management and Development Policy Issue-Linkage in European Union External Relations

**Advisor:** Liesbet Hooghe

**Abstract:** After establishing the emergence of migration as a foreign policy topic and priority for EU institutions and EU member states, this article evaluates the contributing factors and outcomes of the EU's linkage of migration management goals with development policy cooperation following the 2015 Valletta Summit on Migration. Through expert interviews at EU institutions, and with Italy as an EU member state case study and Senegal as an EU partner country case study, this investigation evaluates the Migration Partnership Framework and the EU Trust Fund for Africa in terms of their prescribed goals and preliminary outcomes as instruments for migration and development policy issue-linkage. From May 2017 to July 2017, I conducted nine weeks of expert interviews in Dakar, Brussels and Rome, including at the Senegalese Ministry of Foreign Affairs, the Senegalese Ministry of the Economy and Planning, the EU Commission Directorate Generals for Home Affairs, Development and International Cooperation, the European External Action Service, the African Union Delegation to the EU, the Italian Ministry of Foreign Affairs, among others.

2:50-3:00 — Ad Lane (Anthropology)

## Questions of Kazakhstani Identity Through the Lens of Craftwork and Nation-branding at the 2017 World Expo and Beyond

**Advisor:** Rudi Collaredo-Mansfeld

**Abstract:** Throughout history, colonized lands have frequently been the victims of heritage and cultural suppression by occupying powers. In their independence, many find themselves in an uphill battle to reclaim their past in order to guide their future. Kazakhstan, of former Soviet claim, faces one such fight. Independent since 1991, it has been led in its development by Nursultan Nazarbayev, Kazakhstan's first and only president. Now, the end of that presidency draws near, while Kazakhstan's need for a strong identity grows everyday in the midst of increasing corporate and international interests. The country is tasked with the complex challenge of reaffirming and rebalancing culture and identity for presentation on an international level, using traditions as a foundation for “nation-branding.” One such long-respected Kazakh tradition is craftmaking. My research sought to examine the overlaps and deviations in how concepts of identity and “Kazakhness” are reconciled between artisan communities and national branding campaigns. It also investigated the role of artisan values by branders to establish a state image presentable to both international and domestic audiences. Through a combination of interviews, observations, and photo-documentation, I argue that between artisans and branders, the elements comprising the Kazakhstani identity receive varying prioritization. The relationship, then, is an alternating symbiotic one - incorporation of the other's ideology only when beneficial.

3:00-3:10 — Alexander Peebles (History)

## Developing Rights: Post-Independence Education in Tanzania Through 2002

**Advisor:** Lauren Jarvis

**Abstract:** Since its inception as an independent nation, Tanzania, or Tanganyika, has had leaders interested in the place of education in a democratic nation. After assuming control of its own education system, not only did the Tanzanian people capitalize on the existing global rights discourse, but Tanzanian thinkers generativity added to that discourse, espousing a vision of education that accounted for the way in which economic instability changes the capacity of states to fulfill to provide education, while not reducing the necessity of education. The case of Tanzania also serves a reminder of the ways in which national education systems can serve as locations of transnational influence as local interests interact with international intrigue and politics. Tanzania does not represent a utopic education system for poor nations or a monolithic resonance across the global south, but it does serve as an effective reminder that the ideals of post-independence African states were not universally doomed. From the

start of independence through the early 1970s, Tanzania prioritized education among its political commitments and the education system rapidly expanded both in length of coursework and number of students while breaking down pre-existing barriers. Tanzanian leaders justified these efforts both on the basis of economic development and human rights, a mix that would have later consequences.

3:10-3:30 — **Questions**

## **Panel 11 Biology, Biostatistics, and Chemistry in 3102**

**Moderator: Vicki Richardson**

2:30-2:40 — Xueqi Zhu (Biology)

A Unique Population of Neurons Within the Extended Amygdala Drives Autonomic Arousal and Anxiety States

**Advisor:** Garret Stuber

**Faculty/Postdoc Contributors:** Jose Rodriguez-Romaguera

**Abstract:** Anxiety disorders are characterized by elevated anxiety states. Neural circuits implicated in pathological anxiety involve multiple brain regions. The bed nucleus of the stria terminalis (BNST), also known as the extended amygdala, has emerged as a hub in networks that regulate anxiety. The BNST is a functionally heterogeneous region involved in many other motivated behavioral states, making it imperative to study distinct neuronal populations to disentangle the role of the BNST in motivational states. To do so, we used a transgenic mouse line to target a subset of BNST neurons that uniquely express prepronociceptin (Pnoc). We developed an assay to present olfactory stimuli to head-fixed mice while simultaneously measuring pupil diameter with a camera, locomotion on a running disk, and calcium activity of PnocBNST neurons with a 2-photon microscope. In the presence of anxiogenic synthetic predator odor 2,4,5-trimethylthiazoline (TMT), we observed increases in PnocBNST neuron activity and pupil diameter. Furthermore, we used optogenetic tools to activate PnocBNST neurons while simultaneously measuring pupil diameter, heart rate, body movement, and reward-seeking behavior. This activation led to increases in pupil diameter and heart rate. Taken together, these findings suggest that PnocBNST neurons are involved in driving autonomic responses characteristic of anxiety-like behavior. Thus, PnocBNST neurons could be a target for pharmacological intervention to reduce pathological anxiety.

2:40-2:50 — Jie He (Biostatistics)

Deep Convolutional Neural Network for Classification of Three Types of High-Grade Gliomas from Brain MR Images

**Advisor:** Dinggang Shen

**Graduate Student Contributors:** Dong Nie

**Faculty/Postdoc Contributors:** Han Zhang, Jin Lei

**Abstract:** Gliomas have been the most common form of primary malignant brain tumors with an annual incidence of seven per 100,000 adults, and the treatment as well as the prognosis of patients differ largely due to different types of high-grade gliomas. The classification of high-grade glioma types is a key step in the diagnosis of brain lesions, but the more accurate brain biopsy diagnosis is invasive and may put the delicate brain at great risk. Thus, the most commonly used diagnostic technique for gliomas is noninvasive imaging such as MR imaging. In this respect, it is important for radiology researchers to enhance both accuracy and functionality of image analysis methods for noninvasive imaging in glioma diagnosis. My research project focuses on classifying the three types of high-grade gliomas - glioblastoma, anaplastic astrocytoma, and oligodendroglioma (III) - with a high accuracy based on a relatively large dataset. It employs the model of deep convolutional neural

networks that can recognize patterns for classification from a large number of data and does not incur subjective bias in the feature selection/extraction process. Hence, radiologists can use it to better distinguish the three types of high-grade gliomas for diagnosis which can be very difficult to differentiate by eyes. Further, this research can extend to facilitate radiology research in training a deep learning model for noninvasive imaging.

2:50-3:00 — Margaret Bernish (Biology)

Community Composition of Plankton in the Western Antarctic Peninsula as Determined Through Sequencing the 18S Ribosomal Gene

**Advisor:** Adrian Marchetti

**Abstract:** The Western Antarctic Peninsula (WAP) has been an area of interest to ecologists in recent years due to climate change and the resulting sea ice melting. A part of the Long-Term Ecological Research network (LTER), this region has experienced the ramifications of ocean warming and is thus being studied for its response climate change. In order to analyze how this ecosystem responds to climate change, it is important to understand how local variability in climate affect food webs and community structures. Using 18S sequencing, we can genetically barcode the various species of diatoms in the WAP and determine the community structure. We are sequencing the DNA from filtered samples from the WAP in order to analyze the plankton community structure in this area and how different species may fluctuate or decline due to large-scale climate change. The extensive process to prepare these samples for sequencing include extracting the DNA from the filters. We then perform PCRs on the 18s sequences of each sample in order to look for small base pair changes in the v4 region of this variable sequence. Other steps include measuring the concentration of DNA in each sample to ensure enough has been extracted, and doing a PCR cleanup in order to purify the DNA and prepare it for sequencing. We hope to compare our 2017 data to other data collected from five years of data to determine how community structure has changed spatially and temporally.

3:00-3:10 — Martina Knechel (Chemistry)

Characterizing a Novel Signaling Pathway in *Pseudomonas entomophila*: Elucidation of the Signal Cascade Initiated by *Pseudomonas* Virulence Factor (PVF) through Transposon Mutagenesis

**Advisor:** Bo Li

**Graduate Student Contributors:** Ashley Kretsch

**Abstract:** *Pseudomonas* Virulence Factor (PVF) is a signaling molecule synthesized by proteins encoded in the *pvf* gene cluster of *Pseudomonas entomophila*. We have shown that mutation of these genes greatly reduces the bacterium's ability to initiate virulence. While its ubiquity in bacterial virulence has also been established, little is known about the signaling pathway PVF initiates in neighboring *P. entomophila*. Our goal was to identify the genes involved in this novel signaling pathway, from the reception of PVF at the membrane to transcription initiation. Tn5 mutagenesis was used to disrupt individual genes in a reporter strain of *P. entomophila* containing a promoter activated by the PVF signaling pathway fused with *lacZ*. Cells that took up the Tn5 plasmid were selected by antibiotic resistance and screened using a blue/white screen. Resultant white colonies exhibited disruptions in genes vital to the pathway as they were not able to produce galactosidase (*gal*), the product of *lacZ*, whereas blue colonies had functional pathways. White colonies were further screened with an assay measuring the *-gal*-catalyzed conversion of ortho-Nitrophenyl--galactosidase to o-nitrophenol. A total of 5,500 colonies were screened, and 49 white colonies were identified. The genomic location of these Tn5 insertions was identified by arbitrary PCR, and with the aid of bioinformatics, we identified a putative histidine kinase and methylesterase that are likely involved in the PVF signaling pathway.

3:10-3:30 — **Questions**

