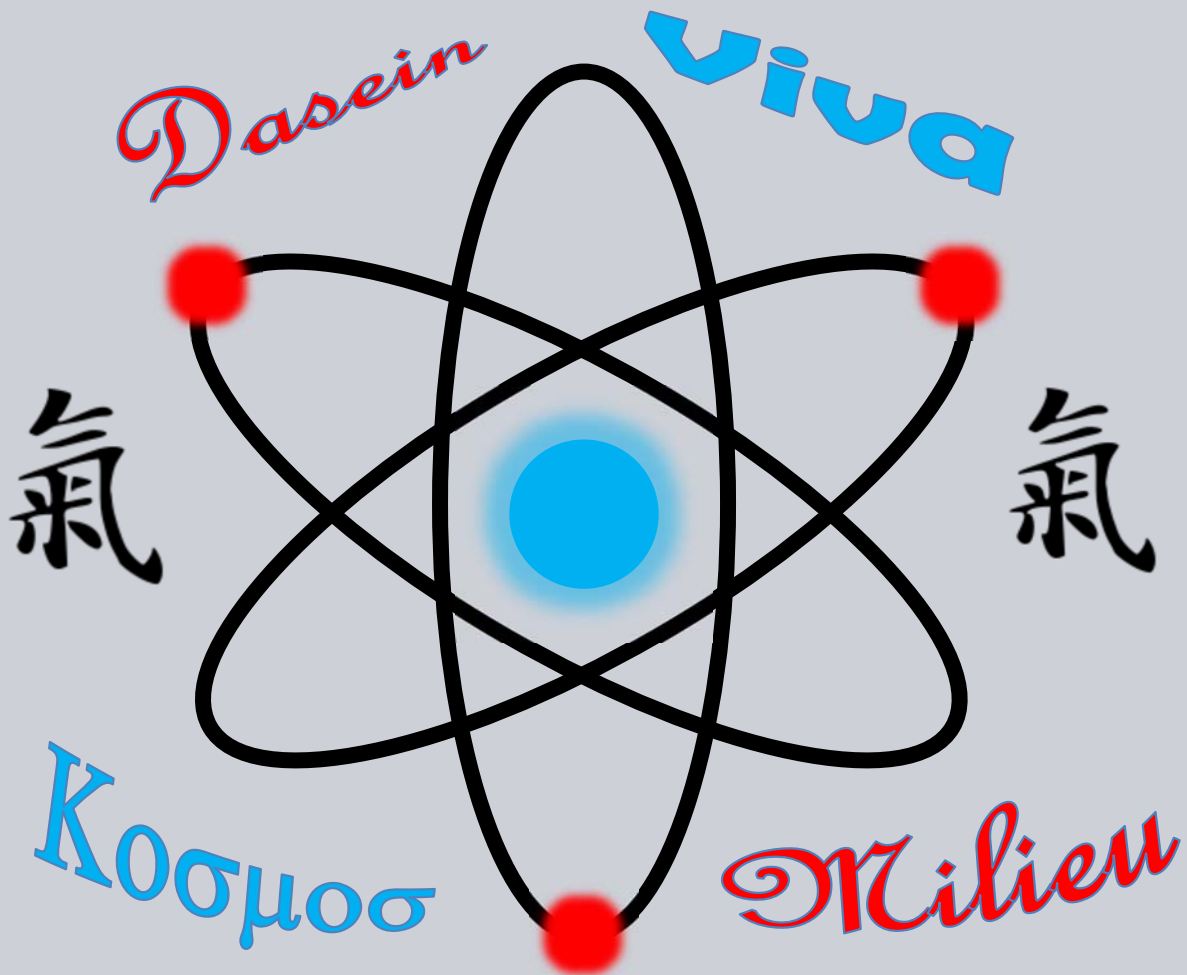


UNDERGRADUATE RESEARCH AND SCHOLARLY ACHIEVEMENT

# URSA SCHOLARS WEEK

Committed to Undergraduate Excellence

MARCH 26-29, 2018



**BAYLOR**  
UNIVERSITY

OFFICE OF THE VICE PROVOST  
FOR RESEARCH

**ABSTRACTS &  
PROGRAM**

Achievement • Creativity • Research • Vision

# Undergraduate Researchers!



Nominate your faculty research  
advisor for  
**Undergraduate Research  
Mentor of the Year!**

**Nomination forms are available on the URSA website:  
([www.baylor.edu/ursa](http://www.baylor.edu/ursa)).**

**It will only take a few minutes to complete a nomination for an exceptional research mentor, and submit it via the website.**

**Say thanks to a Baylor faculty member!**

## What is URSA?

The Undergraduate Research and Scholarly Achievement (URSA) initiative at Baylor welcomes all undergraduates, from freshman to senior, to maximize their education through a variety of research, creative and scholarly activities. Undergraduates take advantage of opportunities on-campus from the laboratories in the Baylor Sciences Building, to the design studios, to the library collections. They also participate in off-campus programs, including research internships at medical schools, assistantships at field stations, and apprenticeships in museums. URSA sponsors a small grant program, with funds available exclusively for undergraduate projects.

## What is Scholars Week?

Each year Baylor Sponsors a series of events to celebrate undergraduate research and creativity. Every spring, Baylor dedicates an entire week to scholarly presentation. The first two days are dedicated to platform (oral) presentations where students from a cross-section of academic disciplines share their projects and results. In mid-week, individual students and research teams display posters in the Baylor Sciences Building. Academic departments and the Baylor Libraries provide judges to determine the most outstanding efforts from both the platform and poster presentations. URSA recognizes the winners, along with outstanding faculty mentors at an Awards Reception at the end of April.

## Who administers Scholars Week and URSA?

The Office of the Vice Provost for Research has oversight over The URSA Steering Committee, which includes faculty and student representatives. Administrative research staff participate *ex-officio*. BURST, Baylor Undergraduate Research in Science and Technology, a student-run organization, assists with the event venue for Scholars Week.

## The URSA Steering Committee

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## Colleagues:

Once again, I have the pleasure of welcoming you to the Baylor URSA Scholars Week. Please find time within your busy schedule to examine the breadth and depth of the research of our students. It is easy to see that Baylor Research is *Making a Difference* in the lives of our undergraduates around the world.

The achievements of the faculty and students represented in this eleventh annual Scholars Week celebration are exemplary. As such, I encourage you to sample all of the scholarship on display, not just in your own discipline. The quality of each individual presentation once again demonstrates the monumental commitment provided by every Baylor faculty mentor and the direct impact this commitment has on our students.

Please also take the time to thank your faculty colleagues and students who have worked so hard to bring URSA to where it is today. Their unwavering enthusiasm promises a bright future for the undergraduate research experience at Baylor and is worthy of our praise!

As always, please accept my thanks for all you do on a daily basis for Baylor research.

I appreciate it and you.

Best regards,

*Truell W. Hyde*

Truell W. Hyde, PhD

Vice Provost for Research

## KEYNOTE ADDRESS

A special Scholars Week presentation and reception, organized as part of the speakers series sponsored by BURST. with The College of Arts and Sciences.

### Adventures in Solid State Synthesis: Hidden Gems to Link Materials' Properties



## Julia Chan, PhD

Author of over 170 publications in solid state chemistry

Monday, March 26, 2018

4:00 pm BSB B110

Presented by:



BAYLOR  
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Professor Julia Chan (B.S. in Chemistry, Baylor University; Ph.D., University of California at Davis) began her faculty appointment at Louisiana State University in Fall 2000, after spending two years as a National Research Council Postdoctoral Associate at the National Institute of Standards and Technology in the Materials Science and Engineering Laboratory. She then moved her research group to the University of Texas at Dallas Fall 2013. Her research interests involve synthesis of materials that exhibit metal-to-insulator transitions, mixed valence, highly correlated electronic systems, superconductivity, and materials for energy conversion. Efforts are placed on the crystal growth, structures, and properties of new materials. Prof. Chan has published over 170 papers and given over 100 invited talks. She has graduated 19 Ph.D. students and has mentored over 40 undergraduates in her laboratory. Prof. Chan's awards include NSF Career Award, American Crystallographic Association Margaret C. Etter Early Career Award, Baylor University Outstanding Alumni Award, Alfred P. Sloan Research Fellowship, Iota Sigma Pi Agnes Fay Morgan Award, American Chemical Society Exxon Mobil Faculty Fellowship in Solid State Chemistry and one of 12 Profiled in 2002 C&E News series on "Women in Chemistry", highlighting women making an impact in the chemical sciences. She is currently an associate editor of *Science Advances* and served on the Editorial Advisory Board of *Chemistry of Materials* and *Inorganic Chemistry*.

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# Platform Presentations

Bill Daniel

Student Center

March 26-27, 2018

## **Monday, 1:30 p.m. Session One - Baines Room**

### **Economics**

#### **A1. The Effect of the Gender Education Gap on Infant Mortality Rates in Sub-Saharan Africa**

Jessica Schurz; Faculty Mentor: Dr. Corneliu Bolbocean

*Department: Economics*

Closing the gender gap in education has the potential to develop the third world. Investing in education empowers both men and women by creating a healthier and more economically developed population. This paper seeks to explore how the gender education gap affects infant mortality rates in Sub-Saharan Africa. Data from the years 2000-2015 across 48 Sub-Saharan African countries was collected from the World Bank data base to test the hypothesis that the education gender gap is an indicator of a country's infant mortality rate, holding constant life expectancy, health expenditure, adolescent fertility rate, GDP, and GDP growth. Evidence was found to support this hypothesis, indicating that the gender gap in education has affected infant mortality rates in Sub-Saharan Africa over the past 16 years. One of the major contributions of this paper is in explaining how the education gender gap is an indicator (rather than predictor) of health outcomes. Other researchers have explored how women's empowerment causes health outcomes on a societal level. They argue that women currently enrolled in school are likely to have children later, have fewer children, take better care of their children, and implement better health practices. This paper is unique in that it looks specifically at a population of girls who are not having children -these girls are not the ones whose infants are dying. This paper shows, rather, that the countries which are not educating women are likely to have worse health outcomes for its infants.

#### **A2. Charitable Giving and Its Effects on Altruistic Behavior**

Rebecca Peirce; Faculty Mentor: Dr. Jason A. Aimone

*Department: Economics*

Prosocial behavior, specifically the acts of volunteering and charitable giving, is an aspect of human behavior that has been analyzed by economists in the recent past. When the acts of volunteering and contributing to charity are analyzed at surface level, it appears that those individuals who participate in these actions do so only for the benefit of those less fortunate or for the betterment of society. Research has shown, however, that one's desire to volunteer can stem from various motives, one of which is warm glow motivation. Warm glow motivation is the desire to engage in prosocial behavior not because the prosocial behavior benefits society, but rather because it provides the individual engaging in the prosocial behavior with positive feelings that boost self-image (Lilley and Slonim, 2013). The research conducted in these laboratory experiments further analyzes prosocial behavior in order to draw conclusions regarding charitable giving and the manner in which it affects an individual's altruistic behavior. Specifically, the laboratory experiments focus on the ways in which different social settings, including the public knowledge of one's charitable donations and the presence of a representative from the charitable organization, affect an individual's altruistic behavior and the motivations underlying this behavior.

#### **A3. Identifying Differential Effects of Mass Incarceration on Substance Addiction**

Samuel Kang; Faculty Mentor: Dr. Scott Cunningham

*Department: Economics*

The total count of individuals incarcerated in state prisons grew by nearly 250 percent from 1980 to 2000. This growth may in part be explained by a general tightening in American criminal justice policy, particularly with



respect to drug enforcement. This paper investigates the effect of rising incarceration rates on state-level rates of substance abuse across race-gender groups by exploiting a significant overcrowding law suit against the Texas prison system. In the aftermath of the case, Texas over doubled its prison capacity and the state prison population more than tripled in size. To conduct my analysis, I use two-stage least squares estimators to instrument for Texas incarceration rates with operational prison capacity and discretionary parole rates. My estimates show that Texas drug treatment admissions declined in response to this rise in incarceration and that these declines differ across race and gender groups. Black and male drug users, who are known to be more closely associated with the contemporary crack epidemic, are shown to be the most responsive to rising incarceration rates. I also find that alcohol treatment admissions decline in response to rising incarceration rates, giving indirect evidence that the reductions in drug admissions are at least partially driven by incapacitation effects.

## **Monday 1:30 p.m. Session Two - Beckham Room**

### **History and Governance**

#### **A4. Epic Poetry or Epic Biography? The History of William Marshal and The Life of the Black Prince in the Middle Ages**

T. C. Kniphfer; Faculty Mentor: Dr. Jeffrey S. Hamilton

*Department: History*

William Marshal, Earl of Pembroke (c. 1147-1219) and Edward the Black Prince (1330-1376) were both phenomenal soldiers and leaders who so inspired their contemporaries that each man had a biography written not long after his death. These were *The History of William Marshal* and *The Life of Black Prince*. The object of this paper is to analyze the comparative natures of the *History of William Marshal* and *The Life of the Black Prince* primarily as they relate to war and the idea of the noble leader. It will demonstrate how the aristocratic martial culture that surrounded each man was instrumental in producing these two vernacular biographies. Finally, given the political history of the careers of Marshal and the Black Prince, this paper will show the importance of these sources for political historians in the reading of the history of each's man respective period.

#### **A5. Peter Wentworth: Parliamentary Hero or Anti-Monarchist Traitor in Elizabethan England?**

Kyle Martin; Faculty Mentor: Dr. Bracy Hill II

*Department: History*

Peter Wentworth, a puritan MP known for speaking out directly against Queen Elizabeth I, has long been viewed as indicative of a larger pattern emerging within the parliaments of the queen, namely, a growing belief in the position of monarchical republicanism. Monarchical Republicanism, a term first coined and defined by Patrick Collinson roughly describes a growing sentiment under Elizabeth I that her counselors, although dedicated servants of the Queen, also bore some separate obligation of service to the state beyond the wishes of the Virgin Queen. Wentworth has been viewed in even stronger terms derived from the foundations of monarchical republicanism, with many English historians viewing him with somewhat anachronistic tendencies, attempting to attach anti-monarchical views to Wentworth that are more fitting in describing Parliamentarians in the English Civil War than Elizabethan MPs. This flawed approach is exacerbated by Parliamentary "high drama" historiography that tends to examine instances of dramatic political upheaval in Elizabeth's Parliaments rather than realistic records of Parliamentary proceedings. An examination of Parliament and Elizabeth's opinions on Parliamentary counsel and Parliamentary privilege, coupled with a focus on Wentworth's contentious speeches in Parliament and the process of gradual institutional expansion of parliamentary power and privilege reveal Wentworth to not be a symbol of change, but rather an outsider, constantly opposed not only by the Queen but by Parliament, whose vision of a limited monarchy and an expanded and empowered Parliament were applicable for an enemy of Charles I, but not for a loyal subject of Queen Elizabeth I.

## **A6. Bolivarian Revolution in Retreat: Understanding the Venezuelan Crisis, its Human Toll and its Outlook**

Fernando Centeno; Faculty Mentor: Dr. Sara Alexander

*Department: Anthropology*

From 2008 to 2016, the Bolivarian movement of Venezuela, now in its second decade of life, saw the country's economy quickly deteriorate as its supporters witnessed the collapse of a governing framework that for long offered the country's disenfranchised the means to escape long-perpetuated adversity and inequality. The human cost of this crisis has been unparalleled in the bicentennial history of the Latin American nation: rising infant and maternal mortality, ubiquitous scarcity of food and basic commodities, and repressive efforts by an increasingly entrenched government have engendered an impoverished and precarious livelihood for the citizens of one of the world's leading oil exporters. Contextualizing these concomitant national maladies, this presentation aims to (1) examine the social, economic, and political factors that precipitated this apparent vicissitude of fortune, (2) characterize the impact of the crisis on Venezuelan health and society, (3) discuss and analyze the response from aid agencies and financial entities abroad, and (4) evaluate the prospects of recovery for the country and the future of the post-Hugo Chávez Bolivarian national project.

## **Monday 1:30 p.m. Session Three - White Room**

### **A7. The Significance of the Trends Shown in The Austrian Party System During the 1990s**

Lauren Barnes; Mentor: Dr. Ivy Hamerly

*Department: Political Science*

During the 1990s, Austria experienced a massive ideological shift toward the right. Studying the Manifesto Project's database and right-left indicator scores show that parties that had been left leaning for decades were suddenly adopting right-wing positions. For example, the Greens, a traditionally leftist party, jumped up nearly 30 points towards the right from 1990 to 1994. In this analytical paper I seek to answer why the Austrian system as a whole experienced these changes. I argue that this shift was caused because parties shifted their ideologies in an attempt to appeal to the median voter, and could not do so because the Austrian system was experiencing political dealignment. In order to test this theory, this paper looked at the first three elections in the 1990s and consistently found signs pointing to dealignment including drops in voter turnout, voter volatility, the formation of splinter parties, and more voters being classified as waverers and later deciders. However, this paper also tested the conflicting theory of realignment and found there to be no significant correlation between where a party fell on a postmaterialist indicator, freedom and human rights, and what percent of the vote the party received. After concluding that the Austrian system was experiencing dealignment not realignment, this paper then applied the Downs' proximity model to explain how dealignment caused the political system to shift. Finally, I reach the conclusion that because voters felt frustrated with the political status quo that had prevailed for decades in Austria their voting patterns changed, and then political parties were unable to find the median voter, so they responded by changing their ideologies in an attempt to recapture the median voter. This research is significant because if the trends established in the early elections of the 1990s were to continue, however, one could expect to see even more voter volatility and ideological shifts in the parties. Until the voters' faith in Austrian politics returns and they began to vote predictably, political parties will be unable to accurately find the median voter, and will then, as a result, swing across the ideological spectrum.

### **A8. The Rise in Sentiment Against Immigrants in Germany: Economic Concerns or Something More?**

Hannah Byrd; Faculty Mentor: Dr. Ivy Hamerly

*Department: Political Science*

Politicians and governments with xenophobic and anti-immigration policies often cite the economic insecurity that immigrants create to justify these policies. The refugee crisis in Syria and other areas of the Middle East has made immigration a particularly salient topic in the western world and especially in the European Union (EU) in recent years. Germany leads the EU in receiving asylum seekers from the crisis and historically has a welcoming culture or *willkommenskultur* to refugees; it has also experienced a rise in sentiment against immigrants according to the World Values Survey. This paper seeks to find if economic insecurity has caused sentiment against immigrants to rise in Germany. To answer this question, this paper analyzes sentiment toward immigrants in terms of the percentage of surveyed Germans who indicated that they did not want immigrants or foreign workers as their neighbors in a World Values Survey question from 1992-2013. This paper analyzes Germans' economic security in terms of the unemployment rate meant to indicate individual economic well-being from 1991-2016 with data from the World Bank. Finding a lack of connection between the two variables, this paper argues that economic concerns cannot account for the rise in sentiment against immigrants in Germany. Upon further analysis, this paper finds that security concerns and dissatisfaction with current policy provoked the rise in sentiment against immigrants and led some German voters to seek different political solutions in the recent election.

### **A9. Gendered Jailing: Women's Incarceration on the Rise**

Mackenzie Chakara; Faculty Mentor: Dr. Patrick Flavin

*Department: Political Science*

In my research, I aim to look at the rapidly increasing rate of women in the United States criminal justice system. While there has been a strong push to reduce the number of male inmates as legislators seek to reverse the mass incarceration crisis, women's incarceration rates are climbing exponentially. I aim to examine the growing rate of female imprisonment, especially seeking a leading cause of the increase. I hypothesize that the emphasis that legislators and criminal justice reform advocates place on reducing male prison populations has led women- many of whom are tied to crimes along with their male partners - to become the new overrepresented group in prisons. To date, the racial disparity among incarcerated women has been steadily decreasing, so it appears that this issue is largely gendered as opposed to the racialized nature of male incarceration. Working with Dr. Flavin, I plan to test my hypothesis about criminal justice reform targeting male incarceration in order to decipher whether these well-intentioned efforts have ultimately led to another humanitarian crisis: the mass incarceration of women.

### **A10. Popular or not so Popular? Offensive Structural Realist and Institutional Predictions of German Neighbors in Regards to German Power**

John Ryan Isaacson; Faculty Mentor: Dr. Ivy Hamerly

*Department: International Studies*

A powerful Germany, both militarily and economically, has not always boded well for the continent of Europe. As of today, Germany has the largest European economy in terms of GDP, it has the largest population, and it is a central player within the European Union. Should Germany's neighbors hold a favorable view of German influence, despite its success? This paper will test the explanatory power of two International Relations theories in regards to German popularity within three other states: Great Britain, France, and Spain. The two theories are Offensive Structural Realism, which predicts that Germany's neighbors should not view German influence as favorable, and Institutionalism, which predicts that institutions like the EU do allow German neighbors to view German influence as favorable. Each theory will have testable independent variables which act on the dependent variable, which is each state's view of German influence. The dependent variable will be verified by a survey conducted by Globescan/BBC/PIPA, which measures the percentage of respondents within Germany, Great Britain, France, and Spain who had a favorable view of German influence in the years of 2008-2014. This paper concludes by showing that Offensive Structural Realism's predictions do not hold in Germany today; but rather, the Institutionalism's predictions do hold. Because of institutional rules and economic in-

terdependence, German neighbors generally have a favorable view of German influence, despite Germany's economic power.

## **Monday 1:30 p.m. Session Four - Fentress Room**

### **Biology, Chemistry and Statistics**

#### **A11. qRT-PCR analysis of bivalent genes implicated in EMT and their response to KDM6A H3K4me3 demethylase**

Taylor Nesbit; Faculty Mentor: Dr. Joseph Taube

*Department: Biology*

Modifications of histones near promoter gene regions have the capacity to serve as docking sites for either transcriptionally-promoting or silencing proteins. Trimethylation of H3K4 near promoters is known to stimulate transcription and trimethylation of H3K27 near promoters is known to repress transcription. Some genes possess both a histone modification that poises for activation and one that poises for inhibition within the same promoter. A histone demethylase the H3K27me3 mark, KDM6A, is known to participate in the transition to a monovalent methylation state, during retinoic acid-induced differentiation of mouse ES cells. Some genes possess both a histone modification that poises for activation and one that poises for inhibition within the same promoter; this is referred to as a bivalent domain. We decided to look at regulation of KDM6A through inhibition utilizing the small molecule inhibitor GSK-J4 in known bivalent genes during the progression of epithelial-to-mesenchymal transition (EMT) and mesenchymal-to-epithelial transition (MET). EMT/MET is thought to be implicated in the metastasis of cancer cells. Western blot analysis determined that KDM6A protein is highly expressed during MET and its expression decreases during EMT. Through qRT-PCR, we observed the effects of KDM6A inhibition on a set of known bivalent genes. The bivalent genes were categorized into subsets via the state of their chromatin configuration before and after EMT. Sets where H3K4me3 is initially present and K27me3 is acquired de novo were characterized as Group I and involved genes involved in cell growth and differentiation. Sets where H3K27me3 was initially present and H3K4me3 was acquired after EMT were characterized as Group II. Group III were characterized as having no initial H3K4me3 and H3K27me3 marks and resolving in bivalency, and Group IV were characterized as being bivalent before and after EMT. From analysis of qRT-PCR data, we observed that the majority of genes in Groups I-III are downregulated to a statistically significant degree following TGFB-induced EMT in MCF10A cells. The majority of group IV genes conversely, were unchanged. Overall, this data shows that KDM6A-dependent H3K27me3 removal is involved in the re-expression of bivalent genes to confer epithelial characteristics following MET. Future investigations involve determining the effectors involved in KDM6A regulation during EMT and MET to determine possible anti-metastatic targets.

#### **A12. High Performance Liquid Chromatography Analysis of the Bioreductive Cleavage of Prodrug KGP372 to Its Effector Anti-cancer Agent Combretastatin A-4**

Nathanael Lutz, Cody Hamrick, Kadon Caskey, Tracy E. Strecker, Yifan Wang, Matthew T. MacDonough; Faculty Mentors: Dr. Kevin G. Pinney, Dr. Mary Lynn Trawick

*Department of Chemistry and Biochemistry*

Regions of hypoxia are common in cancerous tumors and contribute to chemotherapeutic treatment failure and cancer metastasis. Cell studies have demonstrated that NADPH cytochrome c P450 oxidoreductase (POR) is a major enzyme responsible for the activation of the nitrothiophene-containing prodrugs under hypoxic conditions. In cells with standard oxygen levels, any reduced prodrugs are spontaneously re-oxidized. The purpose of this research, collaborative with the Pinney Group at Baylor University, was to analyze the bioreductive

cleavage of the prodrug KGP372 to the active anti-cancer agent combretastatin A-4(CA4) by POR. To ensure hypoxia, the reaction solutions were flushed with nitrogen and incubated with the oxygen scavenging enzyme protocatechuate-3,4-dioxygenase (PCD) and its substrate protocatechuate (PCA). In addition to POR, PCA and PCD, the reactions contained NADPH, Triton X-100 to facilitate solubilization of the prodrug, and KGP372 in phosphate buffer (pH 7.4). Reactions were treated with acetonitrile and analyzed by reversed phase high-performance liquid chromatography (HPLC) using the following mobile phase: 55% acetonitrile/water (10 min), followed by a gradient (30 min) increasing to 95% acetonitrile/water (10 min). Using this method, CA4 and KGP372 standards were eluted from the column with retention times of 6.5 min and 24.0 min, respectively, and detected by absorbance at 254 nm and 300 nm. Standard curves were linear from 2.5-200  $\mu$ M for both CA4 and KGP372. Reaction samples were analyzed by this method and demonstrated cleavage of the prodrug to CA4.

### **A13. Structural and Mechanistic Insight of MCMs**

Michael Bougoulias; Faculty Mentor: Dr. Michael Trakselis

*Department: Chemistry and Biochemistry*

Helicases are an essential group of enzymes necessary for unwinding duplex DNA. Amongst many types of helicases, the Mini Chromosomal Maintenance (MCM) family of proteins plays a central role in DNA replication and repair. While much is known regarding MCM, many structural and mechanistic details currently elude our knowledge. MCM8 is an important human helicase thought to be involved in double strand (ds) DNA break repair pathways and has been associated with infertility and diseases such as premature ovarian failure. [1] As more of the biological role of MCM8 is revealed, there is an increasing demand to unveil the structural and mechanistic components of this helicase. In this project, the N-terminal segment of MCM8 was purified in order to raise antibodies against MCM8. These antibodies will accelerate the study of MCM8 with applications ranging from in vivo MCM8 detection to purification of full length MCM8. In addition, the mechanism of DNA unwinding was investigated utilizing a structurally homologous Archaeal replicative MCM from *Sulfolobus solfataricus* (Sso). We are investigating the role of the excluded DNA strand during DNA unwinding. Unwinding assays were performed utilizing forked DNA and morpholino substrates which have different backbone chemistries. Results highlighted the importance of an electrostatic interaction between the excluded DNA strand and the external surface of SsoMCM, which support the Steric Exclusion and Wrapping (SEW) model for helicase unwinding.

### **Monday 1:30 p.m. Session Five - Houston Room**

## **Health, Environmental and Geosciences**

### **A14. The Impact of Health Literacy on Health Behaviors of Waco Residents**

Alexa Larsen; Faculty Mentor: Dr. Beth Lanning

*Department: Public Health (Health, Human Performance, and Recreation)*

Literacy, especially health literacy, is lacking in the U.S. adult population, especially among people of low socioeconomic status. According to the 2003 National Assessment of Adult literacy, 36% of adults have below average competence in interpreting and acting upon health information. Low health literacy has been linked to poor patient outcomes and higher rates of negative health behaviors, but results of studies examining the association of health literacy with smoking and drinking behaviors have been mixed. Furthermore, few, if any, studies have investigated the relationship of health literacy with health anxiety. In this study, we measured health literacy among adults at the Waco Family Health Center using the Newest Vital Sign tool. Smoking and drinking behaviors were gathered from EPIC medical records as reported by patients to their primary care physician. Health anxiety was tested using a shortened Whiteley Index. The data were then analyzed for correlations between health literacy and each variable separately, controlling for demographic factors such as race

and socioeconomic status. Results indicate that smoking is associated with lower health literacy, but no relationship was found between health literacy and drinking. There was no statistically significant relationship between health literacy and health anxiety; however, trends in the data indicate that lower health literacy may be associated with higher health anxiety. The relationship between health literacy and risky health behavior like smoking highlights the importance of adequate health literacy education and indicates a potential benefit of screening for health literacy in a primary care setting.

### **A15. The Role of Communication in Climate Science: How Scientists Can Successfully Present Research to a Religiously Diverse Public**

Madison Stewart; Faculty Mentor: Dr. Julie King

*Department: Environmental Science*

Today, the role of religion in sustaining Earth's environment is of global concern. Research has shown that over the past century, the Earth's climate has been exponentially warming as a result of anthropogenic greenhouse gas emissions. Despite a 97% peer-reviewed consensus and affirmation by the world's leading scientific organizations, only 63% of the American public believe in the existence of climate change. Moreover, only 52% confirm that climate change is primarily driven by anthropogenic factors ("Climate Change in the American Mind" 2015). Studies have demonstrated that religion is one of the key variables in the perception of climate science. Research has shown that those who are not religiously affiliated are more likely to affirm anthropogenic climate change than those who are religiously affiliated. This paper will explore the beliefs of some of the most popular American Christian religions and the ways that religious affiliations can affect public perceptions on climate change.

### **A16. Applying Paleobotanical Paleoclimate Proxies: A Case Study of Tropical African Floras**

Michaela Donahoo; Faculty Mentor: Dr. Dan Peppe

*Department: Geology*

The size and shape (physiognomy) of woody dicotyledonous angiosperm leaves is strongly influenced by climate. For example, mean annual temperature (MAT) is strongly correlated with the presence of leaf teeth, and mean annual precipitation (MAP) is correlated with leaf size. These relationships are used to create paleoclimate proxies to estimate MAT and MAP. Current proxies have been calibrated primarily using floras from the temperate Northern Hemisphere, and there are no floras from Africa in the calibration datasets. African floras have a different relationship between leaf physiognomy and MAP and MAT than floras from the Northern Hemisphere, thus current models may not be appropriate to use on them. To test the accuracy of these models on African floras, I measured the physiognomy of woody dicot leaves from sites with climate data from across tropical Africa. These sites were chosen to increase geographic, climatic, and altitudinal diversity in the dataset. I used the existing univariate models Leaf Area Analysis (LAA) and Leaf Margin Analysis (LMA) to estimate MAP and MAT, respectively, and the multivariate model Digital Leaf Physiognomy (DiLP) to estimate MAT and MAP. When the estimates were compared to the climate of the sites, most proxy-based estimates of MAT and MAP were within uncertainty, though the uncertainties are very large. Further, DiLP frequently overestimated MAT and underestimated MAP. Therefore, current paleoclimate models are unsuitable for estimating climate for African floras, and sites from Africa must be included in leaf physiognomic proxies before they can be applied globally.

### **A17. Hydrogeologic Characteristics of Spillway Creek, Belton, TX**

Kendai Sutton; Mentors: Dr. Joe Yelderian, Wayne Hamilton, MS

*Department: Geology*

Spillway Creek is a natural stream that acts as part of the emergency spillway for Stillhouse Hollow Reservoir and Dam. It is located within Chalk Ridge Falls park operated by the US Army Corps of Engineers and occurs in the Northern Segment of the Edwards Balcones Fault Zone (BFZ) aquifer. The Northern Segment is the least studied portion of the Edwards BFZ aquifer, yet supplies water to local communities, rural residents, and threatened salamander species. The channel of Spillway Creek consists of exposed bedrock that provides a rare continuous view of the lower portion of the Edwards formation, the entire section of the Comanche Peak formation, and the upper portion of the underlying Walnut formation confining bed. This research studied the exposures in Spillway Creek to describe hydrogeologic characteristics of the Northern Segment of the Edwards BFZ aquifer. Caves, fractures and springs were described and mapped along the channel. Fracture density combined with spring and seep discharges were used to develop a conceptual model of general aquifer characteristics which could be used for water management decisions and field parameters for water chemistry were collected to provide a baseline to use in later comparisons. The characteristics of the Northern Segment of the Edwards BFZ aquifer as exposed in Spillway Creek represent an increase in fracture density and subsequent aquifer flow capabilities from the Walnut formation upward into the Edwards formation with a dramatic increase in flow near the Edwards-Comanche Peak contact. This conceptual model can now be tested as a basis for understanding the aquifer within the region of the Northern Segment of the Edwards BFZ aquifer.

## **Monday 1:30 p.m. Session Six - Cowden Room**

### **International cultures and communication**

#### **A18. Side Effects May Include Peace: Richard Nixon, the Soviet Union, and SALT**

Charlotte Stoltzfus; Faculty Mentor: Dr. Steven Jug

*Department: Modern Languages and Cultures*

In today's climate, when each day seems to revisit conflicts of days gone by, particularly the Cold War, examination of the history of international relations is more important than ever. In my research, I examined the Strategic Arms Limitation Talks (SALT) between the United States and the Soviet Union. Through a close reading of recently declassified government documents including memorandums, meeting minutes, and transcripts of conversations between the negotiating powers and within the Nixon administration, I found that US diplomacy at the time was marked by inter-administration competitiveness, ignorance of other cultures, and strategic pragmatism. I ultimately argue that SALT was not a tool of peace, but a tool to promote President Nixon's domestic image, and to maintain the United States' defensive power.

#### **A19. Censorship Under Nicholas II Tsar**

Wyatt Griffis; Faculty Mentor: Adrienne Harris

*Department: Modern Languages and Cultures*

Nicholas II gained infamy for his authoritarian, arbitrary, and often nonsensical censorship laws. Despite considering himself a well-meaning leader, the Tsar's eccentric and bumbling leadership created a wide variety of strange and difficult circumstances for Russian writers and intellectuals to navigate in order to avoid arrest.

## **A20. Women's Experiences in China During the Twentieth Century**

May Kearney; Faculty Mentor: Holly Shi

*Department: Modern Languages and Cultures*

Inspired by previous work on women's narratives in foreign films, this project discusses stories of women from the beginning of the twentieth century to the opening of China. The specific focus is that of World War II and the Cultural Revolution, as shown in the three Chinese films selected. The first film, *Twenty Two*(二十二), is created by Guo Ke. The movie reviews the lives of twenty-two "Comfort Women," those who were forced into sexual slavery during the Japanese occupation of China in World War II. The second film, created by Hou Yong, and entitled *Jasmine Women*(茉莉花开), depicts the lives of four generations of women throughout the twentieth century. The third film is *Xiu Xiu*(秀秀), created by Alice Chen. This movie describes a story about a girl who is forced to have sex with Communist party members in order to receive her freedom. All of these movies examine the narratives of women in this time period and give a close-up view of individual women's fates at a time China was going through rapid changes. Women's stories are essential to understanding cultural influences in history, and these films give perspective on several different aspects of women in Chinese society through the lens of classism and social structure.

## **A21. Animation Development in China**

Katie Heenan; Faculty Mentor: Holly Shi

*Departments: Communication and Asian Studies*

This paper provides an overview of the development of Chinese animations and the values and stories embedded in such films to reflect upon China's developing culture. Featured are some of the top grossing films or series analyzed to reflect upon the stories that lie underneath the film itself. This will be an overview as to how Chinese animation has transformed from traditional story telling into embedding their culture and stories within modern day settings. Chinese production companies have taken animation and merged it with their present day and ancient history to compete with some of the globally dominated competitors in animation such as America and Japan. As Chinese animation takes on a global position, it is important to notice the socio-historical contexts but also recognize it as a crucial cultural form with global popularity and its uniqueness that is aesthetically pleasing. I will be focusing on the development of animation in China and how it connects history through modern day life in China by going through the history of Chinese animation all the way to present day animations created.

## **Monday 1:30 p.m. Session Seven- Lipscomb Room**

### **Presentations in French**

#### **A22. Comparative Literary Stylistics within Samuel Beckett's *Godot***

Jennifer Wilson; Faculty Mentor: Dr. Richard Duran

*Department: Modern Languages and Cultures*

The field of comparative stylistics studies lexicological and grammatical mannerisms in different languages in order to reveal characteristics of each language and the relationship between them. Samuel Beckett's *En Attendant Godot* and his own translation *Waiting for Godot* provide a unique opportunity to compare the style of English and French. The same author is communicating the same ideas in the same context, so differences can be attributed to differences of language. By comparing the two, we can observe the characteristics of Beckett's



translation process. Dialogue within Godot is characterized by deviation from normal syntax and repetition. This abnormal style augments the effects of absurdity on the themes and message of the play.

### **A23. The Effect of French on Modern Breton Grammar**

Parker Wright; Faculty Mentor: Dr. Richard Duran

*Department: Modern Languages and Cultures*

This research aims to investigate and determine the changes that Breton, a Gaelic language spoken by a minority group in the French region of Brittany, has undergone as a result of heavy language contact with Modern French. While this study is concerned with the overall linguistic state of the language, there is specifically a focus on the morphological, syntactic, and phonological evolution of Breton as it has been cut off from other languages within the same family.

### **A24. Le futur de l'énergie de la France avec l'accord de Paris**

Julia Frandsen-DeLoach; Faculty Mentor: Dr. Richard Duran

*Departments: Modern Languages and Cultures, and Environmental Sciences*

The continuing global climate threat jeopardizes global temperatures as greenhouse gases raise anthropogenically. France aims to mitigate this rapidly growing issue by pledging to lower their carbon dioxide emissions through the Paris Agreement under the United Nations Framework Convention on Climate Change. France's progressive plans strive to attain carbon neutrality by 2050, showing their dedication for improving everyday life for all French citizens, and the rest of the world.

## **Monday 3:30 Session One - Baines Room**

### **Journalism and Media**

#### **A25. Why We Can't Search "Latina": An Analysis of Latina Sexualization on Twitter and Stereotypes in Film Media**

Cassandra Rodriguez; Faculty Mentor: Dr. Mia Moody-Ramirez

*Department: Journalism, Public Relations, and New Media*

This content analysis examines how social media (specifically Twitter) portrays and defines the term "Latina" and what search results emerged from tweets containing material related to the term. It also looks at the representation of Latinas in film media including common stereotypes that exist in television and movies. The researcher utilizes stereotyping theory and framing theory in their research to analyze the common conception of Latina women and initial thoughts associated with the word "Latina" itself.

#### **A26. The Role of Social Media in the Inclusion of Abortion in Women's Rights**

Kelsey Kaigler; Faculty Mentor: Dr. Mia Moody-Ramirez

*Department: Journalism, Public Relations & New Media*

This study utilizes existing research and social media analysis to measure public opinion toward the inclusion of abortion in the rights of women and to discover how media framing contributes to that opinion.

## **A27. Twitter Analysis of the Language of “bossy,” Applied to Gender and Leadership Roles**

Katie Stewart; Faculty Mentor: Dr. Moody-Ramirez

*Department: Journalism, Public Relations & New Media*

The word “bossy” is most often an adjective used to reference a woman or young girl in leadership roles. As this research supports, rarely is the word used to describe men and more specifically men in roles of leadership. In 2014 Sheryl Sandberg, Chief Operating Officer of Facebook, launched her campaign “Ban Bossy” to encourage young females to feel empowered enough to seek roles of leadership. The campaign also involved Girl Scouts USA CEO Anna Maria Chávez and former Secretary of State Condoleezza Rice (McFadden & Whitman, 2014). This campaign sparked a new discussion with opposing perspectives of the appropriate use of the word “bossy” and challenged the opinions of the word as a disadvantage to women. Large media outlets such as NPR, FOX News, The Guardian, The Washington Post joined in on the conversation about the use of the word “bossy” and the ways in which it is used in social contexts (“Tell Me More,” 2014; Nance, 2014; Mitchell, 2014; Petri, 2014). This study will use content analysis while applying feminist theory to a sample of 57 tweets that use the language of “bossy” (or a variation of the word further explained below) to understand the public’s tone towards, and perspective of the word “bossy.”

## **Monday 3:30 p.m. Session Two - Beckham Room**

### **Religion and Philosophy**

#### **A28. Paul, Peter, and the Sword: Matta El Meskeen on Submission and Romans 13**

C. Carter Barnett; Faculty Mentor(s): David Whitford (Religion) and Abjar Bahkou (Arabic)

*Departments: Religion and Modern Languages and Cultures (Arabic)*

This presentation explores Romans 13:1-7 by exegeting the passage and considering the interpretation of Matta El Meskeen—a Coptic theologian, monk, and Egyptian dissident. My understanding of Meskeen’s interpretation derives from his Romans commentary entitled *Sharīh Rasaala Al-Qudis Bulsh Al-Ra’ool Ila Ahl-Romani* (Explanation of the Apostle Paul’s Letter to the People of Rome). After comparing my exegesis of Romans 13 with Meskeen’s spiritual interpretation, this presentation explicates differences in understanding based on Meskeen’s historical situation in twentieth-century Egypt. Meskeen’s relationship with the Coptic church and Egyptian state is fundamental for understanding his call for total submission under governing authorities. In conclusion, this presentation calls for a more generous understanding of Romans 13, which was serious for followers of Christ in Paul’s day and remains relevant in global Christianity today.

## **Monday 3:30 p.m. Session Three - White Room**

### **Political science**

#### **A29. Debunking the Twitter Revolution: A Rationalist Approach to the Arab Spring**

Andrew Patterson; Faculty Mentor: Dr. Hamerly

*Department: Political Science*

The Arab Spring has inspired many to ask what caused the revolutions that very quickly swept across the Arab world. To the media and many scholars, the Arab Spring was the Twitter Revolution. Drawing from the rationalist branch of political science, this paper argues that whether or not an Arab country experienced a full revolution comes down to simple cost-benefit analysis on the part of the protesters and the security forces (military and police). Twitter and other social media platforms may have helped in the organization of events, but the fundamental cause was choices by individual actors. In order to test this explanation, I examine the cases of Algeria, Tunisia, Egypt, and Libya. Examining these countries controls for many variables due to their geographic proximity and similar cultures, but also controls for education and access to social media. The two factors differentiating these countries that are examined in this paper are social unity vs social fragmentation and pro-opposition military vs pro-regime military.

### **A30. Modernization's Relationship to Democratic Trends in Modern Turkey**

Megan Galvin; Faculty Mentor: Dr. Ivy Hamerly

*Department: Political Science*

Straddling two continents, even the geography of Turkey points to a confusing, tumultuous nation. What is the cause of the seemingly unpredictable regime changes within the state of Turkey? A modernization model posits that a growing, educated, urban middle class demanding increased freedoms leads to democratization, while a civic engagement model asserts that citizens who trust and cooperate with one another lead to democratization. After briefly defining the models and clarifying their key characteristics, this paper will argue that the modernization model most accurately describes Turkey's shift from an authoritarian regime towards a democratic regime through three critical tests that Berman's civic engagement model fails. Ultimately, this research will conclude that the modernization model best accounts for Turkey's democratization because of the country's high GDP per capita compared to its past and the global median with a low number of civic associations per 1,000 population, low percentage of the population working in agriculture with low levels of trust amongst neighbors, and high level of urban education within middle class citizens with a disregard for rule of law. The paper concludes by applying the findings to Turkey's recent slide toward authoritarianism.

### **A31. Origins of Democracy in Costa Rica and Nicaragua**

David Pottinger; Faculty Mentor: Dr. Lizbeth Souza-Fuertes

*Department: Latin-American Studies*

An incredible disparity exists between the current political state of affairs in Costa Rica and Nicaragua. Costa Rica is a stable democracy with a high rate of development for its region, while Nicaragua is widely considered to be drifting towards authoritarianism and is one of the poorest countries in the hemisphere. This begs the question: what could possibly account for this divide? After all, Costa Rica and Nicaragua share many aspects of culture and geography. Although the broadness of this question means that innumerable answers could be given, this thesis will attempt to demonstrate that a single factor primarily accounts for these differences: the contrasting outcomes of the Liberal Reform period (1821-1909) for the two nations. While Costa Rica began pursuing reforms early and gradually, and was largely free from foreign intervention, Nicaragua was repeatedly stymied in its efforts to modernize, both by internal strife and interference from the United States. Understanding how Costa Rica was able to plant the seeds of democracy in this pivotal period, and how Nicaragua was prevented from doing so, will help to explain the roots of their successes and failures even up to the present.

## **Tuesday 1:30 p.m. Session One – Baines Room**

### **Religion**

#### **A32. I Am Lilith, Hear Me Roar**

Lily Pellegrini; Faculty Mentor: Dr. Mikeal Parsons

*Department: Religion*

Lilith—the first woman, an evil precursor to Eve, and a cultural phenomenon even without an official place in the Old Testament. Her character has no real home within the Christian canon; the Lilith myth derives most of its roots from Hebrew folklore where her story was passed as more of an oral tradition. Demon and seductress, child-eater and monster, feminist and advocate for women, Lilith has been approached in a variety of angles, with an understanding that as times change, so do our perceptions. Once vilified, progression through time has created a new context for our first woman. The evolution of the Lilith myth speaks to the evolution of our understanding of women's role in society. Here, Lilith will be analyzed in terms of her cultural implications, beginning in the Talmud and early Jewish texts, her later appearances in the *Alphabet of Ben Sira*, and ending with her modern renaissance.

#### **A33. The Book of Esther and its Additions**

Sophie Rhodes; Faculty Mentor: Dr. Mikeal Parsons

*Department: Religion*

This textual criticism explores the differences between the Hebrew and Greek versions of the Book of Esther. The addition of God as an explicit character and its effects on the story as a whole are examined, as well as how this changes the role of Esther as a protagonist. This paper additionally explores cultural standards for women in Greek society and how they compare to standards for women according to Hebrew society. Esther's piety in the Apocryphal text is contrasted with piety among important Jewish men as portrayed in the Old Testament. Lastly, canonization and the cultural importance of the story are discussed. The book of Esther contains many cultural elements that make it unique among other Old Testament writings.

#### **A34. Redemption in Ruth and Esther**

Mary-Todd Ridley; Faculty Mentor: Dr. Mikeal Parsons

*Department: Religion*

Women in the Bible are few and far between. Often not discussed in great importance, women in biblical accounts sometimes appear trivial. Out of 66 books in the Bible, only two bear women's names, Ruth and Esther. Clearly, these women's stories have a distinctive quality that merits their inclusion in the scriptures, and this distinguishing factor is redemption. Ruth and Esther bravely faced the obstacles before them in foreign lands, among a people who was not their own in order to save and redeem those who depended on them. Through her

marriage to Boaz, Ruth saved herself and Naomi from an insecure life of hardship. Esther protected Mordecai from Haman's wrath and rescued the Jews from the threat of imminent death. Furthermore, the theme of redemption in Ruth and Esther is emphasized through narratives regarding foreigners, food and drink, and God's sovereignty.

## **Tuesday 1:30 p.m. Session Two – Beckham Room**

### **Russian**

#### **A35. How Mikhail Lermontov's and Aleksandr Pushkin's Reactions to Nature Shaped Russian National Identity**

Nick Lee; Faculty Mentor: Dr. Adrienne Harris

*Department: Modern Languages and Cultures*

Abstract: In writing about their homeland's bounty, Lermontov and Pushkin expressed how they felt about the emerging idea of Russia. It is one thing to see a snowy day repeated over and over through a winter and remark on its harshness and splendor. It is a more nuanced and useful thing to connect the harsh snow with the tenacity of the people who live through it. Lermontov writes with a passion and fervor about the natural world of Russia. His love of the Caucasus and the black sea, seep through his writing. Pushkin however uses nature as a backdrop on which to paint the Russian identity, the idea of the Russian man. The works of both authors captured the definition of Russian nature and what that scenery says about Russians.

#### **A36. Pushkin's Rusalki**

Rachel Quiles; Faculty Mentor: Dr. Adrienne Harris

*Department: Modern Languages and Cultures*

The era of Romanticism in 19<sup>th</sup> century Russia forced writers to look back to ancient stories and folklore for inspiration. One of the greatest writers of this time, Alexander Pushkin, was known to use folkloric references to narrate his own political and social beliefs. This essay describes Pushkin's portrayal of the ancient creature, the rusalka, in three of his works and the possible reasons for his evolving representation of this character.

#### **A37. A 21st Century Reimagining of Pushkin's *Eugene Onegin* in Commercial Literature**

Charlotte Stoltzfus; Faculty Mentor: Dr. Adrienne Harris

*Department: Modern Languages and Cultures*

The intersection of popular culture and creative masterworks offers rich opportunities for research. In this paper, I examined the question of how contemporary author Paullina Simons used Alexander Pushkin's novel *Eugene Onegin* to inspire her own trilogy of romantic novels. Through close reading of Simons' and Pushkin's original texts, online and newspaper interviews with Simons about her work, and scholar Caryl Emerson's essay on interpretations of Pushkin's heroine within the academic community, I found that Simons' books both honor Pushkin's original work, and transform it, placing familiar characters in a new time and a new genre. I ultimately argue that Simons does a unique service to Pushkin by making his work newly relevant to a young audience.

## Tuesday 1:30 p.m. Session Three – White Room

### Art

#### **A38. The Other “David”: Michelangelo’s Unfinished *David-Apollo***

Erica Thorpe; Faculty Mentor: Dr. Heidi Hornik

*Department: Art*

This study seeks to bring light on the events in the life of Michelangelo Buonarroti between 1525 and 1530 surrounding the production of the *David-Apollo* sculpture. Its political significance in the sixteenth century and in the twentieth/twenty-first centuries will also be discussed. Michelangelo is known for leaving commissions before completing them but the reasons why are not always obvious. Through a close examination of the documented evidence and influences that impacted Michelangelo’s career around the time of the commission, I will propose why the work was left unfinished and suggest why the work still holds meaning today despite its abandoned state. While it typically resides in Florence’s Museo Nazionale del Bargello, the *David-Apollo* has visited America twice. The first time was in 1949 as a token of gratitude for postwar aid of the United States to Italy and the second was in 2013 for the Italian Year of Culture and, coincidentally, the second inauguration of President Barrack Obama. I will explore the idea that the continued travel of the *David-Apollo* to America is linked to its original intentions as a statue that represents political alliances.

#### **A39. Michelangelo’s *Hercules and Cacus*: Precedent and Political Iconography**

Hunter Ash; Faculty Mentor: Dr. Heidi Hornik

*Department: Art*

During a time of great political disruption in Florence, Michelangelo was fully submerged in sculpting *Hercules and Cacus*. This work becomes the precedent for artists for many years to come. The unfinished *Hercules and Cacus* was examined in relation to Michelangelo’s other works. The stylistic story behind this piece is related to Michelangelo’s contemporary projects such as the Sistine chapel, the tomb of Julius II and *David*. Florentine political affairs and the significance of political symbolism at this time are also evident in the iconographic story of *Hercules and Cacus*.

#### **A40. Shoes as Visual Puns in Greek Art**

Sara Beth Burch; Faculty Mentor: Dr. Nathan Elkins

*Department: Art*

The ancient Greeks had a sense of humor as well as a large vocabulary of euphemisms. In particular, they utilized a plethora of these euphemisms that relate to body parts, and specifically the foot, which also functioned as puns in Greek art and literature. However, there is currently very little scholarship on the connection with shoe puns and art. My preliminary research finds that there are various contexts for the use of puns on ancient Greek painted pottery. The first setting is the symbolic use of shoes as sexual euphemisms and often as corporal punishment by an older male (erastes) against a younger male (eromenos) in a symposium setting. Other areas for further study include iconography related to women and shoes, as well as the presence of shoes in settings such as the symposium and gymnasium. Analysis of the iconography on certain Greek painted vessels shows that shoes were used as visual puns and jokes in art, just as they were in contemporary Greek literature.

## **Tuesday 1:30 p.m. Session Four – Fentress Room**

### **Anthropology**

#### **A41. Rewinding the Urban Renewal Narrative: A Closer Look at The Residential History of 1524 South 2<sup>nd</sup> Street, Waco, Texas**

Samantha Heczko; Faculty Mentor: Carol Macaulay

*Department: Anthropology*

This presentation will provide a history of 1524 South 2<sup>nd</sup> Street, a residential property located near the south-east corner of the McLane Student Life Center. The presentation will focus on this property and its inhabitants before it was razed as part of an urban renewal project in 1959. 1524 South 2<sup>nd</sup> Street emerged in 1932 and was home to a number of families who called the address home until its destruction. I gathered information about the property and its occupants from the Urban Renewal Agency of the City of Waco, the Waco City Directories, Sanborn Insurance Maps, and the 1930 and 1940 Federal Population Censuses, in an effort to better understand the neighborhood that once surrounded Baylor University during the first half of the twentieth century.

#### **A42. Grinding Maize and Ochre: Six *Metates* from Barnhill Rockshelter #6, Coryell County, Texas**

Maisha Dramiga; Faculty Mentor: Carol Macaulay

*Department: Anthropology*

During the 2017 Baylor University Archaeological Field School, the grinding surfaces of six *metates* associated with Barnhill Rockshelter #6 (41CV1649) were processed for starch grain residues and the samples were sent to Linda Perry, Director of the Foundation for Archaeobotanical Research in Microfossils, for analysis. This presentation will describe the design, wear, and maintenance of the grinding basins of these *metates*, present the results of the analysis, and discuss the presence of maize starch grains on two of the *metates* and the presence of ochre on another.

#### **A43. An Overview of the 2017 Baylor University Archaeological Field School at Barnhill Rockshelter 6, Coryell County, Texas**

Madison Tipping; Faculty Mentor: Carol Macaulay

*Department: Anthropology*

This presentation provides an overview of the first year of excavations at Barnhill Rockshelter 6 (41CV1649) in Coryell County, by Baylor University archaeological field school students. The first priority of the field school was to clean and profile the extent of a looter's pit in order to define the stratigraphy of the rockshelter. Nineteen distinct strata were identified, nine of which yielded radiocarbon dates belonging to the Early Archaic Period (8000-4500 BP). We encountered two thermal features in the profile and floted the matrix for macrobotanical analysis, recovering seeds of xeric plant foods that no longer grow in central Texas. We opened a 2x4 meter excavation block within the central area of the rockshelter and despite the disturbed nature of the upper sediments; we were able to identify an occupational surface. The first season yielded over 100 diagnostic projectile points dating from the Early Archaic through the Late Prehistoric periods, other types of stone tools, animal bone fragments, lithic debitage, and *Rabdotus* species snail shell. Future excavations at the site are planned to address four avenues of inquiry: occupational span, site function and seasonal use, botanical and faunal exploitation, and societal networks within and beyond central Texas.

## **Tuesday 1:30 p.m. Session Five - Houston Room**

### **Sociology and Psychology**

#### **A44. Body Mass Index, Body Image, and Total Wellness in College Women**

Georgie Hendrickson; Faculty Mentor: Dr. Kevin Dougherty

*Department: Sociology*

The objective of this research is to examine the relationship that body mass index (BMI) has with various factors, including: self-esteem, depression, close friendships, GPA, social media consumption, childhood diet and exercise, and current exercise. A survey was administered to 130 college women at Baylor University. Participants were analyzed based on the BMI categories of underweight, healthy, overweight, and obese. The results show that obese women tend to have fewer close friends, lower GPA, and generally had an unhealthy childhood, when compared to women of other BMI categories. It was also found that women who are in the categories of healthy weight, overweight, and obese view their bodies as insufficient when comparing themselves to the way women are portrayed on social media. The findings indicated that many aspects of a female's life could be influenced by her weight.

#### **A45. The Presence of an Indian Accent in American Society**

Niharika Koka; Faculty Mentor: Dr. Kevin Dougherty

*Department: Sociology*

For generations, the influx of Indian immigrants to the United States has been increasing due to better educational and work opportunities, with Indian immigrants now being the third largest Asian American ethnic group in the U.S. As the prevalence of this South Asian population grows, the distinctive Indian accent is made more prominent. This study's purpose is to fill the gap in the literature when it comes to understanding how accented Indian immigrants perceive, respond, and adjust to reactions of native English-speakers when communicating. Data was collected from surveys that were given to a sample of Indians that currently live in Dallas and spoke Telegu as their first language. The questions were designed to compare initial and later experiences upon communicating with native-born Americans in the United States, and the findings are intended to suggest possible trends in the methods used by accented Indians to assimilate into American society.

#### **A46. The 'Golden Rule' on 5 hours of Sleep: An Experimental Investigation of Sleep Restriction and Discrimination**

Stacy Nguyen, Abby Corrington; Faculty Mentors: Dr. Michelle Hebl (Rice University),  
Dr. Michael Scullin

*Department: Psychology and Neuroscience*

Inequalities of gender, sexual orientation, and race have spurred recent protests against discrimination (e.g., Black Lives Matter, Women's March, Pride). Discrimination, defined as differential actions toward out-groups, emerges from in-group bias and prejudice (i.e., differential assumptions toward out-groups) (Jones, 2000; Mullen, Brown, & Smith, 1992). The resource depletion theory of discrimination argues that cognitive resources are required to suppress the expression of prejudice, but that because cognitive resources are limited, discriminatory behavior may emerge when resources are depleted (Gordijn, Hindriks, Koomen, Dijksterhuis, & Knippenberg, 2004). One common cause of resource depletion is sleep deprivation (Ghumman & Barnes, 2013), yet no experimental studies exist on whether sleep loss causes increased discriminatory behaviors. Forty-four healthy adults participated in a two-session study from Monday to Friday. Participants completed several cognitive (e.g., attention) and discrimination tasks (e.g., resume ratings with varying names like Mohammad or Ethan). Importantly, participants were randomly assigned to maintain bedtimes of either 10:30pm or 1:30am with morning awakenings set to 7:30am (9-hours versus 6-hours of sleep opportunity). One hypothesis



is that discriminatory behaviors are so entrenched in individuals that sleep restriction will affect the cognitive, but not the discrimination, outcomes. An alternative hypothesis is that sleep restriction will deplete cognitive resources, triggering increased discriminatory behaviors such as rating ethnic minorities as less competent, professional, and successful in the resume tasks. Our findings will thus have both theoretical and practical implications for understanding sleep, cognition, and discrimination.

#### **A47. Logistics-Focused Partnerships Between For-Profit Companies and Humanitarian Organizations: A Content Analysis**

William Gober; Faculty Mentor: Dr. Josh Strakos

*Department: Management*

Logistics is one of the most important functions of a humanitarian organization, however research has identified major shortcomings of humanitarian logistics (HL) in comparison to effective for-profit logistics operations. Little research has been conducted regarding logistics-related partnerships between for-profit companies and humanitarian organizations. Existing research indicates that these partnerships are helpful and might improve humanitarian logistics operations overall. The purpose of this thesis is to provide a structured assessment of cases relating to logistics-focused partnerships between for-profit companies and humanitarian organizations, and from these cases identify commonalities which contribute to the success of the partnerships. The author employs literature review and qualitative content analysis methods. The literature review provides a brief overview of the current state of HL and explains the origins of the research questions. The content analysis assesses five case studies and identifies commonalities between cases. Key findings of the case analysis are that cross-sector HL partnerships are successful and beneficial for both parties. These partnerships especially improve humanitarian groups' proficiency in logistics. Additionally, the research indicates establishing shared values and principles, and outlining deployment criteria for new partnerships reduces difficulties in initiating and maintaining partnerships. This knowledge is valuable because mechanisms for overcoming barriers to partnerships can be utilized by HL practitioners to facilitate more successful cross-sector collaboration in the future.

#### **Tuesday 1:30 p.m. Session Six - Cowden Room**

##### **Spanish**

#### **A48. Don Juan and Doña Inés: Incomplete Opposites**

McKenna Middleton; Faculty Mentor: Dr. Frieda Blackwell

*Department: Modern Languages and Cultures*

Light and dark, black and white, purity and profanity – Romantic literature juxtaposes opposites to highlight certain aspects of the human experience and for dramatic effect. José Zorrilla exemplifies a tendency to establish strong contrast throughout his Romantic drama, *Don Juan Tenorio* (1844). Particularly, the playwright juxtaposes the protagonist Don Juan with the heroine Doña Inés, presenting Don Juan as “satanás,” “diablo,” and “Belcebú,” in contrast with Doña Inés, described as “inocente,” “pura,” and “virtuosa.” From this perspective, Don Juan appears to utilize his free will more frequently than other characters. He flouts societal norms and refuses to repent for his actions. On the surface, Doña Inés seems to lack completely any agency. She exemplifies virtue, piety, and sacrifice. However, these characters are not completely opposites. Don Juan demonstrates a suspension of free will when confronted with God and his final judgment while Doña Inés exhibits a control over her destiny in the same situation by making a deal with the divine. In this way, the presentation of the free will of the Romantic hero and heroine occupies a principal role with respect to the literary device of juxtaposition in the drama. Zorrilla suggests that Doña Inés and Don Juan are not complete opposites, and their ability to exercise agency when faced with concepts of destiny and fate drives the plot.

#### **A49. Criticism of the Theater in Moratín's *La comedia nueva***

Jessica Ullrich; Faculty Mentor: Dr. Frieda Blackwell

*Department: Modern Foreign Languages*

Ironically, love for drama instigated abundant criticism regarding its state in the eighteenth century. The baroque had cultivated a trend toward ornamentation and complexity in art, and, as a result, theater of the age adopted the same qualities, sacrificed clarity of purpose, and lost the power of its influence. Leandro Fernández de Moratín was singularly unsatisfied with contemporary drama. He recognized the problems of the works at the time and the utilitarian potential of the theater. In his opinion, a neoclassical style – including both an educational purpose and the classical unities of action, time, and space- would improve the theater overall. Therefore, he employed the same artistic medium he wanted to reform in order to illustrate the absurdity of existing dramas in Madrid. His drama *La comedia nueva*, written in 1791, utilizes deliberate characterization, juxtaposition of a neoclassical style with the excesses of baroque by means of meta-drama, and the proposed marriage of don Hermógenes and doña Mariquita to highlight the urgency of a theatrical reform.

### **A50. Love, Desire, and Frustration in the Works of Luis Cernuda**

Hailey Beattie; Faculty Mentor: Dr. Frieda Blackwell

*Department: Modern Foreign Languages and Cultures*

Luis Cernuda, the youngest member of the Generation of 1927, distinguished himself as a surrealist poet. His verses reflect a cry for liberation and revolution against repression, both in literature and society. Cernuda was inspired by the surrealist movement and wrote poetry that explores the two faces of surrealism: what is real and rational compared to what is irrational and creative. His works capture the agony and ecstasy of love, from an intellectual and sensational perspective, and connects it with insatiable desires, death and obscurity. Cernuda's poems, "Si el hombre pudiera decir" (1931), "Te quiero" (1931), "Contigo" (1931), and "Orillas del amor" (1934) typify such poetry, exploring the theme of love through romanticized images of nature and utilization of the "metafora brillante", the hallmark of this poetic generation. Cernuda expresses emotions of desire and frustration in his poetry, especially as a homosexual in the repressive society of the 1930s.

### **A51. Implementation of a Spanish Language Track at a Family Medicine Residency**

Daniel Truesdale; Faculty Mentor: Dr. Karol Hardin

*Department: Modern Languages and Cultures*

Both ethical and U.S. legal standards for healthcare dictate that patients with limited English proficiency receive language-concordant treatment, yet patients commonly receive inappropriate care due to inadequate language provision from an interpreter or healthcare provider (Flores et al., 2003; Prince & Nelson, 1995). Few studies have measured and reported objective data on the success of language instruction during medical residency programs. This paper outlines the development of a Spanish language and culture track for the Waco Family Medicine Residency Program and reports on the first phase of its implementation. Five first-year residents volunteered and qualified for the three-year program designed to improve their proficiency to the level necessary to provide care independently. Residents' training included workshops, role-play, and presentation of patient histories. Qualified dual-role interpreters within the clinic were also recruited to serve, first as models and later as a safety net, for Spanish communication. Using an apprenticeship model, two bilingual attending physicians served as resident mentors and provided feedback on grammar, vocabulary, and culture while residents performed regular patient care. Pre- and post-test improvement in proficiency was measured through objective and subjective assessment through an external oral medical language exam and participants' self-assessment. Physicians graduating from the program should be able to independently provide healthcare in Spanish and thereby establish positive relationships with the Spanish-speaking patient populations they serve.

Documentation of the method and results of this program allows other residency programs to replicate and improve this model to provide language-concordant healthcare for patients served by their graduates.

### **A52. Laurencia and #MeToo: Female Agency and Sexual Tyranny in Lope de Vega's *Fuenteovejuna***

Julia Castillo; Faculty Mentor: Dr. Paul Larsen

*Department: Modern Languages and Cultures*

Among the fundamental questions that Lope de Vega raises in *Fuente Ovejuna* is that of women's agency. This is demonstrated in the character of Laurencia. Evaluating her agency in comparison to that of other women of her time, I conclude that Laurencia's sovereignty is higher than what would normally be acceptable. Since there are also ways in which she reinforces gender roles, her character is contradictory in a way that parallels the contradictory messages of the text as a whole. Laurencia's significance within the plot is made evident in the speech she delivers to the men of her town, a speech which leads to the climactic action of the play, the killing of the Comendador. This speech shows her ability to cause action on behalf of herself, which is especially relevant as it connects to the protection of her honor. I argue that all of this evidence shows Laurencia to be capable of sovereignty over herself, and so she is an integral part of *Fuente Ovejuna*'s larger conversation about the justice of seizing power when it is being misused.

## **Tuesday 3:30 p.m. Session One – Baines Room**

### **Religion**

#### **A53. Leviathan: A Novel Use of an Ancient Figure**

Ethan Bryant; Faculty Mentor: Dr. Mikeal Parsons

*Department: Religion*

The Bible provides little explanation on the mythical figure of Leviathan, leaving modern Christians of the Western world confounded with how to address its role in Scripture. Examination of Ancient Near-Eastern myth traditions elucidates how Jewish traditions adopted the pagan imagery of the Leviathan and repurposed it in their own apocalyptic tradition.

#### **A54. Sounds of Worship: Christianity's Jewish Inheritance**

Aidan Gettemy; Faculty Mentor: Dr. Mikeal C. Parsons

*Department: Religion*

Whether Protestant or Catholic, worshippers experience vocal music with instrumental accompaniment during the Sunday service. This musical adoption follows an ancient tradition of music in worship that flows from the beginning of Christianity itself. From psalms, chants, and hymns, to the music of Johann Sebastian Bach and modern bands, instrumental music historically surrounds the worship of God in Christianity. The Christian tradition of instrumental music in worship drew from the traditions of its first members, Jewish Christians accustomed to synagogue worship. The inclusion of music in Christian worship arose from Judaism as a result of three key factors: the historical association between music and divine in the Hebrew Bible; the performance practices of music in ancient Israel; and the continuity between early Christian and ancient Jewish music. Originating this rich musical heritage is the historical association between music and the divine in the Hebrew Bible. Musical language represents the norm, not an exception, in the Old Testament, whose language rings with musical allusions and terminology. Israel's deep rooted national-cultural identity lies in instrumental music, implying that the first Christians were accustomed to hearing it. Familiar with Jewish Scriptures, early Christians saw the use of instruments as customary in a wide variety of sacred occasions. Due to familiarity

and functionality, early Christians likely appropriated aspects of Jewish music performance. Representing culture, voice, and expression, the appeal of musical instruments connects the historical and modern worship of God in both religions.

### **A55. Dancing David**

Christian Sessa; Faculty Mentor: Dr. Mikeal Parsons

*Department: Religion*

Many passages in the Bible may at first glance seem out of place or insignificant. David's dance in 2 Samuel 6, described in just a few sentences and rarely referenced after, may be one of those. Despite its short description, David's dance is rich in historical and cultural context as well as theological significance. The passage's cultural context as a fertility ritual brings both the dance and Michal's rebuke into new light, justifying the former and explaining the faults in the latter. When viewed as an act of worship, David's dance becomes an image of total and complete worship and offers an excellent model of how praise should be offered to God.

## **Tuesday 3:30 p.m. Session Two – Beckham Room**

### **Russian**

#### **A56. The Influence of the Cossacks and the Caucasus Mountains on Lermontov**

Robert Zuniga; Faculty Mentor: Dr. Adrienne Harris

*Department: Modern Languages and Cultures*

The creative works and masterpieces made by Mikhail Lermontov are world renowned and have been influential in not only Russia's literary society but in the literary community across the world. His passion behind his writings' is unquestionable, but what has fueled and motivated such passion can be traced continuously in the tumultuous and at times tragic moments of his life. Lermontov at a young age travels and sees the Caucasus mountains due to his health issues and is stricken by the pure natural beauty that is present. This beauty is an echoing theme throughout his life and in his works. Once Lermontov grows up, he then pursues a military career, where he witnesses the bravado and larger than life presence of the Cossacks. These men to Lermontov, convey such confidence and valor in their actions that he makes note of them in his writings and makes constant strides to parallel their vigorous tenacity in combat. With the influence of Caucasus mountains paired with the Cossack's excessive masculinity, they impact Lermontov in a way that effects his writings as well as his personality.

#### **A57. *Dead Souls* as a Commentary on Russian Society**

Elizabeth Arrigali; Faculty Mentor: Dr. Adrienne Harris

*Department: Modern Languages and Cultures*

Nikolai Gogol wrote *Dead Souls* in 1841 during a time of much uncertainty in Russia, particularly the period following the failed French invasion of 1812. Many members of Russian society hoped this failed attempt for the French would bring about a time of change; however, this change did not occur. Instead, during this time Russia appeared to remain at a standstill with few notable historical events. It was not until decades later when some of these changes came about such as the liberation of the serfs in 1861. Gogol used descriptions of characters as well as their estates from this narrative poem to create an image of Russia during this period between progressive change. The image displayed by Gogol was while he was away in Rome, but was a personification of what could be of Russia in the future. It is in this image that Gogol not only shows the flaws, but some of

the qualities of the Russian people that could lead to the future success of Russia. However, *Dead Souls* primarily depicts Russian society in a negative connotation. Many of the characters have personal traits that are quite unfavorable, and hint to the trying times and often disillusionment going on during this period in Russia. Most notably, Gogol uses interactions between the main character in *Dead Souls*, Chichikov, and the other primary characters, particularly various landowners, to depict the flaws occurring within the Russian Society during the nineteenth century.

### **A58. The Personal Beliefs of Nikolai Gogol Disclosed Within "Nevsky Prospect"**

Jenny Payton; Faculty Mentor: Dr. Adrienne Harris

*Department: Modern Languages and Cultures*

No matter how distorted or exotic the subject matter, a close reading of a text is sure to reveal the personal opinions or feelings of the author - and Nikolai Gogol is no exception. Though the reluctant writer has a diverse portfolio, consistent elements throughout his works reveal his feeling on religion, women, marriage, and his perspective on the human condition. The latter most idea plays a markedly potent portrayal in his short story "Nevsky Prospect." As part of the St. Petersburg cycle, the author utilizes grotesque realism in order to create world which mirrors reality in several ominous ways. Layers of imagery, narrative distortion, and motifs of conflicting good and evil amass to assert the argument that Gogol believed man undergoes a constant internal conflict in which vice and virtue compete for expression or suppression. This conflict, directly influenced by the environment, constitutes a true nature that is the essence of human existence.

## **Tuesday 3:30 p.m. Session Three – White Room**

### **Art**

### **A59. A New Interpretation of the Chigi Vase and MacMillan Aryballos from the Perspective of the Phoenician Metal Bowl Tradition**

Joseph Brennan; Faculty Mentor: Dr. Nathan Elkins

*Department: Art*

I present an analysis of the Chigi vase and Macmillan aryballos from the perspective of the Phoenician repoussé metal bowl tradition. An understanding of the iconography, themes, and composition of Phoenician metal bowls shows that the Phoenician artistic tradition had a profound impact on the imagery and themes that the Macmillan Painter incorporated into the Chigi vase and Macmillan aryballos. As a result of the shared iconography between Phoenician metal bowls and the Chigi vase/Macmillan aryballos, one can read the imagery depicted on the Chigi vase and Macmillan aryballos in an entirely new light. In this reading, the overarching themes of royalty and royal pursuits connect the images seen on the Chigi vase and Macmillan aryballos. Specifically, the imagery shows the most common events in the life of a Near Eastern king or aristocrat, such as hunting, war, giftbearing/tribute, and military processions. The lion head that crowns the top of the Macmillan Aryballos also derives its meaning from the Near Eastern artistic context as the symbolic vanquisher of the enemy. By placing the head of a roaring lion above the battle scene, the Macmillan Painter conveys the idea that the victorious hoplite army below is vanquishing its enemy with the ferocity of lions vanquishing their enemies. The Macmillan Painter's pictorial representation of the lifestyle and pursuits of Near Eastern aristocrats, princes, and kings would have conveyed exotic activities that these western aristocrats, some princes in their own right, might have wished to engage in themselves.

## A60. The Nationalistic Legacy of John Boydell's Portrait of Helena Forman

Taylor Strander; Faculty Mentor: Dr. Sean Delouche

*Department: Art*

During the 18<sup>th</sup>-century, Sir Robert Walpole amassed an impressive art collection that included over 200 Old Master paintings. Housed in his estate at Houghton, Walpole's renowned collection functioned as a symbol of British cultural supremacy. In 1779, 204 masterpieces from the Prime Minister's estate were tragically sold to Catherine the Great. At the time of the collection's sale to the Russian monarchy, John Boydell was publishing his much anticipated *Houghton Gallery* project. The loss of Walpole's famous paintings not only presented a technical problem for Boydell and his engravers, but it also significantly affected the project's original purpose. This paper focuses specifically on a print of *Helena Forman, Rubens' Second Wife*, from Baylor University's Martin Museum of Art, in order to demonstrate how the sale of the Walpole paintings transformed Boydell's project into a nationalistic enterprise. During a period of unprecedented popularity for Old Master portraits, Boydell's print of Forman served as a model for living artists who were developing their own portraiture style. By utilizing a print from Boydell's 1788 series, this paper argues that printed reproductions of the Walpole paintings were England's way of asserting cultural authority over the collection. The inseparability between the portrait and its original home established that the Russian monarchy could never fully erase its history, and allowed the British to hold onto the memory of a magnificent collection.



## A61. Daumier and *Les Gens des Justice*

Emily Starr; Faculty Mentor: Dr. Sean DeLouche

*Department: Art*

Daumier's prolific career as a caricaturist is best known for his political assaults of King Louis Philippe and the July Monarchy—and for good reason. The lithographs published with *La Caricature* throughout Louis-Philippe's reign are iconic, from the depiction Philipon created of *le poire* to Daumier's scathing creation of the king in *Gargantua*. Not too long after, the September Laws of 1835 in response to the assassination attempt on King Louis-Philippe heightened the levels of censorship so much that Daumier was forced to turn to *Le Charivari* to focus on what scholars have previously interpreted to be social commentary on the bourgeoisie in the 1840s. However, I argue that Plate 31 from the *Les Gens de Justice* series is an example of a political attack of the disregard for justice in King Louis-Philippe's reign in order to subvert the censorship laws, instead of complaisant social commentary, as has been previously suggested. My paper examines caricatures that display the history of his reign and the depictions of him prior to the September Laws, other caricatures from the *Les Gens de Justice* series and some of the other visual traditions in caricature Daumier references, and makes comparisons with Daumier's caricatures depicting the legal system after all censorship laws were lifted, all of which make the assault of King Louis Philippe by Daumier in Plate 31 obvious. This argument makes Daumier an even more revolutionary artist, as opposed to an artist submissive to the September Laws, contrary to prior readings of the series.

**Tuesday 3:30 p.m. Session Four – Fentress Room**

## **Anthropology**

### **A62. The BSB Garden- Home to more than just flowers**

Lexi Gage; Faculty Mentor: Carol Macaulay

*Department: Anthropology*

Before entering the south doors of the Baylor Science Building, one might take the time to rest on one of the benches facing a rectangular garden, lined with crepe myrtle trees. But what we may fail to realize is that this garden was once a residential property belonging to a succession of working-class families throughout the first half of the 20th century. This research project examined the occupational history of this residence, known at 1605 South 1st Street, beginning in the early 1920s and ending with the purchase of the property by the Urban Renewal Agency of the City of Waco in 1960. Information about the property and its last residents was obtained from the files of the Urban Renewal Agency housed in the Texas Collection. The Waco City Directories provided the occupational chronology of the property and the Federal Population Censuses of 1930 and 1940 provided personal information about those who resided there during those years. The 1926 Sanborn Insurance Map of the property was compared to a similar map in the Urban Renewal Files to document improvements to the property that occurred over a 34 year period. This project has provided a glimpse into the residential neighborhood that once surrounded the Baylor campus during the first half of the 20th century and all of the residents who contributed to its legacy.

### **A63. Homestead Heritage: A Subculture Engaging to Disengage**

Mark Cole Sutton; Faculty Mentor: Carol Macaulay

*Department: Anthropology*

This presentation explores the history, livelihood, and point of view of the people of the Homestead Heritage community north of Waco. This presentation first discusses the founding of the community and the trials its members experienced along the way. Second, it presents an overview of how this community operates and how its members make a living. Finally, it examines their point of view, both on what life is like in their community and how they see and interact with the broader culture they live within but separate from. This information provides insight into the internal reasoning of a subculture that has a strong sense of 'other' and yet actively engages with that 'other' because of a stronger belief in the validity and power of their alternative lifestyle.

### **A64. Slums Beneath the SLC**

Sarah Jones, Sam Houghton; Faculty Mentor: Carol Macaulay

*Department: Anthropology*

During the early 20th century, there was a substantial divide between Baylor University and the surrounding residential areas. The City of Waco utilized the national 1949 Housing Act with the intention of eradicating urban blight and expanding Baylor's campus, thereby initiating the Urban Renewal Project in 1958. Residents were evicted and subsequently relocated throughout Waco. Baylor University requisitioned much of this property for the sake of constructing new facilities in order to accommodate its increasing admissions. The purpose of this study is to investigate two properties, previously known as 1520 and 1522 S. Second Street, that were replaced by the Student Life Center (SLC) of Baylor University during this era. The progression of events, however, surrounding the Urban Renewal movement exemplified distinct conflicting agendas. Thus, extensive research raises the question as to whether or not the Urban Renewal Agency of the City of Waco utilized their power of eminent domain in an ethical manner.

# Poster Presentations

## Baylor Sciences Building

### Session One

March 26-27, 2018



# SESSION ONE: Monday, March 26<sup>th</sup> and Tuesday, March 27 BAYLOR SCIENCES BUILDING – 1<sup>ST</sup> FLOOR

## FAMILY AND CONSUMER SCIENCE B1-B2

### **B1. Food Insecurity, Diet Quality and Body Composition in Private University Students**

Paige Fingerle, Brandon Zuercher; Faculty Mentors: Dr. LesLee Funderburk, RDN; Mr. Stanley Wilfong, MS, RDN

*Department: Family and Consumer Sciences*

**Background:** Food insecurity is a continuing public health concern in the United States. The purpose of this study was to characterize food insecurity in a sample of private university students, assess the relative influence of demographic characteristics on food security, and describe associations between food insecurity, weight status, and diet quality.

**Methods:** This was a cross-sectional study of 125 full-time private university students. Participants completed a demographic information survey, food security survey, and two validated nutrition screeners to assess markers of diet quality. Researchers obtained participants' basic anthropometric data (height, weight, waist circumference) and analyzed body composition using a Dual-Energy X-ray Absorptiometry scan. Statistical analyses performed include use of a cumulative logit model and spearman's correlation coefficient.

**Results:** In this sample of students, 12.8% had low food security and 32.2% very low food security. The estimated odds of reporting high food security were 1.27 and 1.43 times greater in students with higher daily intake of calcium or fruit-vegetables. Weight status was positively correlated with intake of fruit/vegetable servings, but not food security status. The probability of having higher food security is lower for employed students and Hispanic students relative to Caucasian students, but is greater for students who live on-campus and Asian students relative to Caucasian students.

**Conclusions:** These findings suggest that food insecurity and overall diet quality is a concern for this select group of students. Policy interventions are needed to support those students who struggle with food security to improve access to healthful food options.

### **B2. Digital Floor Plan Database: Developing Tools for Analysis**

Scott Fitzgerald (Computer Science), Jillian Bizzaro (Family and Consumer Sciences), Jessica Tomchesson (Family and Consumer Sciences), and Qiannan Wu (Computer Science); Faculty Mentors: Dr. Elise King (Family and Consumer Sciences), Dr. David Lin (Computer Science)

*Department: Family and Consumer Sciences (King) and Computer Science (Lin)*

Those who design and study the built environment are hindered currently by an inability to examine large datasets of architectural drawings. Despite advancements in image recognition, no integrated system can store, read and analyze floor plans. Additionally, creating datasets of architectural drawings is time intensive for researchers. To solve this problem, we are developing the Building Database and Analytics System (BuDAS) to partially automate the process of floor plan analysis. This open-source system is linked to a web interface that allows users to upload information about specific houses, while also providing tools for analyzing longitudinal trends in design. One of our main research goals is to design image recognition software that will scan floorplans and upload them to our database. I have personally worked on updating the web-interface and its features. The main analytical feature I worked on was a tool that created graphical representations of floorplans. These graphs can be generated for any floorplan stored in the database and are similar to bubble diagrams used in interior design. I am also working to update the database to accommodate relevant jargon and possible real-world limitations imposed on the data.

## **PRE-HEALTH B3**

### **B3. Gout Flare Association with Acute Myocardial Infarction**

Kilee Burke and Bisma Ikram; Faculty Mentor: Dr. Rizalia Klausmeyer

*Department: Pre-Health Studies*

The incidence of gout in the United States has increased dramatically over the past two decades. It has been hypothesized that the inflammatory response that manifests itself as a gout flare could also create conditions that lead to a myocardial infarction (MI). The purpose of this study was to examine the correlation between gout flares and MI. Phone call surveys were administered to patients recently admitted to Providence Health Center with a primary diagnosis of MI. Of the 55 patients that responded, 15% had a prior diagnosis of gout. Two patients displayed a co-occurrence of gout flare with MI: one flare occurred 3 months prior to the MI and the other occurred simultaneously with the MI. Due to the limited sample size within this data set, there is not enough evidence to support the primary hypothesis that gout flares can be used as a predictive factor for MI in patients with gout.

## **BIOLOGY B4-B31**

### **B4. Oncomodulin modulates intracellular calcium level**

Taronish Madeka and Kelsey Chaykowski; Faculty Mentor: Dr. Dwayne Simmons

*Department: Biology*

Calcium plays a critical role in hearing, particularly in regulating hearing sensitivity through active amplification mechanisms. In the inner ear, cochlear outer hair cells (OHCs), which amplify sounds, express oncomodulin (Ocm) as their predominant calcium-binding protein. Deletion of Ocm results in early progressive hearing loss. This may be because intracellular calcium levels are not effectively regulated in the absence of Ocm, which may lead to disruption of OHC function, calcium toxicity, and eventual cell death. To explore  $\text{Ca}^{2+}$  signals in the presence and absence of Ocm, we used HEK293 cells that constitutively express Ocm (HEK293-Ocm) as a model for Ocm<sup>+/+</sup> cells and HEK293 cells without Ocm expression. The fluorescent  $\text{Ca}^{2+}$  indicator dye, Fluo-4-AM, was used to indicate the relative presence of free cytosolic  $\text{Ca}^{2+}$ . Both cell types were challenged in independent trials with a variety of stressors known to increase intracellular free  $\text{Ca}^{2+}$ . The data revealed that HEK293-Ocm cells responded to the stressors in distinctly different ways than normal HEK293 cells. HEK293-Ocm cells had: 1) a smaller change in fluorescence for most stressors, and 2) a more transient response to most stressors. Currently, immunohistochemistry experiments are being processed for HEK293 and HEK293-Ocm cells exposed to varying drug treatments to observe for morphological changes in their cytoskeleton and oxidative stress levels.

### **B5. Impact of Oncomodulin on Calcium Toxicity**

Kelsey Chaykowski; Faculty Mentor: Dr. Dwayne Simmons

*Department: Biology*

This study will look into the difference between HEK-293T and HEK Ocm cells when induced by drug stressors known to increase intracellular levels of calcium. After exposing the cells to drugs such as ionomycin, signs of toxicity will be observed at varying concentrations and time points. The cells will be imaged for apoptotic behavior and phalloidin, tubulin, and peroxiredoxin-3 levels to determine the extent of calcium toxicity on the cells. Due to prior research on the calcium-buffering capabilities of oncomodulin in outer hair cells, it can be hypothesized that Ocm mutant cells will have a higher resistance to calcium toxicity brought upon by varying drug treatments.

## **B6. The effects of mutations in Toll-1 receptors on *C. elegans* egg-laying**

Matthew Deande; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Egg-laying represents one of the first *C. elegans* behaviors to be subjected to extensive genetic analysis to elucidate more information about the mechanisms underlying signal transduction and the reactions directing a cell's biology. While many factors have been shown to affect egg laying in *C. elegans*, we are interested in the downstream effects of Toll-like receptors (TLRs) and their impact on egg laying. While recent studies have shown TOL-1 is important in *C. elegans* innate immunity, the function of TOL-1 receptors is vastly unknown. Evidence suggests that TOL-1 receptor activity contributes to the chemosensory abilities of *C. elegans*. Thus, we hypothesize that TOL-1 deficient *C. elegans* mutants will display a reduction in egg laying activity compared to wild-type *C. elegans* due to an inability to act upon environmental cues conducive to egg-laying. In this study, TOL-1 deficient *C. elegans* mutant, *tol-1(nr2033)*, were incubated in serotonin, a neurotransmitter known to stimulate the hermaphrodite specific motoneurons (HSN) that play a central role in regulation of egg-laying behavior. N2 and *tol-1(nr2033)* were plated in serotonin for an egg-laying assay and results showed less egg-laying in *tol-1(nr2033)*, so we did mutagenesis. In F1, there were 215 worms screened for egg laying in serotonin. In F2, there were 288 worms screened for egg laying in serotonin. This research will define the role of toll-like receptor signaling in sensory neurons of *C. elegans* and its chemosensory role. Further analysis is underway.

## **B7. Identification of mutant *C. elegans* resistant to valproic acid**

Phan Quynh-An, Hailey Beattie, Sihan Hu, Chi-Hung Lee, Kavya Munnangi, Quynh-An, Sean Tran; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Valproic acid (VPA) is a generalized drug used to alleviate a broad range of conditions in humans such as bipolar disorder, Parkinson's disease, epilepsy, and other neuromuscular diseases. The use of VPA in treatment of such diseases is due to its properties as a neurotransmitter inhibitor. In studies involving the N2 strain (wild type) of *C. elegans*, VPA has been shown to increase their lifespans through the regulation of insulin/IGF-1 growth factor signaling pathways. However, in humans, VPA can cause serious side effects, such as liver problems, bleeding, and a reduction in blood platelet count. In addition, VPA can decrease diacylglycerol (DAG) production and inhibit IP3 signaling in *C. elegans*, which results in the suppression of egg laying; the IP3 signaling pathway involves the release of calcium ions from endoplasmic reticulum into the intercellular matrix. In our study, we want to create a mutant of *C. elegans* resistant to these egg-laying inhibitory effects that VPA causes, induced by ethyl methanesulfonate (EMS). The mutant *C. elegans* were then bred and screened for their ability to reproduce when exposed to VPA. This procedure was performed and repeated until a generation of consistently VPA-resistant offspring was evident. The results of the project have positive implications for the future of VPA use. By identifying the associated mutant genes in *C. elegans*, we hope to uncover possible ways to reduce the negative side effects caused by valproic acid in humans.

## **B8. Genetic screening to isolate imipramine resistant *C. elegans* mutants**

Jenny Paul, Siera Daniel, Alexandra High, and Nitish Chimalakonda; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Imipramine is a tricyclic antidepressant generally used to treat a wide range of neurological and behavioral disorders, such as schizophrenia. Furthermore, in vitro studies have shown that imipramine is both agonistic and antagonistic to many different functional neurotransmitters. Wild type N2 *C. elegans* exposed to imipramine

showed an increase in egg laying and pharyngeal pumping. *C. elegans* have a total of 16 muscles that are involved with egg-laying, including 4 vm2 muscles that receive synaptic input from neurons. Imipramine targets the monoamine reuptake transporter known as *egl-2*, a *C. elegans* gene that regulates potassium channels by blocking cellular excitation in the neurons and muscles. Mutations in *egl-2* shows a defect in the expression of multiple phenotypes, and causes egg-laying deficiency and sluggish movement. Previous studies have shown that both a null allele *mod-5(n3314)*, which encodes serotonin reuptake, and deletion of the SER-4, which is a 5HT<sub>2</sub> receptor that significantly resists imipramine response, diminishes the wild type N2 *C. elegans* egg laying response to imipramine. With all of this in mind, we were interested in isolating a worm that would exhibit a lack of imipramine sensitivity. The experiment screened for approximately 400 haploid genomes subjected to concentrated amounts of imipramine solution for one hour, in order to isolate the imipramine-resistant mutants. Isolated mutants were then used to further the study of the effects of imipramine on *C. elegans* and its effects on their reproduction. Due to imipramine use for human behavioral disorders, *C. elegans* studies have the potential of uncovering homologous hormonal or neural pathways in humans. Furthermore, such studies provide a potential discovery of a means to forgo the need for certain serotonin pathways in humans.

### **B9. The Influence of Imipramine on the Egg-Laying Behavior of *Caenorhabditis elegans***

Alyssa Alaniz, Neha Hussain, Emily Feese, Annie Luksch, Victoria Mancillas, and Michael Valencia; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Discovering new ways to treat mental disorders is at the forefront of scientific research due to their imposing challenges on worldwide health. A current drug therapy option is imipramine, marketed as Tofranil, a tricyclic antidepressant (TCA) used to treat mental disorders such as depression. TCA's predominantly inhibit the reuptake of the neurotransmitter, serotonin. However, imipramine also affects additional pathways such as acetylcholine, histamine and the  $\alpha_1$ -adrenergic blockade; which causes undesired side effects including lack of coordination and blurred vision. To determine the effect of imipramine, *Caenorhabditis elegans* were analyzed based on their important physiological process, egg laying. Exogenous serotonin increases egg laying by stimulating vulvar contractions. Therefore, we expect *C. elegans* to respond to imipramine by increasing egg laying. In order to identify the genes involved in imipramine stimulation, worms were treated with ethyl methanesulfonate to induce point mutations. Desired recessive mutants were determined by those who laid the least amount of eggs in liquid egg-laying assays. Due to the mutation, imipramine can no longer stimulate increased egg-laying behavior. Selected resistant worms were then transferred onto new NGM agar plates for further analysis. Our group screened 432 of F2 mutants in an egg-laying assay and identified six of the worms as imipramine resistant mutants. Further verification of the mutations are underway. By identifying additional genes affected by imipramine, we will advance our knowledge of the molecular targets, within the neurological pathway, necessary for improved drug therapy treatment.

### **B10. Screening to Determine Imipramine Resistance in *Caenorhabditis elegans***

Ryan Boyette, Mallory Franklin, Taylor Henderson, Mario Rangel, Jeff Rossiter; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Imipramine is a tricyclic drug that is primarily used as an antidepressant for treats depression and anxiety. Imipramine affects the reuptake of the neurotransmitter serotonin by binding to the serotonin reuptake receptors. A lack of serotonin is associated with depression in animals. For our research, we will be using *Caenorhabditis elegans* as a model organism due to its short generation time, large number of progeny and ease of incubation. *C. elegans* is a free-living, hermaphroditic nematode. Under normal conditions, worms exposed to standard levels of serotonin are expected to lay eggs. Worms exposed to imipramine, however, will lay more eggs due to abundance of serotonin in the neurotransmitter gap junctions. Using forward genetics, we will screen for mutant *C. elegans* worms that are resistant to the effects of imipramine. We expect that these mutant worms will not lay eggs in the presence of imipramine. Imipramine works by blocking serotonin uptake via the 5HT

(serotonin) transport system. Worms that are resistant to the effects of imipramine are unable to inhibit 5HT uptake and are therefore prone to imbalances of serotonin which can affect nutrition, motility and egg-laying behaviors. To screen for mutants, we will isolate individual worms in egg-laying assays containing imipramine and screen for egg-laying. Worms that do not exhibit egg-laying behavior in this environment may be resistant to imipramine. Results of this experiment could impact the way antidepressant drugs for humans are tested and created by analyzing the relationship to serotonin reuptake.

### **B11. Characterization of Heterotrimeric G protein pathway linked to EGL-30/G $\alpha$**

Rachel Johnston, Morgan Dunmire, Burgandy Menodza, Aadil Sheikh; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Heterotrimeric G proteins are protein complexes that relay signals from the cell membrane to the inside of the cell in response to a ligand. These proteins are composed of  $\alpha$ ,  $\beta$ , and  $\gamma$  subunits; ligand binding activates the  $\alpha$  subunit by exchanging GDP with GTP and it separates from the heterotrimer. The activated  $\alpha$  subunit then activates a secondary messenger that will affect transcription in the nucleus. We are studying G-protein signaling in *C. elegans*, a soil-living nematode. *egl-30* encodes for an  $\alpha$  subunit which functions in G-protein signaling, specifically in neuronal ion channel inhibition. It has high expression in nerve endings, aiding in acetylcholine signaling between nerve cells, accurate growth of neurons, and preparation of neurons to respond to changes in intracellular  $\text{Ca}^{2+}$ ; it also has high expression in pharyngeal muscles and affects egg laying, male structure formation, and locomotion. Evidence has shown that the GOA-1 pathway negatively regulates the EGL-30-mediated acetylcholine release. The interest of our research is isolating and characterizing suppressor mutations that may be placed downstream of *egl-30* in the G-protein signaling pathway. This mutation would result in a recovery of egg-laying phenotype. Therefore, a forward genetic method will be used to isolate *egl-30* suppressor mutants (mutations were induced with EMS). In order to accomplish this, 400 *egl-30* mutants will be screened and observed for an egg-laying phenotype. These mutants can be used to further characterize *egl-30* and can aid in better understanding the G $\alpha$ q protein in humans and treating malignant peripheral nerve sheath tumors around nerve endings.

### **B12. Genetic Analysis of Octopamine Function in *Caenorhabditis elegans***

Andreanna Burman, Kevin Chandler, Ben Heil, Reese Martin, Kyle Wang; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Though the mechanisms causing most mental disorders are unknown, common neurotransmitters are frequently targeted to help manage these conditions. In clinical depression for example, serotonin and norepinephrine reuptake inhibitors are commonly prescribed as treatment options. *Caenorhabditis elegans* is a species of nematode that is frequently used as a model organism because of its short generation time, well understood genetics, and fully-mapped morphology. Although *C. elegans* does not produce norepinephrine, a different biogenic amine signaling compound called octopamine is thought to be used in its place. In *C. elegans*, octopamine receptor antagonists are associated with longer a longer lifespan, and exogenous exposure to octopamine causes behavior similar to starvation. The most straightforward method to study the effects of octopamine on *C. elegans* is to discover which changes in the nematode's genome cause the organism to be unaffected by octopamine. To this end, ethyl methanesulfonate (EMS) was used to induce point mutations in progenitor worms. We then screened 400 mutagenized worms to determine whose offspring were able to lay eggs despite the effects of octopamine. A better understanding of the role of octopamine and how it affects *C. elegans* can bring new insight on the role of norepinephrine and how it affects brain function.

### **B13. Induced Mutation in *Caenorhabditis elegans* Causes Narcotic Resistance**

Brady Walker, Aman Grewal, Chijindu Diokpa, Grayson Kallas, Luke Harris, Tatiana Aceves; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

In humans, drug addiction is linked to varying dependencies of dopamine levels in the brain. N-methyl-1-phenylpropan-2-amine (methamphetamine) and 1-phenylpropan-2-amine (Adderall) are examples of narcotics that cause an increase in dopamine levels within the brain. These drugs act by the following mechanisms: competitively inhibiting dopamine reuptake, facilitating dopamine movement out of vesicles and into the cytoplasm, and allowing dopamine mediated reverse-transport into the synaptic cleft. This is often accompanied by changes in behavior seen in various animals. For our experiment, *C. elegans* were studied as a model organism due to their simple behavioral patterns and rapid egg laying cycle. In addition, its hermaphroditic status allows us to create genetically identical progeny while experimenting. In this species, the previously mentioned mechanisms inhibit motor neuron activity and result in a basal slowing response in the N2 (wild types). As a result, egg-laying in wild types is inhibited. To induce egg laying, mutagenized *C. elegans* were created with EMS (ethyl methanesulfonate) to potentially produce a dopamine resistant mutation. After mutagenesis, 500 of the mutagenized worms were isolated and screened for egg laying behavior. Multiple rounds of testing will be performed to isolate the true mutants that consistently laid eggs in dopamine solution. More experiments must be conducted to further study the specific mutant gene that causes dopamine resistance in *C. elegans*. Once identified, a homologous gene in humans could be located and studied for similar drug-resistant effects. The knowledge gained from this research has implications in the fields of gene therapy and drug abuse.

### **B14. The Effects of Alcohol on The Locomotion of *C. elegans***

Vanessa Phan, Owen O'Neill, Caitlinn Kolibaba, Tim Noll, and Jeff Renner; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Alcohol consumption is one of the leading risk factors for many major health issues, such as liver disease, cancer, and even brain damage. In the United States, more than 15 million people struggle with an alcohol use disorder, but less than eight percent of those receive treatment. Having both behavioral and physiological impairments, alcohol is known to be the most abused and addictive substances. Alcohol exposure has a wide range of effects on many organisms and intensive research has allowed for the development of low-risk methods of alcohol consumption. Like humans, *Caenorhabditis elegans* are heavily affected by the intake of alcohol. When alcohol is introduced into the *C. elegans*, environment they will become intoxicated and temporarily paralyzed, and then gradually begin to achieve normal locomotive function once the alcohol is removed from their environment. Our primary interest is characterizing the effects of alcohol on *C. elegans* locomotion. To begin the experiment, we performed mutagenesis with EMS on our *C. elegans* to create mutants that are resistant to alcohol intoxication. After, we exposed the worms to a 50% alcohol fume and screened for recessive worms that showed reduced sensitivity to alcohol by moving. The mutants will be characterized by their alcohol related behaviors and compared to other mutants with alcohol resistance, such as *slo-1*, *dop-1*, *dop-4* and more. This method could lead to more discoveries for safer alcohol consumption in other organisms.

### **B15. Identification of Novel Convulsions-Resistant Gene Induced by Pentylentetrazol in *C. elegans***

Caleb Rhee, Lauren Barnett, Lenneth Li, Brittany Savage, and Alyssa Vidaurri; Faculty Mentor: Dr. Myeongwoo Lee

*Department: Biology*

Epilepsy is characterized by frequent uncontrollable epileptic muscle contractions or convulsions, which is caused by the sudden, unprovoked electrical disturbance in the brain. These convulsions or seizures can cause major damage to the brain and body. Pentylentetrazol (PTZ), a gamma-aminobutyric acid (GABA) receptor antagonist, has been used experimentally to investigate the molecular mechanism of convulsion phenomena in *Caenorhabditis elegans* and to identify key factors that potentially regulate seizure susceptibility. Previous studies suggest that a mutation in the *C. elegans* *lis-1* (Lissencephaly-1) or *pnm-1* (ProNuclear Migration-1) allele treated with PTZ induced a seizure mimicking epilepsy. In this study, we attempt to identify and isolate a mutant gene or genes resistant to PTZ. EMS-treated adult *C. elegans* were randomized to receive a small concentration of a PTZ/M9 solution. Convulsion assays were used to quantify convulsions, repetitive anterior muscle contractions while the posterior muscle remains paralyzed, in *C. elegans* and ultimately reject the worms that showed this phenotype. The worms that appeared to resist seizure development within a given amount of time were isolated as progeny. After 7 days, the same procedure was conducted with the next generation to determine whether or not the worms are convulsion-resistant. Further research will be conducted to determine convulsion susceptibility. The results may reveal novel gene roles in convulsions and suggests new insights into the molecular mechanisms of seizure suppression and induction among other organisms.

### **B16. Identification of Mutations Responsible for Serotonin Response**

Katie McBee, Amjad Dabi, Ian Cummings, Jalyn Schneider, Mikayla Hohle; Faculty Mentor: Myeongwoo Lee

*Department: Biology*

Serotonin is a neurotransmitter derived from the amino acid tryptophan that is commonly found in the central nervous system throughout various species of animals. Commonly associated with causing sentiments of well-being, studies have shown that a serotonin deficiency has positive correlation with the onset of clinical depression. By isolating the genes responsible for inducing a lower response to Serotonin, it may be possible to identify genetic risk factors for clinical depression. In this study, we will use the model organism *Caenorhabditis elegans* to investigate and compare various strains of mutants in regards to their response to Serotonin exposure. We begin by exposing N2 (wild type) P0 adults to EMS in order to induce mutations. To test for serotonin resistance, potential mutants from the F2 and F3 generation were placed in M-9 buffer serotonin solution with a concentration of 5 mg/ml. The number of eggs laid after exposure was then measured. Since serotonin has been observed to significantly increase the number of laid eggs, resistant worms are expected to lay significantly fewer eggs following exposure. 25 candidate worms were selected, and each was seeded in a petri dish. 16 worms from the progeny of each candidate was then further tested for serotonin resistance using the same egg-laying assay. If the presence of serotonin-resistance worms is confirmed, a sequencing of the mutant genome could be carried out in order to isolate the responsible gene. This research is presently underway and will continue by testing further generations of potential mutants for serotonin resistance.

### **B17. Cancer, Bacteria, and Inflammation: Outer Membrane Vesicles from Enterotoxigenic *Bacteroides fragilis* and Non-enterotoxigenic *Bacteroides fragilis* Contain RNA Species that Activate Pattern-Recognition Receptors on Human Cells**

Emily Lin, Aadil Sheikh; Faculty Mentors: Dr. Joe Taube and Dr. Leigh Greathouse

*Department: Biology*

According to the National Cancer Institute, colon cancer is the fourth most common type of cancer and is the second leading cause of cancer death in the United States. Factors that affect inflammation and tumorigenesis in the colon include obesity, diet, and commensal bacteria all of which modulate the level of inflammation. Progression to colon cancer is associated with increasing degrees of inflammatory signaling. It is believed that certain types of bacteria can communicate with host cells to activate downstream inflammatory immune responses such as through the Pattern-Recognition Receptor (PRRs), including the activation of Toll-Like Receptors (TLRs). We hypothesize that the inflammation inducing strain of *B. fragilis*, Enterotoxigenic *Bacteroides fragilis* (ETBF), secrete Outer Membrane Vesicles (OMVs) which contain small RNAs (sRNA) that can activate TLRs, specifically TLR7, on colon cancer cell lines or immune system cells and result in downstream inflammatory signals, including inflammatory cytokines. To test this hypothesis, we extracted OMVs and characterized them through Transmitting Electron Microscopy (TEM), protein content and RNA content. We are currently using bioinformatics to analyze the differential sRNA content of the OMVs for potential regulators of mammalian gene expression. We are elucidating novel mechanisms by which ETBF contributes to the inflammation and progression of colon cancer in human host's.

#### **B18. CTR1 expression is not essential for maintaining epithelial or reverting mesenchymal phenotypes in MCF7 and MDA-MB-231 breast cancer cell lines**

Clayton Smith, Beatriz Castillo Rodriguez; Faculty Mentor: Dr. Joseph Taube

*Department: Biology*

Metastasis of epithelia-derived tumors, including breast cancer, requires tightly attached cells to move away from their neighbors, enter circulation, survive, exit circulation and re-initiate tumor growth in a new environment. One of the mechanisms by which epithelial cells can accomplish this is by using the epithelial-mesenchymal transition (EMT), a developmentally conserved biological process. Many signaling pathways and molecules play essential roles in EMT. Copper, required for numerous biological functions, may play an essential role as disulfiram (DSF), a known copper chelator, inhibits TGF $\beta$ -induced EMT. Based on this, we inquired what role if any is played by CTR1, a major copper transporter in the plasma membrane for EMT. To accomplish this, we manipulated expression of CTR1 in MCF7 and MDA-MB-231 breast cancer cell lines, which have epithelial and mesenchymal phenotypes, and high and low expression of CTR1, respectively. We established a stable CTR1 knockdown in the MCF7 cells and upregulation of wild type or mutant CTR1 in MDA-MB-231 cells. The knockdown and upregulation were verified via western blot and q-PCR. MCF7 cells with decreased CTR1 expression showed a moderate increase in susceptibility to DSF, yet we did not observe any differences in EMT status. Based on these data, we conclude that CTR1 expression is not essential for maintaining the epithelial phenotype in MCF7 cells and not sufficient for reverting the mesenchymal phenotype in MDA-MB-231. Next, we plan to determine whether manipulation of CTR1 expression alters the inducibility of EMT in epithelial cells.

#### **B19. Unearthing Antibiotic Potential in Soil Bacteria**

Savannah Brakefield; Faculty Mentor: Dr. Diane Hartman

*Department: Biology*

Antimicrobial resistance is debatably one of medicines' greatest battles this century. As pathogenic bacteria become more resistant to our current arsenal of antibiotics we are rendered vulnerable to dangerous infections.



The most effective way to combat this problem is to find new ways to treat the infection without effecting a patients' natural flora, such as an effective phage therapy treatment would do. However, a developed version of this technology has yet to be perfected. The next most crucial weapon medical researchers can use to combat this problem is to search for new antibiotics until a more permanent solution is found. In this study, a search was conducted for antimicrobial potential within microbes through isolation and analysis of bacterial growths from collected soil samples. Nineteen colonies that exhibited signs of resistance to other bacteria were isolated and subjected to biochemical tests, patch plate tests, as well as a Kirby-Bauer antibiotic test. These assessments served a twofold purpose. The first was to help identify the bacterial isolate, and the second was to determine which ESKAPE pathogens the bacterial strains were effective against. Five of the original nineteen isolates were effective in limiting the growth of one or more ESKAPE pathogens.

## **B20. Characterization of the Production of an Antibiotic Effective Against *S. aureus***

Aarón Murillo-Ruiz; Faculty Mentor: Dr. Diane Hartman

*Department: Biology*

The proliferation of bacteria that are resistant to antibiotics has resulted in severely diminished treatment options effective against certain bacterial infections. Much research has been conducted with the aim of developing antibiotics capable of being used against multi-drug resistant bacteria. The Small World Initiative is an initiative that investigates soil bacterial isolates that show evidence of producing antibiotics that are effective against *Enterobacter cloacae*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterococcus faecalis* (collectively known as E.S.K.A.P.E. pathogens). An isolate, F16.G1.4, produced a zone of inhibition of 16mm and 20mm against *S. aureus* on Mueller-Hinton Agar. The purpose of this research was to characterize the growth of *S. aureus* and F16.G1.4 and determine the relative number of each bacteria required for antibiotic production by F16.G1.4. It was found that *S. aureus* and F16.G1.4 enter the logarithmic phase of growth after approximately 22 hours and 48 hours, respectively, of incubation at 30°C in nutrient broth. The relative number of each bacteria needed for F16.G1.4 to produce its antibiotic is currently unknown but is being investigated. This research offers a potential source of antibiotic for use in the treatment of *S. aureus* infections.

## **B21. Evaluating a diet change for American Black Bears: A Pilot Program**

Audrey Hermes, Cassidy McCoy, Vanessa Martinez, Nathan Bean, Mikayla Jordan, Cody Nethery, Noah Zimmer; Faculty Mentors: Dr. Diane Hartman and Mr. Clint Patterson

*Department: Biology*

Joy and Lady, American Black Bears, are the live mascots of Baylor University. The Bear Program is celebrating 100 years of having live bears on campus and this is actually the first occasion of caring for two adult bears at the same time. The student trainers, who are undergraduate researchers on this project, also work closely with the primary veterinarian to provide animal care and nutrition.

In August 2017, the veterinarian recommended a diet change for the bears to maximize their quality of life and longevity. This dietary change involved a reduction in the bears' avocado intake, as well as a reduction in Omnivore Chow intake. Additionally, cashews and mixed nuts were replaced with almonds and walnuts. This study evaluates the initial effectiveness of the dietary change.

Each bear's pre-dietary-change weights (October 2016-February 2017) were compared to her post-dietary-change weights (October 2017-February 2018) using a two-tailed t-test with an alpha value of 0.05. Lady's mean pre-dietary-change weight was 272 lbs, and her mean post-dietary change weight was 254 lbs, which is a statistically significant change (p-value  $3.68 \times 10^{-4}$ , t critical value 2.228). Joy's mean pre-dietary change weight was 306 lbs, and her mean post-dietary change weight was 283 lbs, which is a statistically significant change (p-value  $6.14 \times 10^{-7}$ , t critical value 2.145).

The results of this study certainly suggest the low-fat diet has been initially effective in lowering the bears' weights. Continuing the diet change and further analysis is recommended.

## **B22. Tape Measure Protein Multiplex PCR Successfully Classifies Arthrobacteriophages**

Hugh Mair; Faculty Mentor: Dr. Tamarah Adair

*Department: Biology*

The sorting of bacteriophages into clusters of high genetic similarity is currently done through full-genome analysis following isolation, DNA extraction, and full-genome sequencing. While this process is accurate and yields the genome for further analysis, it can be time-consuming and expensive. Relying on existing sequence alignments from bacteriophages isolated on *Arthrobacter sp.*, it was determined that, in addition to having a high level of genome-wide sequence conservation, the clusters could be determined by comparing the sequence of the tape measure proteins. Building from this concept, alignments of the tape measure protein were created for each cluster from which forward and reverse polymerase chain reaction (PCR) primers were selected giving a specific product size for each cluster. These primers were tested against known samples of bacteriophage DNA, which confirmed the ability to identify the correct cluster based on the PCR product sizes. This biotechnology application can be used in future research by enabling cluster determination for lower-titer phage lysates and direct soil extracts. This will enhance research on the diversity of arthrobacteriophages in the soil and expand the types of research questions that can be explored. In addition, this protocol will be added to the SEA-PHAGES educational research program to extend the DNA characterization techniques that students learn and apply.

## **B 23. Elesar: A founding member of the new *Arthrobacter* phage cluster FF**

Lathan Lucas, Ashley Young, Braden Hansen, Sarah Antrich, Alaina Baird, Victoria Dinh, Emily Dunn, Bethany Fernandes, Emma Fraley, Alia Ghanem, Michael Gilbert, Terra Morris, Benjamin North, Mary Overcash, Katherine Pavleszek, Lily Pellegrini, Long Pham, Leo Rule, Emily Schultz, Jensen Smith, Brandon Thong, Haley Turner, Gabriella Walker, Zachary Whitaker, Rachel Wilsey, Reid Yanney; Faculty Mentor: Dr. Tamarah Adair

*Department: Biology*

The discovery and annotation of novel phages and their genomes increase general knowledge of phage structure and function and contribute to the information available in phage databases. This study focused on the isolation, characterization, and annotation of *Arthrobacter* phage Elesar, a bacteriophage isolated from a Las Vegas garden soil sample on host *Arthrobacter globiformis*. A high titer phage lysate was generated through plaque purification and used for transmission electron microscopy and DNA extraction. Phage Elesar was sequenced at the Pittsburgh Bacteriophage Institute using Illumina sequencing. Gene annotations were completed with DNAMaster, Phamerator, GeneMark, NCBI, and PhagesDB. Phage Elesar has siphoviridae morphology, as indicated by the long non-contractile tail and icosahedral capsid. A total of 61 genes, 16 of which have known functions and conserved domains, were manually annotated. Based on nucleotide sequence, Phage Elesar formed a new cluster (Cluster FF) with two other *Arthrobacter* phages; this cluster shares little similarity with other known *Arthrobacter* phages. The results from this study add to the existing knowledge of *Arthrobacter* phage genomes. Due to the continually growing phage databases, investigations concerning the mechanisms of bacteria/phage evolution and gene regulation, as well as applications in biotechnology are advanced.

## **B24. Analysis of the negative effects of Triclosan on *Navicula viridula***

Jorawar Sandhu, Daniel Navid, Jack Stutz; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

Triclosan is a toxic chemical found in many household products. It often enters the waterway through runoff. This experiment was performed to see how Triclosan affects algae in our water systems. The algae that was studied, *Navicula viridula*, produces nearly a quarter of all the oxygen on earth. We hypothesized that with increasing concentrations of Triclosan, the photosynthetic rate of *Navicula viridula* would decrease. Two trials were completed using varying concentrations of Triclosan that correlated to averages found in current waterways, as well as those predicted to be found in the future. Varying concentrations of Triclosan (Trial 1: 1.2E-5, 2.5E-4, 3.7E-4, 5.0E-4, Trial 2: 2.7E-4, 5.5E-4, 8.2E-4, 1.1E-3) were placed in containers with *Navicula viridula*. The photosynthetic rate per container was measured each day for seven days. As predicted, the photosynthetic rate of *Navicula* decreased with increasing concentration of Triclosan. Determined through this study was the inverse relationship between the amount of Triclosan present and the photosynthetic rate of *Navicula*.

### **B25. The Effects of the Addition of Nitrogen to Living *Ankistrodesmus fusiformis***

Douglas Blackaby, Michael Coale, Blair Robichaud; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

This experiment was designed with the intention to study and analyze the impact of varying nitrogen levels on algal species *Ankistrodesmus fusiformis*. The impact of differing chemical concentrations was observed by measuring photosynthetic rate of isolated samples of algae. From conducting our experiment, it was hypothesized that addition of nitrogen would promote algae growth until it reached a harmful concentration in the water. At this concentration, algae growth was expected to cease and the species would begin to deteriorate. As expected, the data revealed that as the addition of nitrogen increased in the samples of algae, the photosynthetic rate also increased. The two algae groups with the highest concentrations of nitrogen added demonstrated complementary growth patterns, and the two algae groups with the lowest concentrations of added nitrogen demonstrated similar growth patterns as well. The algal species was not harmed contrary to the hypothesis, however the photosynthetic activity continued to increase overtime. This evidence displays that nitrogen served as a nutrient for the algae, but only to a certain extent due to the presence of other restrains.

### **B26. The Effects of Hydration on Laparoscopic Peg Transfer Performance**

Sara Walden, Taylor Guynup, Claire Hartnett, Jacey Hilbers, Davis Payne, Chara Blackwell; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

The purpose of this study is to identify the effects of dehydration on laparoscopic peg transfer performance. The laparoscopic transfer exercise uses Maryland dissectors to move six pegs to the other side of the peg board and back. To identify a student's hydration state two separate trials were conducted. For the hydration trial, each student consumed one 16.9 fluid ounce bottle of *Ozarka* water before performing the peg transfer exercise. For the dehydration trial, students did not consume beverages for four hours prior to the exercise. The exercise was conducted in the same manner for both the hydration and dehydration trials. This exercise was done continuously for twelve minutes or until the student felt a hand cramp. Each student was timed, and errors were accounted for, an error being a dropped peg. The anticipated outcome of the study was to find a correlation between dehydration and laparoscopic peg transfer performance. Our data shows that there is not a statistically significant difference between the number of completed trials and errors committed for the students in both hydration conditions. However, our data suggests that there is a statistically significant difference between hand cramping and hydration status.

### **B27. The Effects of Attire on Laparoscopic Performance**

Amayah Brown, Margaret Klausmeyer, Sabrina Martinez; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

“Dress well, test well” is an active, and long-time circulating theory. Many hold the belief that when one is dressed nicer than usual, their academic performance is enhanced due to an increase in self-confidence. In contrast, when dressing down, it is believed that you will not feel as good about yourself and your performance will therefore be hindered. This study has been extended to examine the laparoscopic performance of a group of students instructed to come dressed in different attire than usual. On top of having tested whether or not attire would have an effect on performance, the extent to which it would be affected was also observed. To obtain optimal results, a portion of the participating students dressed up in formal attire, with their hair and makeup done. Another portion came dressed down in clothes similar to sleepwear and were not allowed to wear shoes. As a control, both groups’ data was compared to their baseline data collected from weekly practice times. When students completed the Pegboard Task, their times were observed to see whether or not they increased, decreased, or remained the same as a result of their attire. After collecting, compiling, and analyzing the data, no real change in trend was observed for the group of students that dressed up formally. However, in the group that dressed down, a mild downward trend in performance was observed.

### **B28. The Effect of Prior Stress on Laparoscopic Performance**

Megan Taylor, Mason McNamara, Joelle Kim, Aelesia Hughes, Vivian Tran, Cici Chen; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

Stress is generally defined as “any environmental or physical pressure that elicits a response from an organism” (The Editors of Encyclopedia Britannica, 2016). The presence of stress can be a crucial factor in determining surgical success in an operation. Stress can be directly caused by the procedure itself, or through other external factors outside the operating room. In this experiment, a prior stressor unrelated to the laparoscopy task was induced to determine whether prior stress would impact laparoscopic performance. While there were individual changes in levels of laparoscopic performance in a comparison of experimental trials to control trials, the results were insignificant. This demonstrates the difficulties of designing an experiment appropriately representing stress and indicates further research is necessary to quantify effects of prior stress on surgical performance.

### **B29. Effects of Exercise Intensity on Laparoscopic Performance**

Aidan Coggeshall, Evelynne Morris, Pradeep Tatineni; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

For this project, it is hypothesized that participating in high intensity exercise will cause the participants to produce fewer errors and attain a faster time in laparoscopic surgical training. The parameters of this study were to determine if there was a significant correlation between the level of physical activity a subject performs and the number of errors made using a laparoscopic surgery training module developed by the Fundamentals of Laparoscopic Surgery (FLS). Doctors often work long hours with few breaks and little time to exercise. We know the benefits of exercise and elevated heart rate on physical health, but we also wanted to study how exercise would affect surgeons’ performance in laparoscopic surgery. We used college students, who have similar lifestyles to surgeons, to help simulate the effect of exercise on laparoscopic performance.

### **B30. Effects of Muscle Fatigue in Laparoscopic Surgery Training**

Ernesto Sanchez, Joseph Kelly, Navin Kumar, Ernesto Sanchez, Andrew Ensberger, Cici Chen; Faculty Mentor: Dr. Marty Harvill

*Department: Biology*

Laparoscopic surgeons experience muscle fatigue while performing surgeries. Our project measured the effect of muscle fatigue on laparoscopic box trials. By doing wrist curls, we hoped to simulate a type of muscle fatigue a surgeon would experience during a long, intensive laparoscopic procedure. To see the effects of the muscle fatigue, we used a control group that would have the “regular” times without any muscle fatigue. This would be the trial that we could compare the experimental group. Our experimental group was the trial in which the students had experienced the muscle fatigue and a way to stimulate the muscle fatigue was to use weights while students performed wrist curls. An average time to use was sixty seconds, and this time would be helpful to perform trials. Although a trend supporting our hypothesis was observed, the trend is not statistically significant, and therefore is not strong enough evidence to support our hypothesis that muscle fatigue causes an increase in score during pegboard trials.

### **B31. The Impact of Surgical Error Awareness on Laparoscopic Trainees**

Ilyasah Muhammad, Kathleen Klinzing; Faculty Mentor: Dr. Mojgan Parizi-Robinson

*Department: Biology*

As a worldwide standardized system of laparoscopic training is being established, the factors impacting training performance are of interest to supervising surgical mentors. An experiment was designed to determine if knowledge of surgical error decreases the scores and times of laparoscopy students performing the pegboard exercise. Control group 1 did not read an article. Control group 2 read an article unrelated to surgical errors and the experimental group read an article outlining surgical error statistics. The participants then completed the laparoscopic pegboard exercise and their data was compared to their baseline scores. The results indicated a trend but no significant difference between the baseline and experimental scores and times of the participants.

## **HEALTH, HUMAN PERFORMANCE, AND RECREATION B32-50**

### **B32. ACL RECONSTRUCTION IN A PROFESSIONAL ICE HOCKEY ATHLETE**

Kolten Adams; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** Patient is a professional ice hockey athlete who tore his left ACL during practice. Patient has a history of three previous ACL tears in his right knee and none in his left knee. Patient was pain free and able to skate off the ice, ambulate to the athletic training room, and had no visible signs of injury at the time of injury. He described his injury only as feeling a “shift” in his knee. After MRI diagnosis, the patient had limited options left for reconstruction given his surgical history.

**Differential Diagnosis:** Joint hyperlaxity, meniscus pathology

**Treatment:** The patient underwent ACL reconstruction surgery using his left hamstring tendon to construct the ACL graft. He was able to begin rehabilitation immediately and returned to play within six months of his injury.

**Uniqueness:** The patient had used both of his patellar tendons as well as a cadaver graft in his three previous ACL reconstructions and was only left with the option of using the hamstring graft or another cadaver graft. Given that the cadaver graft failed in his right knee, the patient opted to utilize his hamstring tendon.

**Conclusion:** While many things can contribute to the overall integrity of an ACL graft, the athletic trainer must take into account the evidence supporting each type of graft, the level of activity expected after the reconstruction, the limitations the patient may have to overcome in addition to recovering from reconstruction, and patient preference when selecting the type of ACL graft to use.

### **B33. Concussive Impact Syndrome in a Collegiate Soccer Player**

Mychelle Berry; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** Patient is a female division I soccer, who was diagnosis with a concussion. The patient was hit in the head with the ball, with low impact. Patient displayed symptoms of a concussion such as dizziness, blurred vision, and trouble walking. Patient was withheld from placed under concussion protocol and followed up with the team doctor the next day. A month later patient still had symptoms such as headaches, dizziness, and foggi-ness, and unable to pass the impact test.

**Differential Diagnosis:** The patient's symptoms were also conclusive with symptoms of a skull fracture or CT. MRI and CT scans were used to rule these diagnoses out. Due to the prevalence of her concussive symptoms, the patient was diagnosed with concussive impact syndrome.

**Treatment:** The patient was medically disqualified from the team. The patient received head, neck, and spinal CT scan, X-rays, and MRI. Patient saw to multiple specialist including neurologist, cognitive neurologist, and sports psychologist. Patient was prescribed rehabilitation. In the beginning, it included eye movement, and it progressed to balance and coordination rehabilitation and phototherapy.

**Uniqueness:** The patient's concussion symptoms have last over two years. All the patient's test came back neg-ative.

**Conclusion:** While concussion research is becoming more prevalent, concussion research in females is still very limited. There is an unprecedented need for more research and education on the impact of concussions in females, especially as female sports become more competitive, and by extension, dangerous.

### **B34. Reverse Hill-Sachs Lesion Case Study**

Sarah Beshears; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** Patient is a 20-year-old female division I softball player who has undergone corrective surgery for a Reverse Hill-Sachs labral tear due to a posterior dislocation while batting. This is the patient's non-dominant left shoulder. The following is a 4-week rehab plan starting 15 weeks post-op focusing on functional exercises with an emphasis on eccentric strengthening.

**Differential diagnosis:** Rotator cuff pathology, shoulder girdle instability, SLAP tear.

**Treatment:** the patient underwent an arthroscopic procedure to repair the damage caused by the posterior dis-location. There was minimal posterior bone damage, so repair was focused on the posterior capsulolabral tis-sues. After 6 weeks in a sling and an overall 9 weeks post op, the patient began the exercise rehab protocol.

**Uniqueness:** A reverse Hill-Sachs labral tear is extremely rare. They are often caused by a direct and strong traumatic event or a violent contraction of internal rotary muscles which may be a result of an epileptic sei-zure. Due to the rare nature of this injury this athlete could have had chronic posterior weakness and a possible history of undiagnosed lesions due to frequent batting. Reverse Hill-Sachs lesions can be misdiagnosed if in-correctly X-rayed. Clinical signs are not always presented clearly but should include pain and a decreased abil-ity to fully elevate and externally rotate. If there is a fracture of the lesser tuberosity or the patient presents with fixed internal rotation of the arm, then athletic trainers should suspect a posterior dislocation.

### **B35. OATS Repair in Knee Repair Following ACL Repair**

Christian Cabello; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** Patient is a female division I volleyball middle hitter who tore her left ACL, lateral meniscus, and damaged cartilage in her knee after falling and landing on her leg following a block. Initial treatment for the injury was an ACL reconstruction using the patellar tendon on the same leg. After 18 weeks of rehabilitation following surgery the patient was still under an immense amount of pain and did not have normal function or normal range of motion.

**Differential Diagnosis:** ACL tear, meniscus pathology, chondromalacia, arthritis.

**Treatment:** The patient underwent an OATS procedure also known as, Osteochondral Allograft Transplantation, to replace the damaged cartilage with healthy cartilage from a cadaver. After surgery the patient began a rehabilitation protocol 24 hours post surgery. The patient is now eighteen weeks post-operative and reports a dramatic decrease in pain with normal function and full range of motion.

**Uniqueness:** The option of an OATS procedure is dependent of the severity of the lesion in grades from I-IV, Grade I being small tear, Grade IV being a full-thickness lesion. The patient experienced a Grade IV lesion. An OATS procedure is typically a procedure used to correct chronic tissue damage, but in this case the injury was acute. The damage resulted from a traumatic event experienced during the initial injury where the patient tore her ACL and lateral meniscus.

**Conclusion:** Although OATS procedures aren't used anymore, athletic trainers should be prepared to recognize the signs and symptoms associated with extreme cartilage damage following a traumatic injury.

### **B36. Conservative Treatment of stress fracture and bulging disc of L4-L5.**

Lex Davis; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** Patient is a female right-handed tennis player that has been playing tennis competitively for over eleven years. At the age of fourteen patient complained of pain in her lower back and went to see her physician. Physician recommended rest and NSAID's for pain management. Patient rested for two months and returned to play with same pain levels, she then saw a specialist, at the age of fifteen, who diagnosed her with a stress fracture at L4 and L5 and recommended steroid injections. She continued receiving injections until her sophomore year of college. She did not receive injections her junior year. Now, her senior year, she has received two steroid injections and has been taking NSAID's regularly and has been diagnosed with a bulging disc at L4-L5 on her right side.

**Differential Diagnosis:** Spondylolisthesis, Spondylosis, Bulging disc, Stress Fracture

**Treatment:** Strengthen exercises, as well as incorporating postural restoration, has help correct some of the biomechanical issues that have been a contributing factor to pain. We will continue to focus on maintaining strength, as well as core stability, in her rehabilitation program. The compensations she had in weeks 2-4 have been decreased because the patient's pain is now down to a bearable level. She reports that her serve has become more effective and less painful due to the upper extremity exercises so we will continue with these exercises. The patient also had modified practices and completed daily stretches, as well as having mandatory off days.

**Uniqueness:** Lower back injuries are very complex and have to be approached in a very different way. Having a patient with a history of L4 and L5 complications, such as stress fractures and bulging discs. The conservation treatment had to constantly be modified to suit the patient and her progress. Using a pain scale really gave great feedback and helped me developed a plan that improved her condition.

**Conclusion:** In the six weeks of the rehabilitation plan this patient has made much progress. She was first diagnosed with a bulging disc at the lumbar vertebra L4 and L5. Her initial patient outcome measures using the function rating index questionnaire was a score of 26 and the acute low back pain Screening questionnaire was initially a score of 96. After the six weeks of progress the patient completed the same questionnaires and her score we significantly decreased. Function rating index final score was a 15 and acute low back was 87. The patient also showed an increase in her range of motion. Right lateral bending and flexion of the back were in-

creased. All other motions we maintained throughout the six weeks. Manual muscle testing also had a slight increase or was maintain.

### **B37. Conservative Treatment of Acromioclavicular Osteolysis**

Jahana Deadmon; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** The patient, a division 1 collegiate football athlete, was in the middle of their season when they received a tackle to the anterolateral aspect of their right shoulder. After this hit, the patient continued to collapse onto the damaged shoulder. Prior to this event, the patient had not experienced any shoulder complications and was not a candidate for potential shoulder pathologies.

**Differential Diagnosis:** Labral Tear, AC joint sprain, Glenohumeral Instability

**Treatment:** As the injury occurred in the middle of the season, the patient opted to undergo conservative treatment options in the hopes that pain would subside. During this time, the patient's rehabilitation focused primarily on pain management. Following an official diagnosis, the patient again opted for conservative treatment and now their rehabilitation focuses on strengthening surrounding musculature in hopes that it will put his shoulder in optimal position for decreased pain and increased stability.

**Uniqueness:** Osteolysis refers to the active resorption of bone matrix. Though this typically occurs in patients who have recently received a joint replacement, unpreventable bone growths or arthritis, this case is assumed to have developed as a result of a direct blow. This injury is typically corrected through a surgical procedure by which the joint is completely replaced. As the patient is still an eligible athlete, taking a conservative route will allow for their continued participation with limited isolation from play. This could eliminate the surgery recovery timeline interruption if successful while also minimizing performance losses through continued participation.

**Conclusion:** As there were no signs or symptoms to indicate the chronic development often associated with osteolysis, this is a rare occurrence and thus the alternative approach to treatment has the potential to assist Athletic Trainers in the future treatment of elite level athletes who present osteolysis acutely.

### **B38. Recurrent Glenohumeral Dislocation**

Ashley Faris; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background** Patient is a male Division I football player who had numerous dislocations in his left shoulder during the fall football season. The patient was diagnosed with recurrent glenohumeral (GH) dislocations, type II superior labral tear from anterior to posterior, and a reverse humeral avulsion of the glenohumeral ligament (rHAGL) of the left shoulder after the fall season ended (in the spring).

**Differential Diagnosis** glenohumeral subluxation, bicep tendonitis, rotator cuff pathology

**Treatment/Surgery** Patient had a left shoulder arthroscopy with anterior labral repair, a capsulorrhaphy, reverse HAGL repair, and SLAP lesion repair. The rehabilitation program began 4 weeks post-surgery. During those first 4-weeks, the patient was in a sling and not permitted to do work on range of motion (rom). **Uniqueness** The uniqueness is the combination of injuries. A SLAP lesion is a superior labral tear from anterior to posterior that normally occurs with a dislocation. A rHAGL is the tearing off the posterior glenohumeral ligament from the bone. A rHAGL can lead to frequent shoulder dislocations that then led to SLAP lesions. The only solution to these injuries is surgery with rehabilitation. The patient regained almost 40 degrees of flexion in just 5 weeks after starting the rehabilitation process. **Conclusion** A rHAGL, SLAP lesion, and recurrent GH dislocations can be linked. Through rehabilitation and surgery, a patient can return to activity/the desired sport.



This patient fully regained rom and was cleared to compete in fall football. Athletic trainers should test the bicep tendon and GH ligament when frequent GH dislocations occur.

### **B39. Labral Repair after Surgery.**

Aspen Graves; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

The patient began rehabilitation one day after undergoing left labral repair surgery due to an acute mechanism of injury during a game. To measure the patient's progress, the Shoulder Pain and Disability Index was used as the patient-based outcome measurements documenting total pain, disability, and spadi scores. The first week post-surgery, the patient showed signs of appropriate range of motion but to prevent shoulder stiffness, light/weightless range of motion exercises were implemented while also using appropriate modalities were used to reduce swelling and pain. After four weeks, the patient was removed from the sling but overhead and active range of motion activities were prohibited. However, the patient's Shoulder Pain and Disability index decreased 16% and flexibility increased so light weights (<2lbs) were added to rehabilitation exercises with clearance from physician. At eight weeks, the patient was able to begin active range of motion pertaining to daily living. The patient's Shoulder Pain and Disability Index continued to decrease while their range of motion of the left arm increased at a rate within normal limits. Slowly weights were implemented during rehab to maintain muscular strength up to the pain tolerance of the patient. A positive outlook and an open line of communication with the athletic trainers/physical therapist allowed for a smooth transition between phases and a plan more conducive with the patient's progression. By the end of the rehabilitation process, the patient was able to do all daily activities and showed little to no signs of discrepancy after being completely healed.

### **B40. Partial Boxer Fracture in a Collegiate Baseball Pitcher**

Katie Hamm; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance and Recreation*

**Background:** Patient is a 19 year-old male collegiate baseball pitcher who fractured his fifth metacarpal. The injury occurred when the patient got upset and punched a wall with the medial side of his hand. Patient was previously diagnosed with mental health issues related to anxiety and difficulty with anger management.

**Differential Diagnosis:** hand joint dislocation, hand contusion, or wrist dislocations.

**Treatment:** Patient had an x-ray after initial evaluation which revealed a fracture in his fifth metacarpal had already started healing herefore diagnosed as a partial fracture. The patient underwent treatment to decrease swelling and pain. A rehabilitation plan was implemented to aid in restoring range of motion, preinjury strength and endurance, and increase neuromuscular control.

**Uniqueness:** During the initial evaluation the patient reported a false history. After further questioning the patient confessed the true mechanism of injury and that it was related to an episode with his mental health. In addition, treatment was administered after the healing process had already become making it difficult to find where the rehabilitation should start.

**Conclusion:** After the patient completed his treatment and rehabilitation plan he showed that he was pain free, had full range of motion, and continuing to work on regaining his preinjury strength.

### **B41. Bilateral Rectus Femoris Chronic Delayed Onset Muscle Soreness in Multi-Sport Collegiate Athletes**

Emily Summerlin; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background** Patient is a 22-year-old collegiate athlete who participates in soccer, track and field high jump, and Reserve Officers' Training Corps (ROTC). The patient's training involves early morning workouts with ROTC containing cardio workouts loaded with 40 to 50-pound weighted vest. Fall afternoon practices for soccer consisted of cardio and sport specific training with weights afterwards. Spring afternoon practice for track and field consists of plyometrics, cardio, and sport-specific training with weights after. Predisposing factors consisted of decreased flexibility of the hip-flexors and quadriceps group with an anterior tilt of the pelvis and decreased strength of the hamstrings. Over the course of seven months, the patient experienced delayed onset muscle soreness (DOMS) from increased training volume. Because the patient is a multi-sport athlete, the muscles were not given adequate time for recovery, resulting in chronic DOMS.

**Differential Diagnosis** Stress reaction, muscle strain, muscle tear, compartment syndrome

**Treatment** Patient underwent treatment in order to decrease pain and increase range of motion for the quadriceps and hip-flexor group. Additionally, a rehabilitation protocol was put in place to help strengthen the hamstring group and core. Exercises were introduced based on muscle groups that proved as predisposing factors. In an effort to not trigger further damage to the muscle groups, patient did not begin rehabilitation until pain was decreased from the reduced training load in addition to therapeutic modalities. Therapeutic treatments were introduced for temporary relief of pain and symptoms. Training was also reduced at track and field in order to give the patient sufficient time to recovery during the off-season between the end of soccer and beginning of outdoor competition with track.

**Uniqueness** Patient is a multi-sport athlete at the D1 collegiate setting.

**Conclusion** Patient reported significant decrease in functional pain after three months of rehabilitation. Patient has still yet to gain back full range of motion of knee flexion or hip extension or report being completely pain-free for one full day. Additional time withheld from activity during that three-month period would have proved a significant decrease in the patient's reported pain. Proper mechanics of high-jumping and proper footwear may be necessary in order to avoid further damage to the area.

## **B42. Discovery of Buford Complex in a Collegiate Football Player**

Shani Thompson; Faculty Mentor: Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background** The patient is a 23-year-old male who participates on a division I football team. He sustained a Type III SLAP Lesion from a repetitive compression of the superior joint surfaces in a three-point stance. The patient has a history of pain and anterior instability. The patient has also completed conservative rehabilitation sessions. Arthroscopic repair of the effected side preceded further rehabilitation and eight weeks' post-operative, the patient regained mobility in all planes of motion but, remains stiff.

**Differential Diagnosis** Shoulder Subluxation and Labral Avulsion

**Treatment** Upon arthroscopy, there appeared to be an absence of anterior superior labrum and presence of a thickened medial glenohumeral ligament (MGHL), instead. The tear was repaired by removing the torn part of the labrum. In addition, sutures anchoring down the MGHL where it and the glenoid meet, were used to close the sub labral hole and decrease stress on the repair. Six weeks' post-operative, the joint surfaces healed and allowed for active range of motion.

**Distinctiveness** Absence of anterior superior labrum and thickened MGHL, produce what is known as the Buford Complex. Buford Complex is a normal congenital variant and is present in 1.5% of the population.

**Conclusion** Patients and clinicians, alike, may not discover the Buford Complex until arthroscopic repair for a tear has begun. Differentiation from other normal variants may be difficult but, if discovered, surgical repair should be avoided to delimit introduction of stiffness during external rotation, caused by attempt to close the sub labral hole using anchors on the MGHL.

### **B43. Patellar Dislocation in a High School Football Lineman**

Shea Williams; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background** Patient is a 16-year-old male high school football offensive lineman who dislocated his patella and suffered a Grade II PCL sprain during a game. The injury occurred when the defender the patient was blocking ran into another player; the force caused the patient to fall posterior. The anteromedial force from the fall resulted in the patella to laterally dislocate.

**Differential Diagnosis** Patella dislocation, PCL tear, ACL tear, LCL tear, Meniscus pathology. **Treatment** The knee was immediately immobilized on scene. On arrival to the patient, the patella had partially reduced. The patient underwent surgery three days post-injury to reconstruct the posterior surface of the patella and to repair the PCL. Immediately postoperative, the patient underwent treatment to control pain and swelling in the extremity. A rehabilitation protocol was implemented to regain strength and range of motion with an emphasis on patellar tracking.

**Uniqueness** The patient dislocated his patella while in knee flexion, which is an uncommon position for this injury. The mechanism of injury was forced hyperflexion of the knee, which also brings a unique quality to this injury.

**Conclusion** Three months postoperative, patient reports unexplainable periodic pain, but has gained full range of motion and increases in strength. A surgery six months postoperative may be necessary to improved imbalanced patellar tracking if detected.

### **B44. Anterior Cruciate Ligament and Medial Meniscus Tear in High School Basketball Player**

Courtney Harle; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

**Background:** Patient is an 18 year old female high school basketball shooting guard and small forward. The injury occurred during the landing of a layup during practice; the quick deceleration and rotational force of the landing resulted in an anterior translation of the tibia on the femur and a torn anterior cruciate ligament (ACL) and medial meniscus.

**Differential Diagnosis:** ACL tear, PCL tear, Medial Meniscus tear, MCL tear, Lateral Meniscus tear. **Treatment:** Patient was initially evaluated on scene which resulted in positive Lachman, McMurray, and Anterior Drawer tests for pain, clicking, and laxity. A rehabilitation protocol was implemented for strengthening prior to surgery. The patient underwent surgery three weeks post-injury for a patellar tendon ACL graft and medial meniscus repair. The patient was non-weight bearing for six weeks post-surgery. A post-surgery rehabilitation protocol was implemented to regain strength and range of motion with emphasis on quadriceps strength.

**Uniqueness:** The patient underwent a meniscal repair instead of a meniscal debridement which resulted in increased time non-weight bearing post-surgery. This led to changes in the rehabilitation protocol and a delayed return to play timeline. The patient highly identified with the sport and therefore needed psychological support during rehabilitation to encourage emotional investment and manage symptoms of depression due to absence from the team.

**Conclusion:** After delays in the rehabilitation timeline, the patient was able to achieve full range of motion, equal strength bilaterally, and a complete return to play after twenty-four weeks post-surgery.

### **B45. Using Subjective Measures for Rehabilitation of a Posterior Hip Labral Tear**

Tristan Hawkins; Faculty Mentor: Dr. Andrew Gallucci

*Department: Health, Human Performance, and Recreation*

This study focused on the treatment and rehabilitation of an athlete with a posterior labral tear in her hip. Once a week for five weeks the patient was given the Harris Hip Score Sheet to fill out based on how she felt throughout the week, and the different activities she could and could not perform with ease. The score sheet was used to see the impact of a patient's subjective scoring on the rehabilitation process to decrease the time before return of full functionality. The Harris Hip Score Sheet, range of motion, and manual muscle tests were scored at the beginning of each week, then the patient completed her rehabilitation exercises three times a week. Each week included a different set of exercises to help the patient improve her activities of daily living. The patient saw mild improvement during the first two weeks and increased her ability to perform daily activities slightly while still relying on crutches. Her biggest improvement came between weeks three and four as she was able to complete normal daily tasks such as climbing stairs without crutches and jogging. In the final week of the study the patient had a near perfect Harris Hip Score. She began running and squatting while nearing full functionality of her hip. The Harris Hip Score sheet provided useful subjective information that allowed for the exercises to be specifically tailored to the patient. This score sheet was useful in helping the patient regain functionality, strength, and returning to normal life activities.

#### **B46. Grade I Ankle Sprain in a Female Collegiate Basketball Player**

Madison Lohr; Faculty Mentor: Dr. Andrew Galluci

*Department: Health, Human Performance, and Recreation*

**Background** Patient is a Female Division I Basketball Player who received a Grade I Ankle Sprain after coming down from a rebound and landing on the foot of an opponent.

**Differential Diagnosis** Tibial Fracture, Syndesmotomic Ankle Sprain

**Treatment** Worked to control the swelling for the first several weeks. Eventually moved to progress to range of motion exercises and strengthening exercises. After the first month the patient began functional movement exercises.

**Uniqueness** After 8 weeks the patient returned to play, which can be exceptionally long for a grade I ankle sprain. The patient was non compliant with wanting to progress rehabilitation exercises. Had to work by slowly adding in extra exercises and increasing the weight. Also had to work with getting accurate feedback as far as pain and tolerance before progressing exercises.

**Conclusion** It is important when rehabilitating an athlete to understand them and find ways to encourage them in order to return them to play. Some athletes are not always willing or wanting to return so they do not keep up or push themselves through treatment. It is important to approach each athlete differently and talk to them in specific ways given personality traits and goals. It is also important to remember that each athlete is different so handling everyone the same way is not always beneficial.

#### **B47. Through the eyes of Brazilian youth: A photovoice study on quality of life**

Arianna Gomez; Faculty Mentor: Dr. Beth Lanning

*Department: Health, Human Performance, and Recreation*

Adolescent health can be classified using common morbidity and mortality data such as accidental death rates, violence statistics, drug use, and teen pregnancy rates. These data are helpful for planning future health interventions, but they do not provide information about environmental factors, perceived society norms and peer pressure that so often influences adolescent behaviors. Understanding the environmental dynamics which adolescents live in is important for the design and implementation of effective health initiatives, especially in developing countries. Photovoice is a qualitative method used in Community Based Participatory Research (CBPR), which allows individuals to combine photography and personal narratives in order to demonstrate the realities of their daily lives. This method is employed to create social change and policy development that

serve marginalized individuals and communities whose voices are often disregarded. The researchers used photovoice to prompt discussion surrounding major topics regarding adolescent community members' perception of factors that affect their health and quality of life in Anchieta, a small coastal town in the state of Espirito Santo, Brazil. The participants presented their findings to community leaders and church members in order to facilitate discussions about future health initiatives. Overarching themes that arose from this experiment included: spirituality, friendship, family bonding and animal companionship. Results will be used as a guide for development of future health interventions which will occur through the health intervention course at Baylor and in collaboration with the Baylor in Brazil directors.

#### **B48. Summer School Program Improved Glucose and Lipoprotein in Female Students**

Rachel Meach, Anna Bergquist; Faculty Mentor: Dr. Yonsuk Koh

*Department: Health, Human Performance, and Recreation*

**Purpose:** To investigate whether a 5-week summer school program involving physical activity has an effect on plasma glucose levels and lipid profiles among Hispanic female high school students.

**Methods:** Thirty-three female students, aged 15-17, were assigned to either a summer school program (n=17) or a control group that maintained normal summer activity (n=16). All participants had a BMI greater than the 85th percentile. The summer school program was held 5 days per week (08:00-16:00) for 5 weeks, involving a variety of physical activities for 90 minutes each day. Overnight-fasting blood (5 mL) was collected pre- and post-study to analyze changes in plasma glucose and lipid profiles.

**Results:** Regardless of summer school attendance, HDL-C was reduced by 1.77 mg/dL (42.75±0.63 mg/dL to 40.98±0.63 mg/dL), which was statistically significant (p=.033). After participation in the summer school program, LDL-C and glucose levels decreased by 12.44±5.16 mg/dL and 5.55±3.83 mg/dL, respectively, as opposed to the levels of non-participants which increased by 4.10±5.51 mg/dL and 8.13±5.09 mg/dL, respectively. No other variables were different.

**Conclusion:** LDL-C and plasma glucose levels were reduced more in participants in the summer school program as compared to those of non-participants. Although HDL-C decreased independently of the summer school program, it remained within a healthy range. Therefore, the summer school program may be an effective method of improving plasma glucose and lipid profiles.

#### **B49. Assessment of Total Macronutrient Contents By Fourier – transform Infrared Spectroscopy Following High-fat Diet and Exercise**

Susanna Hamsley, Jarrett Walbolt, Raegan Chunn, David Gresch, Arish Bheraiya, Susanna Hamsley, Olademehin Latunde, and Sung Kim; Faculty Mentor: Dr. Yunsuk Koh

*Department: Health, Human Performance, and Recreation*

High fat-low carbohydrate (HFLC) diets are an increasingly common approach to enhancing health and performance in endurance runners. Macronutrient contents in plasma may change in response to diet and exercise.

**Purpose:** To examine the responses of total plasma macronutrient contents in trained males following dietary manipulation in combination with aerobic exercise.

**Methods:** Eight runners (age = 39.5±9.9 years, body weight = 81.6±7.1kg) switched to a HFLC diet for 3 weeks. The caloric intake during the HFLC intervention derived from 70% fats. Indoor treadmill exercise at varying race paces followed by a 5-km time trial were completed during both trials. Overnight blood samples were collected before and after exercise to analyze changes in plasma macronutrients using attenuated total reflectance Fourier-transform infrared spectroscopy (ATR FT-IR).

**Results:** The ATR FT-IR analysis found that, independent of diet or exercise, there were no significant changes in total plasma proteins. However, a significant accumulation of lipids (30.06±7.75 AU, 95% CI=6.93) and

carbohydrates ( $42.92 \pm 11.62$  AU, 95% CI=10.39) were observed at the HC baseline as compared to the HFLC baseline ( $28.29 \pm 7.56$  and  $38.47 \pm 13.08$ , respectively). In addition, total lipids in the HC diet significantly decreased at 24-hours post-exercise (from  $30.06 \pm 7.75$  to  $28.51 \pm 7.91$  AU,  $p=0.016$ ).

**Conclusion:** Amid the high carbohydrate diet, post-exercise total lipid contents decreased, suggesting that lipids consumed as a primary energy substrate during exercise did not recover to baseline levels. Additionally, following the high carbohydrate diet, lipid and carbohydrate contents had increased, possibly due to elevated plasma lipids. No significant changes occurred with the high fat diet.

## **B50. Exercise Training Improved Plasma Glucose and Lipid Profiles in Obese Hispanic Women**

Kaylee Clyma and Katie Martin; Faculty Mentor: Dr. Yunsuk Koh

*Department: Health, Human Performance, and Recreation*

**Purpose:** To examine the effects of a 12-week aerobic exercise training program at either high or low-intensity on plasma glucose and lipid profiles in obese Hispanic females.

**Methods:** Thirty inactive, obese females (age=  $26.07 \pm 4.4$  years, height=  $161.4 \pm 4.1$  cm, weight=  $89.8 \pm 8.1$  kg and %body fat=  $40.9 \pm 4.9\%$ ) were randomly assigned to three exercise groups: control (n= 10, no exercise), low-intensity (LI, n= 10, 50%  $VO_2$ max) and high-intensity (HI, n=10, 70%  $VO_2$ max). Both LI and HI groups participated in exercise training on a treadmill for 12 weeks with the following protocol: weeks 1-4 (3 days per week to expend 13.5 METs-hr/w), weeks 5-8 (4 days per week to expend 18.0 METs-hr/w), and weeks 9-12 (5 days per week to expend 22.5 METs-hr/w). Plasma samples were collected before (PRE) and after (POST) the 12-weeks to analyze changes in plasma glucose and lipoproteins, including: total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C). A 3 x 2 analysis of variance with a Tukey post-hoc test ( $p < 0.05$ ) was used.

**Results:** TC at POST in the LI group ( $116.53 \pm 5.32$  mg/dL) was significantly lower ( $p = 0.012$ ) than in the control group ( $139.12$  mg/dL). Plasma glucose at POST in both LI ( $75.32 \pm 2.71$  mg/dL,  $p = 0.024$ ) and control group ( $80.1 \pm 2.71$  mg/dL,  $p = 0.001$ ) was lower than the HI group ( $90.77 \pm 2.78$  mg/dL).

**Conclusion:** Both LI and HI training equally improved body weight and composition. However, the low-intensity exercise provided a more favorable effect on the plasma glucose and lipid profiles than the high-intensity exercise.

## **SESSION ONE: Monday, March 26th and Tuesday, March 27th**

### **BAYLOR SCIENCES BUILDING – 2ND FLOOR**

#### **GEOSCIENCES B51-61**

##### **B51. Molecular Analysis of Flood Deposits in the Tennessee River Valley: Implications for Understanding Carbon Cycling in Fluvial Environments**

Emily Blackaby, Owen Craven, William Hockaday, Steve Forman, Gary Stinchcomb, Lance Stewart; Faculty Mentor: Dr. William Hockaday

*Department: Geosciences*

The Tennessee River Valley contains a series of well-preserved, buried flood deposits. The purpose of this study was to characterize the organic carbon in a fluvial environment and identify changes over time. Ten sam-

ples were collected from three sites: Right Bank Canal, Left Bank Canal, and Bond. Depths varied between 37cm to 350cm. Samples were dated using optically stimulated luminescence (OSL). Each was pretreated with HCl and HF, underwent solid-state cross polar  $^{13}\text{C}$  NMR analysis at twelve kilohertz, underwent an elemental analysis, and a molecular mixing model (MMM) was used to determine the molecular components of the organic matter present. The MMM categorized carbon molecules present in terms of carbohydrate, protein, lipid, lignin, char, or carbonyl.

Char was the most prominent molecular component ranging from 28.7 to 55.9% and comprised larger percentages in older deposits while younger deposits contained more non-char constituents. The carbonyl, lipid, and carbohydrate groups are present throughout all the samples with carbonyl ranging from 9.3 to 31.4%, lipid from 5.5 to 16.7%, and carbohydrate from 4.4 to 16.9%. High amounts of carbonyl throughout the samples indicates a highly oxidizing environment. The weight percent of carbon in each sample ranged from .41 to 1.24%.

Trends in the molecular data suggest that there is a consistent decrease in the presence of char in younger samples compared to older samples while there is an increase in protein, lipid, and lignin. Differences in the presence and amount of carbon groups may indicate selective degradation of molecules based on chemical stability.

### **B52. Were the Volatile Contents of Yellowstone Caldera's Lava Creek Tuff the Same?**

Rachel Holsteen Bruyere; Faculty Mentor: Dr. Kenny Befus

*Department: Geosciences*

Yellowstone Caldera's most recent supereruption produced the Lava Creek Tuff. The eruption occurred as two events, the Lava Creek Tuff A and B, which erupted at slightly different times and have different mineral assemblages. To further explore the differences between Lava Creek Tuff A and B, we used FTIR spectroscopy to measure the  $\text{H}_2\text{O}$  and  $\text{CO}_2$  content of quartz-hosted melt inclusions. Melt inclusions are trapped blebs of magma. For each sample, we handpicked quartz grains for analysis from crushed pumice clasts. Initially, melt inclusions are opaque and highly decrepitated. To return them to pristine glass, we homogenized melt inclusions in a suite of experiments at 750-800 °C and 2000-2500 bars for 24-48 hours. After homogenization, inclusions are transparent glass with up to 5% microlites and sparse bubbles. Melt inclusions from Lava Creek Tuff A contain 1.4-3.8 wt. %  $\text{H}_2\text{O}$  and 9-65 ppm  $\text{CO}_2$ . Melt inclusions from Lava Creek Tuff B have 0.6-1.1 wt.%  $\text{H}_2\text{O}$  and less than 10 ppm  $\text{CO}_2$ . Assuming volatile saturation, those volatile contents correlate with a storage pressure of approximately 100 MPa. Such values indicate the magmas were shallowly stored at ~3 km depth prior to the supereruption.

### **B53. Using a Neural Network in a Surrogate Model to Estimate Soil Moisture in Near-Real-Time**

Scott Fitzgerald (Computer Science) and Kathy Breen (PhD student, Geology); Faculty Mentor: Dr. Scott James (Geology, Mechanical Engineering)

*Department: Geosciences and Computer Science*

Computationally expensive hydrologic modeling simulates surface and groundwater fluxes in response to environmental conditions and can assess risks for drought and flooding. However, neural network models, which run orders of magnitude faster, can be used as surrogates for hydrologic models to estimate soil moisture. The predictive power of a neural network relies on the quality and quantity of the data provided during the training process. A common problem in hydrologic models is the spatio-temporal sparsity of observational datasets. Remotely sensed parameters provide high-resolution datasets with minimal data latency relative to *in situ* networks. This research has developed a neural network surrogate model for the Soil & Water Assessment Tool (SWAT) hydrologic model to provide near-real-time soil-moisture estimates for use in hydrologic risk assessments. The surrogate model was developed on the Middle Tennessee-Elk River watershed, which is an area with relatively homogeneous land use. The region has low topographic relief appropriate for remotely sensed soil moisture data collection. Training data for the neural network were generated using thousands of SWAT model runs. Satellite soil-moisture estimates from NASA's Soil Moisture Active Passive satellite were inte-

grated into SWAT model outputs by replacing temporally synchronous predictions with remotely sensed data during neural-network training. In this effort, the data used to train the neural network were identified and refined. Then, the properly trained neural-network model accurately estimated soil moisture in a fraction of the time required to run the SWAT model.

#### **B54. Perspectives and Visualizations of the Waco Wetlands Using UAS**

Morgan Cody, James McGill, Kenadi Sutton, Tyler Leggett; Faculty Mentor: Bruce Byars, MS

*Department: Geosciences and Environmental Science*

Traditional digital elevation models utilize gridded data for terrain representation at varying resolutions. These data are typically developed by several different methods that include hand digitizing, digital scanning and utilizing passive systems such as LiDAR and photogrammetry. Typical resolutions for widely available data are 30m and 10m for digitally-derived datasets, down to 1m and even sub-meter data for LiDAR derived datasets. UAS (Unmanned Aerial Systems), provide a new high-resolution method for collecting and visualizing geographic data, including terrain. UAS capabilities are such that traditional methods used by government agencies are being questioned for their quality of resolution and compared to these new UAS methods as out of date. In this project we compared the quality of traditional digital and LiDAR resolution of one meter to the UAS-derived 2.5cm resolution of our field survey. Not only do the raw data of our mission provide better quality visualization, the ability to model the area in 2-dimensions and 3-dimensions is of a higher quality than our ability to model with traditional digital elevation data. Using UAS, we applied these higher resolution methods to model and map the Lake Waco Wetlands to demonstrate the high-quality capabilities of the UAS's technology in comparison to traditional methods.

#### **B55. An Economic Spatial Optimization Analysis of Central Texas Lignite Coal Mining**

Bradley Rains; Faculty Mentors: Wayne Hamilton, MS; Bruce Byars, MS

*Department: Geosciences*

The purpose of this research is to conduct an optimal overlay analysis of maps containing different production data to display the most economically viable location for a lignite coal mining operation in Central Texas. The fundamental categories taken into consideration are transportation, mineral availability, and land access. This overlay methodology includes the utilization of several data sources such as mineral data from the USGS, railroad data from TxDOT database, mine claim data from the Railroad Commission of Texas, and complete geological data of Texas from the United States Geological Survey. Each data type will be given a numerical weight that is determined by its significance in the proximity, transportation, and overall production value established by the company. A Geographic Information System (GIS) is the methodology and approach we used to sort and analyze the data. Processing the data requires the use of geo-processing tools within ArcMap. The data will then be part of an overlay analysis, each criterion labeled with their corresponding weight. By converting the regional data into a hotspot analysis map of the weighted criteria, a clear spatial distribution of data will be produced. This spatial distribution will display the most production efficient location by colored weight. This methodology can be applied to a wide variety of industries by adjusting the criteria and inputting different weights for each criterion.

#### **B56. A Review of the Causes and Oil Spill Response to the BP Deepwater Horizon Oil Spill and Off-shore Drilling**

Adrian Charles; Faculty Mentor: Wayne Hamilton, MS

*Department: Geosciences*



The purpose of this research is to characterize oil spill response clean up methods and investigate re-use of the recovered oil. This research focused on the oil spill at the Macondo Prospect in the Gulf of Mexico which is the location of targeted reservoirs for oil production. Offshore drilling and operations is risky and dangerous work but even more so in the ultra-Deepwater of the Gulf of Mexico. British Petroleum (BP) one of the world's largest major oil and gas companies contracted with offshore drilling company Transocean to drill the Macondo Prospect. While drilling had been initially successful the well ultimately blowout due to: 1) improper borehole cementation, 2) multiple blowout prevention valve failures, one prior and after the explosion, 3) formation pressure misinterpretation during well completion. These three factors are the significant contributors that caused the well blowout and release of oil to the environment. The oil spill clean-up methods that were used were industry and regulatory approved techniques that included: dispersants, burning, and skimmers. Only a third of the oil was recovered and was disposed by flaring. The recovered crude oil is potentially an opportunity to turn this oil into fuel for consumers. The remaining two thirds of the spilled oil naturally dispersed, evaporated, dissolved and as residual in water column or sediments. Finally, this research also reviews new recovery methods that will be compared to the current industry and regulatory accepted approaches.

### **B57. Correlating Faults and Earthquakes to Understand Tsunamis in Tohoku, Japan**

Gilliane Del Rosario; Faculty Mentor: Wayne Hamilton, MS

*Department: Geosciences*

The purpose of this research was to study the connection between faults, earthquakes, and tsunamis in Tohoku, Japan. The focus was to correlate seismogenic and tsunamigenic behaviors in relation to existing faults by understanding Japan's seismic history, tsunami production, and the infamous 2011 Tohoku event. Seismic activities measured by GPS means played an important part in tsunami computation prediction accuracy. A general cause and effect logic tree displaying different justification levels was used to determine seismogenic and tsunamigenic areas. The results of this assessment showed a variation in levels of seismogenic and tsunamigenic behaviors along the Japan Trench due to inconsistent asperities across the subduction zone. This irregular slip condition was one of the reasons why Tohoku is notorious for colossal earthquakes and massive tsunamis. The locking mechanism of the plates spring loaded the area to the point where the stored energy would likely cause a tsunami if released. Since many tsunamigenic zones around Tohoku were found to be within seismogenic areas, measured at  $M_w \geq 7.5$ , it is thought that events of these magnitudes can result in tsunami production. Evaluations of interplate coupling and how the 2011 Tohoku event happened exhibited a pattern of energy propagation through different seismic zones as a result of extremely high magnitude earthquakes. The application of this research lies with early warning system and safety precautions against natural disasters.

### **B58. Feeding the E-Ring: Eruption Mechanisms & Controls of Volcanism on Saturn's Icy Moon Enceladus**

Emily Gackstatter; Faculty Mentor: Wayne Hamilton, MS

*Department: Geosciences*

Located within the E ring, Saturn's sixth largest moon Enceladus is one of the most volcanically active planetary bodies in the solar system. Structurally, Enceladus is a primarily icy body with a rock-metal core, liquid water ocean, and an icy shell. Volcanic processes are present in the form of cryovolcanism in the southern hemisphere in the form of water geysers. The Cassini spacecraft first passed Enceladus in May of 2006 making its initial discovery of the moon's icy jets. Using instruments onboard, the Cassini spacecraft determined that these water geysers have volcanic plumes spewing water, ice,  $N_2$  (or  $C_2H_4$ ),  $CO_2$ ,  $CH_4$ ,  $NH_3$ , and higher-mass hydrocarbons into the surrounding atmosphere. Plumes erupt  $\sim 200 \text{ kg s}^{-1}$  of vapor  $\sim 80 \text{ km}$  into the surrounding atmosphere. Instruments on board the Cassini spacecraft include an Ion and Neutral Mass Spectrometer as well as Visible and Infrared mapping spectrometer and were the main instruments used for data collections during flybys. Such data collection indicates that eruption mechanisms are tidal deformation and tidal heating, while the eruption time is most likely controlled by an interior viscosity difference within the crustal ice. These

mechanisms and control variables can be observed in the southern plumes from four main fissure vents. It is further hypothesized that ejecta from the fissures plumes are the primary source for material within Saturn's E-Ring.

### **B59. Geologic and Hydrocarbon Reconnaissance of The Esperson Dome Field in Liberty, Texas**

Peter McCoy; Faculty Mentor: Wayne Hamilton, MS

*Department: Geosciences*

The purpose of this research is to evaluate oil & gas activity near the Esperson Dome Field area in Liberty County, Texas. The total productive area of this field is approximately 5,700 acres, and since its 1929 discovery, there have been a total of 270 wells drilled of which 119 are presently producing. To date, the shallowest production comes from a Miocene sand at 1,800 feet and the deepest hydrocarbons comes from the second Crockett Sand at a depth of 9,995 feet. The deepest well, owned by General Crude Oil Co., referred to as Esperson B-21 that reaches a depth of 13,000 feet. Currently, the field has a daily allowable production of 5,000 barrels. The characteristic graben pattern of the dome and the arching of sediments is the result salt flowage during domal growth. Dip increase with depth and stratigraphic convergence towards the salt, and penetration of the Claiborne sediments of Eocene age is clear, especially in older formations. The Miocene, Frio, and Vicksburg traps are a result of normal faulting and upward flexures in association with the salt dome intrusion. While the Yequa and Crockett traps were the result of truncation of the strata against the salt mass. Due to radial faulting on the flanks of the dome, each productive fault block has its own characteristic oil-water and gas-oil contact. The accumulation of oil is primarily the result of the doming effect caused by faulting or stratigraphic punch-out, or a combination of both.

### **B60. A Compare and Contrast Study of Coal Bed Methane Stimulation Strategies**

Daniel Pinillos; Faculty Mentor: Wayne Hamilton, MS

*Department: Geosciences*

The purpose of this project is to explore the different extraction strategies for coal bed methane and to compare them by listing their advantages and disadvantages. Coal bed methane is an unconventional gas resource found in the matrix of coal seams. Coal bed methane is formed during the coalification process, in which organic matter usually in swampy areas gets buried, and thereby exposed to high temperatures and pressures. These extreme conditions catalyze the production of thermogenic methane which is then stored within the coal matrix and held in place by hydrostatic pressure. The water acts as the seal, and must therefore be extracted to depressurize the well and stimulate production. In the United States, some of the most active coal bed methane fields are: Black Warrior Basin in Alabama, San Juan Basin in New Mexico, and Powder River Basin in Wyoming. Depending on many subsurface conditions, a specific extraction strategy may be chosen which will facilitate production. Hydraulic fracturing, for example, pumps pressurized fluid into perforations made at the target coal seam which propagates cracks and increases permeability. Cavitation (or dynamic-cavity completion) can also be used to significantly increase flow rate. This is done by under-reaming the target coal seam, which is then rapidly pressurized and depressurized until failure occurs. Other stimulation strategies used are carbon dioxide fracturing and nitrogen fracturing. These both use standard fracturing techniques with liquified gas instead of water to facilitate clean up and reduce well damage.

### **B61. Assessing the Effectiveness of Geophysical Survey Methods in the Brazos River Alluvium in Central Texas**

Khang Vo; Faculty Mentor: Dr. John Dunbar; Wayne Hamilton, MS

*Department: Geosciences*

Geophysical surveys were conducted to determine their capability to detect lithology types and saturated sediments in the Brazos River alluvium. The purpose of this research was to analyze and test electrical resistivity and geophysical seismic refraction method from the alluvium. The geophysical interpretation was then compared to the known alluvium lithology and groundwater data from nearby water wells. The resistivity survey utilizes a dipole-dipole array setup across the Brazos River Alluvium. The dipole-dipole array is a type of electrode configuration that uses direct current for resistivity surveys. In addition, a seismic refraction survey was conducted in the general area. Seismic refraction is a surface method that uses the properties of acoustic waves to measure the velocity of the material through which the waves travel. The seismic refraction method is when a wave reaches an interface between two materials having different seismic velocities, that seismic wave will be refracted either towards the normal to the interface, or away from the normal depending on whether the velocity increases or decreases at the boundary. Both geophysical methods yielded an understanding of the subsurface in the study area. The resistivity interpretation appeared to correlate with higher permeable sediments at the end of the transect. The refraction survey indicated velocity changes at about the same depth as the adjacent well water level. Both geophysical surveys extended our geologic knowledge between known wells and confirmed our understanding of the alluvium.

## **CHEMISTRY AND BIOCHEMISTRY B62-70**

### **B62. Computational Analysis of Metal-Adducted Trisaccharides using Density Functional Theory**

Emily Ziperman, Tara Liyanage, Andrew Smith; Faculty Mentor: Dr. Elyssia Gallagher

*Department: Chemistry & Biochemistry*

Carbohydrates are important biomolecules that play prominent roles in many biological processes, such as cellular communication and host-pathogen interactions. Ion mobility-mass spectrometry has been used extensively to characterize carbohydrate-metal adducts, which have different conformations based on the binding interactions between the carbohydrates and metal ions. Some of these carbohydrate-metal adducts have been experimentally shown to exist in two energetically stable conformations. However, there is a lack of computational data to describe these structures at the molecular level. This research aims to move toward filling in these gaps. We have computed the relative enthalpies, free energies, and binding energies for model sugars, melezitose and maltotriose, upon binding to metal ions. Carbohydrates were modelled with Gaussian09 and Density Functional Theory (DFT) calculations utilized the B3LYP functional and 6-31+G(d,p) level of theory to obtain energy-optimized structures and thermochemical data. These energy-optimized structures will also provide the starting input files for more complex computations using Molecular Dynamics (MD), allowing our research group to address more complicated molecular questions, such the effects of solvent on carbohydrate conformation.

### **B63. CRADLE diagnoses low-intensity leukocoria before clinical diagnosis**

Michael Munson, Devon L. Plewman, Collin Zahler, Alireza Abdolvahabi, Linsay Vacca, Carlos Rodriguez-Galindo, Shizuo Mukai, Ryan Henning; Faculty Mentor: Dr. Bryan F. Shaw

*Department: Chemistry & Biochemistry*

Leukocoria is indicative of several ocular disorders ranging from retinoblastoma to amblyopia. Ophthalmoscope screenings for leukocoria contain several drawbacks that render it ineffective when administered by primary physicians on undilated eyes. A growing number of anecdotal and scientific reports suggest that flash photography serves to be a stronger alternative when screening for leukocoria. Here, we present CRADLE (ComputeR Assisted Detector of LEukocoria), a free smartphone application that utilizes machine-learning to detect trace leukocoria in digital imagery. CRADLE was tested against 71,967 photographs of 20 children with retinoblastoma, Coats' disease, cataract, amblyopia, or ametropia. CRADLE detected leukocoria in 17 children before diagnosis by  $389 \pm 134$  days, even when presented with low intensity leukocoria. Computer-assisted

leukocoria detection can accelerate diagnoses of eye disease, especially in low-income nations where young adults with smartphones outnumber physicians 1000-fold.

#### **B64. Release Kinetics of Dyes Covalently Attached to Various Tissues**

Allie Stinchcomb, Jerry Quintana, Kayla Murphy; Mentor: Dr. Robert Kane

*Department: Chemistry & Biochemistry*

The innate immune system can complicate transplant surgeries by causing an acute inflammatory response, threatening the health and viability of newly transplanted tissues; one significant pathway is via the stimulation of toll like receptor 4 (TLR4). A TLR4 antagonist has been identified that dramatically reduces inflammation in transplanted islets of Langerhans, and our lab seeks to expand our work with islets to include covalently modifying the surface of other tissues with the TLR4 antagonist. Over time, the TLR4 antagonist will detach from the tissue, locally inhibiting the innate immune system and protecting the tissue. In a series of preliminary studies, we have experimented with covalently attaching a fluorophore to the tissues using a cleavable linker. This allows us to measure the rate at which the fluorophore detaches from the tissue, which will mimic the release of the TLR4 inhibitor. We are currently working on synthesizing better linkers with which to treat the tissue, and after completion of the synthesis we will continue to collect data on the rate of fluorophore release. To do so, we treat the tissues with the linker molecule and a fluorophore, image the tissue at specific time points over a couple days, and use Image J to acquire quantitative data. Our previous results demonstrate that the fluorophores will covalently attach to the tissues pre-treated with a linker molecule, and the experimental linker will cleave over time in comparison to the control.

#### **B65. Baylor Minipharma**

Minwoo Kim, Javier Hernandez, Cody Yao, Aaron Murillo-Ruiz, Tim Philip; Mentor: Dr. Daniel Romo

*Department: Chemistry & Biochemistry*

The objective of Minipharma is: to expose undergraduates to the highly interdisciplinary and collaborative approach taken by the pharmaceutical industry toward drug development. The MiniPharma team is a semi-autonomous group of undergraduates focused on a common project involving organic synthesis of natural product-derived anticancer agents, biological assays of these derivatives, and computational modeling to assist with the design of derivatives to be synthesized. Currently, the Minipharma group is working with Agelastatin A.

#### **B66. Cruzain Inhibition by Thiosemicarbazone Compounds for Potential Therapeutic Use Against Chagas Disease**

Isaac Lill, Samuel O. Odutola, Erica N. Parker, Brett D. Harper; Mentors: Dr. Mary Lynn Trawick, Dr. Touradj Solouki, Dr. Kevin G. Pinney

*Department: Chemistry & Biochemistry*

Chagas disease, the result of infection by the parasite *Trypanosoma Cruzi*, is responsible for about 12,000 deaths per year worldwide and causes severe chronic illness for many more people. Treatment during the acute phase when the parasite is found in the blood is effective, but this phase may only last a few weeks and is often asymptomatic. There are currently no approved treatments that are effective in eliminating the parasite during the chronic phase after it has migrated into the tissues. One promising avenue of research into treatment of the chronic phase is the inhibition of cruzipain, a cysteine protease that is necessary for the parasite's survival and reproduction. This study, a collaborative work between the Trawick and Pinney groups, used cruzain, which is a recombinant form of cruzipain and is a cathepsin L like enzyme. Thiosemicarbazone compounds that had

previously been shown to be effective inhibitors of cathepsin L were tested against cruzain. Enzymatic activity of these thiosemicarbazone compounds was determined by using a fluorogenic enzyme assay to assess the cleavage of 7-amino-4-methylcoumarin (AMC) from the cruzain substrate Z-FR-AMC. Effective inhibitors with a low IC<sub>50</sub> were further tested to determine other kinetic parameters. Progress curves indicate that these compounds are time-dependent inhibitors of cruzain and merit further investigation into their potential for treating Chagas' disease.

### **B67. Molecular Design and Synthetic Progress Towards Chalcone and Benzophenone Analogs as Potential Inhibitors of Cathepsin L**

Tejas P. Joshi, Ricardo Francis; Faculty Mentors: Dr. Kevin G. Pinney, Dr. Mary Lynn Trawick

*Department: Chemistry & Biochemistry*

Cathepsin L is a member of the papain family of cysteine proteases that is upregulated in a variety of tumors. Secreted cathepsin L contributes to cancer cell metastasis through degradation of the extracellular matrix and thus serves as a promising target for anti-cancer therapies. Collaborative studies (Pinney and Trawick Research Groups, Baylor University) led to the discovery and advancement of a series of promising thiosemicarbazone-based inhibitors. Drawing inspiration from established inhibitors of cathepsin L and cruzipain, we have embarked on a synthetic program designed to expand functional group diversity and explore alternative warheads. Specifically, our studies center on the incorporation of epoxides, selenosemicarbazones, and nitriles as warheads designed to function as the electrophilic moiety within these inhibitors. Molecular frameworks under investigation include functionalized benzophenones and chalcones. Aspects of molecular design and synthetic progress towards these inhibitors of cathepsin L will be described.

### **B68. RhoA Pathway Proteins in Human Umbilical Vein Endothelial (HUVEC) Cells and 4T1 Mouse Breast Cancer Cells**

Max Hayashi, Emily A. Taylor, Tracy E. Strecker, Samuel O. Odutola; Mentors: Dr. Mary Lynn Trawick, Dr. Kevin G. Pinney;

*Department: Chemistry & Biochemistry*

Compounds that inhibit tubulin polymerization into microtubules interfere with microtubule dynamics. Microtubule dynamics are essential to cell processes such as intracellular vesicle trafficking, and cell division, proliferation, and migration. Such colchicine-site, tubulin binding compounds may potentially function as anti-cancer agents in two different ways: (1) specifically target established tumor neovasculature acting as vascular disrupting agents (VDAs), and (2) inhibit mitosis with resulting cellular cytotoxicity. As part of a collaborative project between Trawick and Pinney laboratories, the indole-based tubulin-binding compound OXi8006 and its phosphate prodrug OXi8007 were developed and investigated as VDAs and anti-mitotic agents. In the present study, a series (from HUVECs activated with growth factors, and from 4T1 mouse cancer cells) involved in cell signaling were evaluated by western blotting. Activated HUVECs were used as a model for the tumor endothelium, and 4T1 cells, a tumorigenic, mouse triple negative breast cancer cell line, were the cancer cells employed. Several proteins involved in the RhoA pathway which is activated by tubulin-binding VDAs were determined. In HUVECs, large amounts of cofilin, the filamentous actin disassembly protein were observed. Modest levels of GEF-H1, an intramolecular guanine nucleotide exchange factor were determined. To facilitate quantitation, a linearity test was carried out for GEF-H1, protein kinase B (Akt), phosphorylated cofilin and the housekeeping enzyme glyceraldehyde-3-phosphate dehydrogenase (GAPDH) to establish the relationship of the concentration (from 0.5-60 mg/mL cell lysate) to the luminescence signal for western blotting. Supported by a grant from URSA.

### **B69. Design and Synthesis of Benzosuberene Anticancer Agents**

Leah Eller, Haichan Niu; Faculty Mentor: Dr. Kevin Pinney

*Department: Chemistry & Biochemistry*

Benzosuberene-based inhibitors of tubulin polymerization have been identified as promising anticancer agents. A lead compound, KGP18, draws structural inspiration from the natural products colchicine and combretastatin A-4. Synthetic efforts directed towards a re-synthesis of KGP18 served the dual purpose of providing access to key intermediates useful for the synthesis of structural analogues.

### **B70. Na<sup>+</sup>/H<sup>+</sup> Exchange Regulates CHOP in Pulmonary Arterial Smooth Muscle Cells During Pulmonary Hypertension**

Micheal C. Munson; Faculty Mentors: Dr. Larissa Shimoda (Johns Hopkins School of Medicine), Dr. John C. Huetsch (Johns Hopkins Hospital), Dr. Bryan Shaw (Baylor University)

*Department: Chemistry & Biochemistry*

Vascular remodeling within the pulmonary arterioles is a key component of pulmonary arterial hypertension (PAH). In a rat model of severe PAH, the SU5416-Hypoxia (SuHx) model, pulmonary arterial smooth muscle cells (PASMCs) demonstrate a resistance to apoptosis and contribute to vascular remodeling. Na<sup>+</sup>/H<sup>+</sup> exchange (NHE) is increased in these PASMCs; however, few studies have elucidated the role of NHE in the signaling pathway responsible for apoptosis within these PASMCs. Previous studies have shown a link between NHE and extracellular receptor kinase 1/2 (ERK1/2). Other studies have linked ERK1/2 to the expression of CHOP, a critical mediator of apoptosis. Therefore, we tested the role of NHE on these components of the apoptotic pathway within PASMCs. PASMCs were isolated from distal pulmonary arteries from control rats and rats injected with SU5416 and exposed to 3 weeks of hypoxia followed by 2 weeks of normoxia. PASMCs were treated with pharmacologic inhibitors of NHE (EIPA) and ERK1/2 (PD98059) and controls were treated with the respective vehicles; protein was then isolated. Immunoblot analysis was performed to determine the effect of inhibiting NHE and ERK1/2 on CHOP protein levels. Inhibition of NHE reduced ERK1/2 phosphorylation/activation. Inhibiting either NHE or ERK1/2 upregulated CHOP. Our findings suggest that NHE plays an important role in regulating apoptosis signaling through ERK and CHOP in PAH PASMCs.

## **SESSION TWO: Wednesday, March 28<sup>th</sup> and Thursday, March 29<sup>th</sup> BAYLOR SCIENCES BUILDING – 1<sup>ST</sup> FLOOR**

### **COMMUNICATION SCIENCES AND DISORDERS C1-C3**

#### **C1. Verbal Learning in Veterans with Traumatic Brain Injury**

Katelyn Lucas; Faculty Mentors: Dr. Paul Fillmore, Dr. Geoffrey May, Dr. Evan Gordon, and Dr. Steven Nelson

*Department: Communication Sciences and Disorders*

Traumatic Brain Injury (TBI) is a common injury among returning veterans that could result in cognitive and language complications, including the ability for verbal learning. In attempting to increase one's verbal learning ability, the ROBI study, conducted at the Waco VA Center of Excellence, is a double-blind, sham-

controlled study utilizing of EEG neurofeedback. This poster is to present the effects of neurofeedback on language function. Participants completed 10 to 20 EEG neurofeedback treatment sessions along with a battery of test prior to and following treatment, including the California Verbal Learning Test-3 (CVLT-3). The CVLT-3 assesses the patient's ability to learn a verbally presented list of words, with recall tested immediately, at short-term delay, and at long-term delay. Results from both the intervention and sham-control groups were compared, to determine if the neurofeedback treatment was associated with increased verbal learning ability. The data presented here is the first phase in an on-going process of fine-tuning the neurofeedback protocol to better aid in the treatment of language-related symptoms in TBI.

## **C2. Inefficacy Problem in EEG Neurofeedback Training: Predicting Successful Treatment**

Kaitlin Jones; Faculty Mentors: Dr. Paul Fillmore, Dr. Geoffrey May, Dr. Evan Gordon, and Dr. Steven Nelson

*Department: Communication Sciences and Disorders*

EEG neurofeedback treatment (NFT) has proved useful in the rehabilitation and treatment of many disorders including PTSD, autism, epilepsy and ADHD, among others. However, multiple studies have shown the inability of some patients to respond to treatment. This highlights the importance of developing methods to assess individualized treatment response, and ways to better understand the factors that may lead to treatment inefficacy in some patients. This poster reviews the recent research on neurofeedback treatment, focusing on predictors for both successful and unsuccessful treatment outcomes. This literature is discussed in the context of an ongoing study conducted at the Waco VA's Center for Excellence in Research on Returning War Veterans, in which NFT is used to treat symptoms of traumatic brain injury and PTSD. By understanding the mechanisms of successful brain regulation through neurofeedback training and adapting treatment to each patient, significant changes in a patient's quality of life can be observed. Furthermore, increasing the efficacy of neurofeedback can have lasting implications for patients with cognitive disorders, through reducing symptoms, and enhancing overall intellectual and social performance.

## **C3. MRANATS: MAGNETIC RESONANCE-BASED ADAPTIVE NEUROANATOMY TEACHING SOFTWARE**

Matthew Parham; Mentor: Dr. Paul Fillmore

*Department: Biology*

The current work describes the creation of a software program (MrAnats: Magnetic Resonance-based Adaptive NeuroAnatomy Teaching Software) for teaching introductory neuroanatomy. With the advent of neuroimaging techniques such as magnetic resonance imaging (MRI), much has been learned about neuroanatomy and brain structure. However, many of these advances have occurred primarily in the realms of scientific research and clinical care, often without significant effect on the ways in which students learn about the brain. Currently most textbooks offer fairly simple, two-dimensional views of neuroanatomy and do not make use of modern three-dimensional visualization methods common in scientific applications. In addition, when studying neuroanatomy, there are many different sets of terminology and labels used, making it especially difficult for the new learner to see how the different organizational systems fit together. There is no widespread framework in use for comparing and contrasting these systems. Lastly, current research in learning theory has highlighted the inefficiency of some of the most popular methods of studying (e.g. highlighting, re-reading), and has suggested specific learning methods (e.g. iterative self-testing) that are the most effective use of students' time. The availability of tools to make use of these insights, however, is still lacking. Thus, we describe a program which: 1) Leverages high-resolution MRI scans to visualize neuroanatomy interactively in three dimensions, 2) Presents the common labeling systems for human brain structure and allows for explorative comparing and contrasting, and 3) Uses current best-practices in learning theory to help students learn about the brain efficiently.

## **JOURNALISM C4**

### **C4. Portraits of a people: the evolution of print perception of Latinos**

Pablo Gonzales; Faculty Mentor: Dr. Mia Moody-Ramirez

*Department: Journalism, Public Relations and New Media*

This study utilizes mental models and cultivation theory to look at print representations of Latinos. In spite of the popularity of digital media, print media is often the origin of news. Studies have researched stereotypes of Latinos, but there is a gap in the perceptions of Latinos as a result of the news that fuels these stereotypes. This content analysis of newspapers indicates that there are still stereotypes that are perpetuated by print media.

## **MANAGEMENT C5-C6**

### **C5. It Takes Two to Tango: Gender Dyad Composition in Negotiation**

Andres Umana and Larissa Garcia; Faculty Mentor: Dr. Sara Perry

*Department: Management*

We explore the role of gender dyad composition on negotiation emotions, behaviors, and outcomes. We find that male job candidates in a male-male dyad experience the highest excitement. When negotiating with a female HR representative, they experienced the least anxiety, exhibited the most competitive behaviors, and earned the highest salary outcomes.

### **C6. Hiring Language: An Exploratory Study**

Andres Umana, and Larissa Garcia; Faculty Mentor: Dr. Sara Perry

*Department: Management*

The purpose of this study is to analyze what cover letter language is most associated with being hired, and inversely, what language is most associated with not being hired. Resumes, cover letters, and interviews are universally required for most interviews and hiring decisions. Since each employs either written or spoken language, it is helpful to analyze what words are used and what outcomes said language categories are linked with. Research in the field of Industrial and Organizational Psychology is limited when it comes to utilizing language and finding benefits for employees and employers alike. Research has been on characteristics and fits once in the position of choice, but there has not been research on getting the position based on language use in supporting interview documents. These are preliminary analyses, but the implications could be quite constructive for people looking for employment, students, and for programs in higher-education designed to assist the student career search. The next phase is moving away from solely written components and utilizing the language used in verbal interviews by using LIWC for transcripts of recorded interviews. The findings will give a competitive edge to those who are looking to differentiate themselves from other candidates in job searches, graduate school, and beyond by implementing certain language categories more in their applications while avoiding other language categories.

## **ENGLISH C7**



# Poster Presentations

## Baylor Sciences Building

Session Two  
March 28-29, 2018

## **C7. Peacekeepers**

Diana Lee O'Quinn; Faculty Mentor: Dr. Ginger Hanchey

*Department: English*

My poster presentation will focus on the value of the United Nations throughout history and discuss whether the organization's purpose is being fulfilled today given the recent states of atrocity in Syria. I will elaborate on the founding of the United Nations, list its greatest achievements, and provide an in-depth investigation into the cases of sexual assault and exploitation that have plagued the organization, and as aforementioned discuss the shortcomings of the UN in Syria. The goal of my presentation is to bring awareness through research to the UN's most significant and underreported failures and operations in countries around the world and incite others to demand the UN hold itself more accountable.

## **ENVIRONMENTAL SCIENCE C8-C25**

### **C8. The Ketamine Epidemic and its Ecotoxicity in Aquatic Systems**

Kyle Wolfe; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Ketamine is a drug designed in the 1960s as a major pain killer, and it is widely used in the medical field. However, ketamine does have adverse effects in the form of mind-body dissociation and delirium. These side effects are being exploited by illicit drug users in order to experience hallucinogenic effects. Abuse of ketamine, especially in the southeastern region of Asia, is on the rise. Not only is the use of ketamine growing recreationally, but it is also being used at an increasing rate in hospitals. Whether from recreational users or patients in hospitals, the excrement they produce introduces ketamine, norketamine, and their metabolites into aquatic ecosystems where they can bioaccumulate. The purpose of this research is to examine existing literature and ascertain how the rising ketamine epidemic is affecting water quality and subsequently the health of aquatic organisms. One way that ketamine consumption is being quantified is by measuring the concentration of its metabolites in wastewater influent and extrapolating data to determine frequency of use for a given population. The fate of environmentally occurring ketamine has been examined extensively, specifically in aquatic systems that are irradiated by the sun. Through experimentation, it has been determined that phototransformation of ketamine and norketamine significantly reduces their concentrations in aquatic systems, but irradiated solutions exhibit greater toxicity in many organisms. However, overall ecotoxicological impacts of ketamine and substitutive metabolites on aquatic systems is currently unknown.

### **C9. Global jellyfish bloom: environmental, anthropogenic cause and consequences**

Zhiqi (Chris) Xu; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Jelly fish bloom is a natural phenomenon in the pelagic ecosystem, however, much like tropical storms and hurricane, the number of incidents is steadily rising, the scale of these incidents is getting larger, the incidents are taking place in more locations with more species of jellyfish involved. Many believe that these increases are positively correlated with anthropogenic influences on the ecosystem, such as over fishing which removes competing species, water warming due to thermal effluence from power plants, increased turbidity and hypoxia caused by eutrophication, and accidental introduction of invasive species. These changes are providing more favorable conditions for jellyfish, which is already highly adaptive and have a competitive edge over fish species. When jellyfish bloom gets out of control, it can have many direct and indirect negative effect on human enterprise such as fishery and powerplants, causing significant financial loss. Not to mention jellyfish's ability

to put itself in a self-enhancing cycle when competition pressure decreases, and possibly driving the marine ecosystems they occupy into a trophic dead end. In this presentation cases studies are compiled and analyzed from locations all over the world with diverse ecological and socioeconomical backgrounds and different level of severity. Some situations are already close to the point of no return and others that are just emerging.

## **C10. Microbeads from Personal Care Products in Wastewater and their Effect on Aquatic Ecosystems**

Yoomin Jo; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Wastewater treatment plants are a significant point source of microplastics in aquatic ecosystems in the United States. Microplastics –particularly microbeads –are often added as an abrasive to personal care products such as facial scrubs and exfoliants. However, once in the environment, they can cause serious ecological problems. Previous studies have shown that microbeads can cause physiological damage in aquatic organisms when ingested, leach contaminants such as monomers or additives, and cause sorption of chemicals, leading to an increased rate of bioaccumulation. The extensive contamination from microbeads has resulted in difficulty conducting large-scale cleanups, causing environmentalists to stress the reduction of plastic microbeads in products as the only effective solution. Following public support for the banning of plastic microbeads, several states in the United States have worked to create legislation to ban microbeads in personal care products. Despite these bans, microbead pollution continues to contaminate the environment. The aim of this poster is to follow the pathway of microbeads from municipal wastewater treatment to aquatic ecosystems and analyze their subsequent effects. Through extensive literature review, this study will explain current microbead pollution regulations and future solutions such as more rigorous wastewater treatment and consumer education.

## **C11. The Economic Feasibility of Reclaiming Brownfields in the U.S**

Nora Simpson; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

A brownfield is a property deemed hazardous due to the presence of a hazardous waste, pollutant, or contaminant produced by past use (EPA, 2017). Any expansion, redevelopment, or reuse of the land in question becomes complicated by the existence of a harmful substance (EPA, 2017). Across the United States, it is estimated that there are more than 450,000 brownfields spanning over 200,000 acres (Simons, 1998). It is assumed that there are even more brownfields sites that have gone unlisted thus far, mostly on residential properties (Simons, 1998). Although brownfields make up hundreds of thousands of acres in the United States, both public and private sectors are often hesitant to invest in properties that may pose threat to human health and demand very expensive and complex reclamation cleanups. While reclamation projects are complicated, reinvesting in brownfields properties increases local tax bases, facilitates job growth, utilizes existing infrastructure, relieves development pressures off undeveloped land, and both improves and protects the environment (Malloy, 2014). This project recognizes that land and water contamination are now almost universally acknowledged to be crucial social, ecological, economic, and political issues, and examines how different societies have attempted to design and implement public policies that address brownfields reclamation (Hula and Reese, 2016). The goals of this project include providing a global comparative perspective on brownfields policy and examples of its use in a variety of countries. Through literature searching and research conducted on the Global Environmental Leadership Programme in Hong Kong, China, it was determined that although the U.S. has implemented EPA's Brownfields Reclamation program, there is much left to be done. While the U.S. has more developed brownfields policies than China, several European countries (Netherlands, France, Italy, United Kingdom) adopted advanced brownfields policies decades ago. The U.S. provides tax incentives for brownfields cleanup, however many states and cities are hesitant to incorporate reclaimed brownfields sites into their urban planning strategies. This project will explore why brownfields have a negative connotation,

economic advantages and disadvantages of reclaiming brownfield areas for urban development, and examine international policies surrounding the brownfields issue.

### **C12. Overfishing: A Major Impact of Marine Ecosystems**

Lauren Medlin; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Overfishing has been a major concern for populations of marine species that are heavily exploited for commercial purposes. Currently, there is dramatic decrease in marine species because of industrial fisheries and the need to meet consumers' demands. The fishing industry's technology (vacuums, larger nets, etc.) has progress to help catch fish in abundance. Estimates of maximum sustainable yield are 100 million tons of fish per year, and in 2008 the Food and Agriculture Organization of the United Nations estimated that there were 99 million tons of wild catch per year (Gershwin & Earle, 2014). Negative consequences result from increased of fishing of marine species without allowing the species to recover, and overfishing a species can adversely impact the environment. Some consequences: overfishing a species can decrease the size of fish and create less diversity in a species, remove predators and competitors of smaller marine species, and increase in smaller marine species populations that are relieved from the pressure of predation and competition. Jellyfish are prime examples of a species that increase their populations from the result of overfishing. An evaluation of 45 ecosystems found that increased brought a concomitant 62 percent increase of jellyfish populations in these ecosystems (Ross, 2013). Industrial fishing has made a major impacted in marine ecosystems, as the intensity of fishing increases, 85 percent of the marine species populations are removed each year (World Wildlife Fund, 2017).

### **C13. An Analysis into The Effects of Conservation Efforts of the Demerara Forest in South America**

Saskia Henery; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

The Upper Demerara Forest is of ecological importance in Guyana, South America. Over the last few decades, the forest has been degraded for the purposes of logging, mining, and overall global climate change. The deterioration of the land has put a stress on every species that inhabits the forest, including the Carib tribe of people that are native to the land. Deforestation has caused large levels of carbon to be emitted into the atmosphere, rapid decline in species, and has severely altered the way of life for the Carib society. Conservation efforts are still being debated due to the overall lack of knowledge on the multiple species in the forest, the lack of government involvement, and the rise in logging and mining practices. In the past there have been a number of conservation efforts that have seen a progression of protection but have failed based on numerous levels of conservation needs. This project will examine the efforts that have been put into place, how they have failed to successfully integrate into the system, and what can be done to ensure the prosperity of long term goals.

### **C14. Landfill Zoning/ Management and the Effects on Water Quality**

Jackson Bollinger; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

With a growing world population, landfills seem to be filling up faster than ever; therefore, municipalities, cities, and towns have to coordinate new ways to deal with this mess. As a result, there are certain considerations taken to ensure the well-being of the people and the surrounding habitats. One of the primary concerns with new landfills is often the smell, sight and water quality. Engineers attempt take necessary precautions to ensure that the people and the environment are protected. However, there are many significant effects on groundwater that is caused by the landfills and the leachate that comes from them. Engineers and landfill developers continue to try and make better catchment systems for the water but even these systems are not guaranteed. In my research I was able to see improvements made through landfill development as technologies

have advanced. However, these are still issues that exist and have effects on groundwater, which are most noticeably seen in lesser-developed countries. As a result, there should be continued efforts to create and maintain the cleanest landfills we properly can to make individual societies more sustainable for the long term. There must also be necessary measures to clean this wastewater that comes from these leachate systems, so it can go back into the communal supply wither in a potable or drinkable quality.

### **C15. The Effects of the Opioid Crisis on Marine Life**

Brianna Jackson; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

This project examines the negative effects of prescription drugs on marine life populations. The objective is to illustrate the current environmental dangers posed by the opioid epidemic that has been growing rapidly in recent years. By examining the main active ingredients in prescription drugs as well as their metabolite I will illustrate how these compounds are affecting the brains and development of marine life. These compounds which are excreted from the body in waste makes it through the water treatment system and find their way into main water sources. Because of this, I will also be examining the way wastewater is treated and examine ways to decrease the output of these harmful compounds into main water sources. In contrast, I will use the data collected to predict the future effects if measurements aren't taken to slow down the pollution of the marine habitats.

### **C16. Reservoir Management in Hong Kong: Regulation, Use, and Recreational**

#### **Possibility**

Dakota Bellow; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Under the Waterworks Ordinance (Cap 102) of 1938, the Water Supplies Department of Hong Kong is responsible for controlling activities at the 17 local impounding reservoirs. Many of these reservoirs are located within pristine country parks and public lands. However, public access to the reservoirs is limited. While the primary function of Hong Kong reservoirs is public potable water supply, this aim does not require the exclusion of recreational activities. A Leisure and Recreation Study conducted in 1998 raised the possibility of such recreation; however, safety concerns such as contamination, steep banks, strong currents, and the need for additional maintenance were also cited. Thus, the Water Supplies Department continues to limit public access and recreational use in local reservoirs. Using information gathered through a review of literature and policy, the purpose of this poster is to outline the current regulation, use,

and potential future uses of reservoirs in Hong Kong with regard to both recreation and potable water supply.

### **C17. Health impacts of Urban air pollution in the Northeastern United States, with consideration for long range transport.**

Scott Biebas; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Urban pollution can adversely affect human health. It is most prevalent in heavily urbanized areas like New York city, Philadelphia, and other East coast cities in the united states. NOx pollution can be attributed to point and mobile sources, regarding eastern metropolitan areas it could potentially connect or spread between cities that lie close together. Using EPA and local air monitoring data the prevalence of each cities pollution will be measured and using wind patterns it spread will also be determined, this determination help determine the

amount of health-related issue that pollution can cause. Nearby national forest on the eastern side of the Appalachian Mountains will be used as references data for populations less affected by these problems.

### **C18. Environmental Injustice: The Threat of Lead Poisoning**

Sarah Williamson; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

Childhood lead poisoning is the #1 environmental contaminant disease in the country, and not many are aware of this. Lead is a potent neurotoxin, causing decreased intellectual capacity, neurological damage, and cardiovascular disease, amongst other problems. Children are the most vulnerable to lead poisoning because lead can affect nearly every system in a young developing body, particularly the brain and nervous system, with devastating and sometimes permanent health consequences. The presence of lead in children lowers I.Q. by an estimated 4-7 points for each increase of 10  $\mu\text{g}/\text{dL}$  within the blood. Lead pollution can be a result of mining, smelting, manufacturing, and just pure negligence; however, drinking water contaminated with lead is the main source of lead poisoning. While lead poisoning crosses all socioeconomic, geographic, and racial boundaries, the burden of this disease falls disproportionately on low-income families and families living in older, poorly maintained housing. These families are subjected to disproportionate exposure to pollutants and the denial of access to sources of ecological benefits such as clean air, water, and natural resources. There is data demonstrating that children who typically live in older housing in low-income, predominately minority communities are poisoned at rates much higher than the national average. African-American children are at two times greater risk than their white peers to develop the disease. Through literature, levels in African-American children are still greater than their white counterpart even though there is data to support decline in lead poisoning prevalence throughout the U.S.

### **C19. Preliminary Results of Residential Curbside Residual Lead in West Dallas, TX**

Liana DeNino, Grace Hutchinson, Julia Frandesen-DeLoach, Jonah Salazar, Clark Coneby; Faculty Mentor: Dr. Trey Brown

*Department: Environmental Science*

In 1984 a lead smelter site in West Dallas, near downtown Dallas, Texas, was shut down after fifty years of operation. The site was subsequently placed on the Environmental Protection Agency's (EPA) National Priorities List due to lead (Pb) contamination of the surrounding area. Affordable housing was constructed near the site, however, many original residential neighborhoods remained (EPA 2016). In 2012 the Dallas Morning News and Baylor University, became aware of the presence of waste materials in residents' yards and formed a partnership to begin an investigation of residual Pb contamination in the area. It was discovered that battery-casing chips from the smelter had been given to residents to be used as fill material (Martyn 2015). Although there are no records of where these chips were dumped, they have been found throughout West Dallas (Wigglesworth 2012). This led to concerns that soils contaminated by Pb emissions might still remain in the surrounding area. Our initial investigation presented here includes a survey of soil Pb concentrations near residential homes that will eventually complete an evaluation of urban Pb contamination throughout West Dallas. Once all of the data is collected it will be used to construct a geospatial map of soil Pb concentrations across West Dallas. This data will then be cross-referenced with available blood Pb concentrations that have been collected by the Texas Department of State Health Services over the last ten years to assess the potential risk of exposure of the children of West Dallas to Pb contaminated soils.

### **C20. Probabilistic Hazard Assessment of Cleaning Product Ingredients in the Use Category of All Purpose Cleaners**

Dan Dinh; Faculty Mentor: Dr. Bryan Brooks

*Department: Environmental Science*

Though all-purpose cleaners are routinely used for household and industrial applications, empirical mammalian toxicology information is often limited for its chemical ingredients. This inherently presents challenges to environmental health practitioners performing hazard and risk assessments. Probabilistic hazard assessments using chemical toxicity distributions (CTDs) offer an alternative approach for chemical assessments when toxicity information is lacking. The CTD concept allows for derivation of toxicological thresholds of concern (TTCs) to predict adverse effect thresholds for mammalian species, including humans. Therefore, we systematically examined the acute median lethal dose (LD<sub>50</sub>), and reproductive/developmental no-observed-adverse-effect level (NOAEL) and lowest-observed-adverse-effect level (LOAEL) values for the rat model (oral) from the Cleaning Product Ingredient Safety Initiative database. Probabilistic distributions, including product type-specific and chemical category-specific, were subsequently constructed using data from multiple study durations for all available ingredients in all-purpose cleaners for analysis and comparison. For each CTD, threshold concentrations (TCs) and their 95% confidence intervals (CIs) at multiple percentiles were calculated using the log-normal model. To test whether the incorporation of the common default uncertainty factor (UF) approach (i.e., 10-fold values) in mammalian health risk assessment sufficiently acknowledges its underlying ambiguity, we also derived UFs for acute (LD<sub>50</sub>S)-to-chronic (reproductive/developmental NOAELs) ratios (ACRs) and subacute reproductive/developmental LOAEL-to-NOAEL ratios. This novel analysis is particularly useful for practitioners when identifying TTCs for ingredients in all-purpose cleaning products and other chemical classes. This approach can also support regulatory data dossier development (e.g., read across) and screening-level health risk assessments when limited or no empirical toxicity information exists for specific chemicals.

### **C21. The biological effects of manganese ions on dopaminergic cells: Are the effects protective or toxic?**

Sahar Pradhan, Henry Lujan; Faculty Mentor: Dr. Christie M. Sayes

*Department: Environmental Science*

Elemental manganese is known to catalyze neurologically-based biological effects. Manganese (II) ions (Mg<sup>+2</sup>) function as cofactors for a large variety of enzymes with many functions, such

as detoxification and reduction of oxidative stress. However, engineered manganese particulates (such as nanoparticles, MnNPs) has been implicated with neurodegeneration and manifestation to Parkinsonian symptoms or disease (PD). This project examines the protective and toxic dose-response effects of manganese exposure and is presented in two-phases. First, the publicly available peer-reviewed literature investigating manganese particle-induced neurotoxicity is reviewed. Second, a new experimental design to test the progression of cofactor activation versus neurodegeneration is presented. The results are novel and will help delineate biomarkers of exposure to particulate or ionic manganese (i.e. zero-valent manganese nanoparticles versus manganese phosphate salt). The major differences between the two material-types will be the route of exposure and toxicokinetic characteristics. We hypothesize that in either form, Mn<sup>+2</sup> ions leach from the parent material, however the two forms will preferentially accumulate in different areas and dissociate at different rates and different concentrations. Ingestion (through food and food supplements) is the main route of exposure for ions, while inhalation (through occupational settings) is the main route for nanoparticles. Results show that exposure to MnNPs mimic chronic neurodegenerative loss of dopaminergic cells as seen with PD. The impact of this study is based on understanding the adverse neurological health effects of advanced materials, such as MnNPs, to improve risk and safety assessments for consumers, workers, and the environment.

### **C22. Data Informatics and Proteomics: Multi-Variant Visualization of the Gold Nanoparticle Protein Corona**

Madison Stewart, Marina R. Mulenos; Faculty Mentor: Dr. Christie Sayes

*Department: Environmental Science*

Gold nanoparticles (AuNPs) utilized in pharmaceutical treatments can target specific tissue sites and travel through cell membranes for drug delivery. However, when particles are suspended in physiological fluids, a protein corona cloud forms around its surface, providing either a therapeutic or toxicological effect. The successful utilization of AuNPs in pharmaceutical treatments relies on a comprehensive understanding of the protein corona composition. Through mass spectrometry, the identity of proteins in the corona are elucidated, yielding large data sets. With such high-output analyses, these large datasets pose a challenge when visualizing proteomic information. Thus, the creation of a streamlined visualization method that is useful to a variety of scientific fields, such as chemists, biologists, and computer scientists, is necessary. In this study, we use heat maps, pie and bar charts, tables, cluster analytics, and three-dimensional regression tools to display data informatics about the protein corona characteristics in a simplistic, yet sophisticated manner for scientists and non-scientists to review.

### **C23. Physicochemical Features of the Gold Nanoparticle-Protein Corona: Using Analytical Methods to Detect and Identify Proteins**

Andreanna Burman; Faculty Mentor: Dr. Christie M. Sayes

*Department: Environmental Science*

Nanoparticles are of increasing significance in drug research and development efforts, especially in the area of personalized medicine. In this medicine, nanoparticles have been shown to carry precise doses of specific drugs to a targeted, diseased, location of the body. However, drug products containing nanoparticles with 30 nm diameters can easily translocate through biological membranes such as the blood-brain barrier, intestines, nasal membranes, skin, and mucosal membranes. Upon entering a biological system, proteins readily adsorb onto and desorb from the surface of the nanomaterial. This cloud of adsorbed proteins is known as the 'protein corona' and is postulated to critically alter either the nanoparticle's therapeutic or toxicological effects. In order to understand the protein corona, detection and identification of the proteins that make up the corona is necessary. In this study, time-resolved methods were developed to observe nanoparticle-protein interactions among three different serum sources (fetal bovine, equine, and canine) and three different gold nanoparticle coatings (carboxylate, poly-ethylene glycol, and amine-terminated functional groups). Results show that each of the serum types used in this study formed different protein corona constructs. Corona variations include its thickness, surface charge, density, and protein composition. Furthermore, the three specific nanoparticle-types in this study responded differently to protein corona formation. The carboxylate-coated particles formed the largest corona shell and amine-coated particles were inconsistent in corona formation. These results prove that control over protein corona formation is possible, thus protein corona engineering holds promise as a powerful technique to employ for idiosyncratic therapeutic responses.

### **C24. Microplastic Pollution in an Urban Runoff-Fed Stream in Texas, USA. A Comparison Between Habitat Types Above Treated Wastewater Effluents**

Hannah Dye, Jasmine Stovall; Faculty Mentor: Dr. Susan Bratton

*Department: Environmental Science*

Microplastics are polymer-based particles ranging in size from 50um to 5mm and may be found in the form of microbeads, fibers, or fragments. The ubiquitous presence of microplastics throughout freshwater and marine ecosystems is of environmental concern as they can be ingested by aquatic life and transport waterborne contaminants. Although the presence of microplastics as a global aquatic pollutant has been confirmed, few studies have been published regarding microplastic pollution levels in freshwater systems, specifically on the small watershed scale. The purpose of this experiment is to assess microplastic pollution above local point-source wastewater effluents in the highly urban, run-off fed Waco Creek (Waco, TX) and determine whether differences in microplastic pollution levels exist between micro-habitats and water type. The five micro-habitat types examined were riffle, pool, cut bank, deposition bend, and debris. Each micro-habitat was further categorized into two water types: running water (riffle and cut bank), and still water (pool, deposition bend, and de-



bris). A total of 162 surface water samples, each 800mL in volume, were collected at six sites along the stream gradient from five micro-habitat types at each site. Samples were filtered through a 53um mesh, visually analyzed for the presence of microplastics via microscopy, and characterized by size, color, and form. Overall, there was no significant difference in total microplastics between micro-habitat type ( $p=0.413$ ) or water type ( $p=0.079$ ) across sample sites. Our findings suggest ubiquitous surface transport and widespread microplastic pollution via runoff throughout Waco Creek's small urban watershed.

## **C25. Rising Levels of Microplastic Pollution in Hong Kong Estuaries**

Jessica Bateman; Faculty Mentor: Dr. George Cobb

*Department: Environmental Science*

In the past several years, scientists have noticed an alarming increase in microplastic pollution levels among estuaries in Hong Kong, such as the Pearl River. Microplastics present numerous dangers to aquatic environments through ingestion by marine organisms, causing bioaccumulation of toxins such as dichloro-diphenyl-trichloroethane (DDT) as well as reproductive issues and ecosystem disturbances. In the Pearl River estuary, recent studies have found the total abundance of microplastics to be higher than national averages, revealing Hong Kong as a hotspot for plastic pollution (Cheung & Fok, 2015). As a result, it is important for researchers to work toward finding efficient and cost-effective methods to mitigate these issues. This project will serve primarily to evaluate these methods and educate on the implications of microplastic pollution. Evaluation will be accomplished by reviewing case studies and published articles focused on the accumulation of microplastics in Hong Kong estuaries, such as Pearl River. Upon completion of reviewing these conclusions, findings are expected to reveal the primary sources of microplastic pollution in Hong Kong estuaries, as well as to describe optimal methods in management.

### References

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## **PSYCHOLOGY AND NEUROSCIENCE C26-C50**

### **C26. Associations between Religiosity, Political Ideology, and Attitudes toward Immigrants**

Larissa Garcia, Anonymous; Faculty Mentor: Dr. Wade Rowatt

*Department: Psychology & Neuroscience*

Of the 65.6 million immigrants, more than a third are considered refugees—immigrants who are unable to return to their home-country because of persecution (UNHCR, 2017). Many of these refugees experience prejudice in the countries where they are seeking asylum, including the U.S. At present, immigration is one of the most debated, politically charged topics in America. Two studies explored if (liberal) political ideology mediates the relationship between religiosity/religious fundamentalism (RF) and (negative) attitudes toward immigrants. Students from a private, Christian university completed self-report measures of religiosity, RF, political ideology, and realistic and symbolic threats posed by immigrants. Results show a small relationship between religiosity/RF and negative attitudes toward immigrants. Religiosity also has an indirect relationship with attitudes toward immigrants through political ideology; however, when political ideology is controlled, the relationships become non-significant. These results reemphasize the part that political ideology plays in the relationship between religiosity and immigration attitudes.

### **C27. Effects of Traumatic Brain Injury on Cortical Myelin Content**

Habib Abla, Dr. Evan Gordon, Dr. Steven Nelson; Mentors: Dr. Richard Sanker

*Department: Psychology & Neuroscience*

Traumatic Brain Injuries (TBIs) are thought to impair brain function by diffuse axonal injury, where neural axons are severed and de-myelinated, which can result in various long-term cognitive deficits. Numerous studies have demonstrated TBIs affect myelin in the brain's deep white matter, but whether similar effects occur in the cortex is unknown. Cortical myelin content can be assessed via T1-weighted (T1w) and T2-weighted (T2w) Magnetic Resonance Imaging (MRI). We collected T1w and T2w MRIs from 19 Veterans to assess TBI effects on cortical myelin content. The ratio of T1w/T2w images was used to identify the density of myelin within the segmented cortical ribbon. In each subject, we assessed the number of lifetime TBIs suffered, and the severity of the worst lifetime TBI, using the Ohio State and Vasterling TBI-identification questionnaires. We then evaluated effects of TBI number and severity on cortical myelin content by conducting correlations and one-way ANOVAs at each cortical point. We found that increased TBI number was associated with lower cortical myelin content in superior frontal gyrus. Additionally, severity of the worst lifetime TBI affected cortical myelin content in superior parietal cortex. These findings indicate that effects of TBI on neural myelination are not restricted to the brain's deep white matter, but are present in the cortex itself. This result improves our understanding of neurobiological substrates affected by TBI, can help explain how TBIs affect cognition, and may be useful in future imaging-based diagnostic tests for TBI.

### **C28. Does Mozart Make Memories? An Experimental Test of Targeted Memory Reactivation During Slow Wave Sleep**

Mary High, Taylor Luster, Daniel Zeter, Chenlu Gao, Stacy Nguyen; Faculty Mentor: Dr. Michael Scullin

*Department: Psychology & Neuroscience*

Memory encoding, processing, and consolidation occurs during sleep, particularly slow-wave sleep (SWS; Stickgold, 2005; Walker, 2009). An exciting approach for demonstrating sleep-dependent memory consolidation is the targeted memory reactivation procedure. During learning, a sensory stimulus (e.g., sounds) is presented with the memory task; if those sounds are re-presented during SWS, then next-day memory performance improves (e.g., Rasch, Buchel, Gais, & Born, 2007; Rudoy et al., 2009). The effectiveness of targeted memory reactivation in the laboratory spurs the question whether targeted memory reactivation can help students better prepare for tests. However, previous research has used only simple memory tests (e.g., word lists) and simple sensory stimuli (individual sounds). We recruited 50 healthy undergraduate students to participate in a two-night, laboratory-controlled polysomnography sleep study. On Night 1, we experimentally tested whether listening to popular lyrical music before bed impairs sleep quality. On Night 2, participants took an economics lecture while listening to classical music. When participants entered SWS, we either played white noise (control group) or classical music (experimental group). The next morning, participants took an economics test. If targeted memory reactivation is possible with complex materials (economics) and complex stimuli (classical music), then participants who listened to classical music during SWS will show higher performance on the economics test. The current work will thus shed new light on the popular notion that listening to classical music makes students more intelligent; or, in other words, that Mozart makes memories.

### **C29. Wonder Women: Evidence of the 'Second Shift' Emerge in Household-Labor Disparities of Working Women's To-Do Lists**

Mary V. High, Stacy T. Nguyen, Chenlu Gao; Faculty Mentor: Dr. Michael K. Scullin

*Department: Psychology & Neuroscience*

Despite the increase in women's presence in the workforce, many traditional gender roles at home remain the same. For example, some men are reluctant to perform household tasks that are stereotypically considered to be feminine (Bittman, England, Sayer, Folbre, & Matheson, 2003). Yet, there remains little consensus as to whether a) males recognize this household-labor disparity (or if it is perceived primarily by females), b) whether household-labor discrepancies are limited to married couples (or is observed in dating relationships), and c) whether household-labor discrepancies manifest in same-sex relationships (Bianchi & Milkie, 2010). To

advance the literature, we asked males and females who were recruited via Amazon Mechanical Turk (N = 205), to write their to-do lists and estimate the total number of to-do list items they and their significant other typically have for one week (separated across household, workplace, social, and healthcare to-list items). We found that both male and female participants recognized the household-labor gender disparity (i.e., that females had more household and health/personal-care to-do items than the males). Interestingly, the household-labor gender disparity was only observed in married couples. Furthermore, we did not observe evidence for household-labor discrepancies in participants who were in same-sex relationships. Therefore, despite increasing demands on women in the workplace, our findings demonstrate that substantial gender stereotypes for household-labor persist in heterosexual married couples.

### **C30. A Meta-Analysis of Sleep in Caregivers: Implications for Cognitive Decline**

Nikita Chapagain, Chenlu Gao, Zach Pranske; Faculty Mentor: Dr. Michael K. Scullin

*Department: Psychology & Neuroscience*

Caregiving may have negative consequences for the individual providing care (typically, the spouse). For example, spousal caregivers of dementia patients show decreased cognitive functioning (relative to non-caregivers) that is concomitant with the level of caregiving burden. One possibility is that cognitive impairments in caregivers could be due to impaired sleep quantity or quality. To determine whether, and how, sleep is impaired in caregivers we conducted a meta-analysis. Cohort studies using self-report or objective sleep measures in dementia caregivers were eligible. We identified 33 eligible studies using the Pubmed and Scopus databases. We compared caregivers' sleep quality and quantity with age-matched control groups to quantify the impact of caregiving. The results showed that while sleep quantity was not different between dementia caregivers and healthy adults, caregiving had a medium size effect on lowering sleep quality (Cohen's  $d = 0.28$ , 95% CI [0.22, 0.35]). Our findings suggest that caregivers may experience greater difficulty falling asleep, sleep fragmentation, or altered sleep physiology. Sleep quality should be considered in clinical guidelines for caregivers and future research should investigate whether correcting for sleep disturbances in caregivers promotes better cognition and overall health.

### **C31. Gender Moderates the Relationship Between Sleep and Performance on Educational Learning Outcomes**

Taylor Terlizzese, Chenlu Gao; Faculty Mentor: Dr. Michael Scullin

*Department: Psychology & Neuroscience*

Good sleep hygiene practices are theorized to promote educational learning. Most existing work argues that sleep quantity (7-9 hours of sleep daily) is important to memory and cognition, but there is now emerging evidence that keeping a consistent sleep schedule is just as crucial (King et al., 2017; Phillips et al., 2017). Furthermore, data from retrospective analyses suggest that poor sleep quantity/consistency affects female students more than male students (Smarr, 2015). We utilized ecologically-valid educational learning tasks to investigate whether sleep quantity and variability were associated with retention of lecture materials as well as higher-order concept integration in male and female college students. One hundred and nine undergraduate students (M=19.53 years, SD=1.52; 77 females) completed two experimental sessions. During session 1, participants completed a virtual Economics lecture (supply and demand concepts). Across the following week, we tracked sleep quantity and consistency using wristband actigraphy. During session 2, participants completed an Economics test that included basic questions that they were taught to solve during the lecture and integration questions that required application of supply and demand concepts. Sleep quantity positively predicted performance on basic questions in female students ( $r = .28$ ,  $p = .02$ ), but not in male students ( $r = .05$ ,  $p = .79$ ). Possible neurobiological mechanisms for sleep loss affecting females more than males include differences in reactivity to stress as well as differences in slow wave activity. Future research should investigate relationships in stress and sleep stages, along with other cognitive domains to assess the scope of gender differences.

### **C32. Firsthand Experience Increases Skepticism Toward Eyewitness Testimony**

Megha Rawat, Arish Bheraiya, Audrey Dodds, Bethany Gray, Blake Cordova, Courtney Lyons, David Gresch, Jazmin Ramos, Sydney Gresham, Brittany Nesbitt, Courtney Kurinec; Faculty Mentor: Dr. Charles Weaver

*Department: Psychology & Neuroscience*

Our research stems from work by Jacoby and Kelly (1987), which found that individuals that completed anagram word problems subsequently rated the task as more difficult for someone else to solve, as compared to individuals that were simply given the correct answers. We hypothesized that jurors experiencing eyewitness identification firsthand would become more critical of others' eyewitness testimony. We recruited 213 undergraduate students to act as mock jurors in a fictional armed robbery case. After reading a case summary including the testimony of an eyewitness, subjects were presented with one piece of additional information related to memory: expert testimony, jury instructions, or firsthand eyewitness experience. Participants in the "experience" condition watched a video of an unrelated crime before identifying the perpetrator of the crime from a six-photo line-up and rating the difficulty of their identification experience. All participants then rendered a verdict in the case and rated the credibility of the eyewitness. Subjects reporting increased skepticism toward the eyewitness testimony were more likely to render not guilty verdicts, and there were no differences in skepticism ratings across conditions, suggesting that experience as an eyewitness may be comparable in effect to more commonly used methods for educating jurors about eyewitness memory. Additionally, lineup difficulty was negatively related to verdicts in that subjects were more likely to render a not guilty verdict if they found the identification process to be more challenging. These findings may have important implications for future courtroom practices when eyewitness testimony is presented as evidence in a case.

### **C33. Policewomen Perceived Equally Competent but Warmer than Policemen**

Tierra Carter, Courtney Kurinec; Faculty Mentor: Dr. Charles Weaver

*Department: Psychology & Neuroscience*

Women in policing continue to experience greater challenges to succeed than their male counterparts. Research has found that female officers are consistently considered lower status and lower competence than their male partners by their same- or different-gender partners (Gerber 1996). We explored how the public perceives these differences in officers' competence and warmth by using the Behaviors from Intergroup Affect and Stereotypes model. In this model, people view individuals in ambivalent groups, such as women in traditionally male roles, as high competency but low warmth. Additionally, high competency individuals elicit envy or admiration if they are also low or high warmth, respectively. We hypothesized that female officers would fall into this ambivalent group and elicit feelings of envy. We also hypothesized that female officers would receive higher warmth and lower competence ratings than their male counterparts. As expected, people saw policewomen as more competent than warm, and viewed them as higher in warmth than male police officers. Contrary to our expectations, female police officers received higher ratings of admiration than envy. Also, people perceived policewomen and policemen as having similar ratings of competence. Policewomen were perceived as both high competence and high warmth, eliciting feelings of admiration rather than envy from the public. These findings hint that the public's perception of policewomen is more positive than that within the force.

### **C34. Brain-based sex difference reporting influences gender role endorsement**

Elysse M. Reyes, Tierra Carter, Gabrielle Fowler, Isabella Sanchez, Rachel Sangster, Ann Iftikhar, Courtney A. Kurinec, Suzanne O. Nolan; Faculty Mentor: Dr. Charles A. Weaver III

*Department: Psychology & Neuroscience*

Reading media reporting on neuroscience findings that promote or discount meaningful sex differences may influence not only people's endorsement of gender stereotypes, but also their decision-making. We examined

how neuroscience reporting on sex differences affects people's endorsement of gender stereotypes and willingness to hire male or female candidates for a managerial position. One hundred sixty-two undergraduates from Baylor University read one of three neuroscience articles (Article slant: Innate Differences vs. No Meaningful Differences vs. Control) in a seemingly unrelated memory experiment before reviewing an applicant's resume (Gender of applicant: Male vs. Female). Participants then completed a hiring questionnaire and the Gender Role Stereotypes Scale. To explore possible factors that can moderate this effect, participants also completed measures of sexist beliefs, traditionalism, and political ideology. Article slant did not affect participants hiring decisions, but participants who reviewed the male applicant were more likely to endorse traditional gender roles after reading the Innate Differences article. Additionally, the female candidate received higher evaluations than the male candidate; however, this effect was only significant for male participants, possibly reflecting prejudice suppression and overcompensation in reaction to the articles. Sexist beliefs, traditionalism, political position, and participant gender were all significant covariates of gender role endorsement. These findings suggest that current, often oversimplified neuroscience reporting may exacerbate implicit biases about gender roles.

### **C35. Physiological, Psychological, and Performance Based Correlates of Gratitude**

Sammitha Cheruvu, Kaitlyn Petersen, Nnaema Ukabiala, Sally Norton, Summer Nguyen, Samantha White, Kaiya Huff-Hughes; Faculty Mentors: Dr. Annie T. Ginty, Dr. Jo-Ann C. Tsang

*Department: Psychology & Neuroscience*

Prior research has shown that gratitude may have beneficial physiological effects. It has also been proposed that gratitude may influence performance and effort on tasks in which the participant can gain material value. There has been scant research examining the benefits of gratitude on psychological, physiological and task performance on tasks in which participants can gain monetary rewards. Additionally, research has not yet examined whether gratitude can have negative effects on performance. The aim of the current study is to examine the impact of gratitude on psychological and physiological responses and performance to a challenging task in which participants can earn monetary rewards. Gratitude was experimentally induced via a resource distribution task by increasing the amount of tickets distributed to the participant, which can then be used to win prizes. Heart rate and blood pressure was measured continuously at rest, in response to gratitude, and during the task. To date, 48 participants have been tested. Though no difference in performance has been observed thus far, there is a trend for participants receiving gratitude to have lower heart rate responses to stress. This is a preliminary study in which data is still being collected.

### **C36. Does Police Use of Force Affect Calls for Service?**

Kathleen DiBacco, Gabriele N. Atripaldi, Amanda Wright; Faculty Mentor: Dr. Karenn Malavanti

*Department: Psychology & Neuroscience*

We investigated the use of force from police officers on subsequent citizen calls on suspicious persons in their community. There are higher use of force reported during domestic/disturbance calls (Macdonald et al., 2003). Additionally, when observers are present there are higher magnitude of use of force by police officers which is labeled the observer effect (Spano, 2006). Citizens and police officers have different expectations of how the other should act and focus on different aspects of the interaction. This leads to resistance and use of force (Rojek, Alpert, and Smith, 2010). Using data sets from the Police Data Initiative, we examined data from the Cincinnati, OH Police Department on officer use of force and their calls to service. Cincinnati has 297 thousand residents in fifty neighborhoods and five districts. Neighborhoods with high crime rates have higher reports of use of force by police officers (Lee, Vaughn, & Lim, 2014). We assessed the relationship between officer use of force and community calls on suspicious persons in relationship to individual differences between city districts. Using a one-way ANOVA, we found a significant effect of more use of force in districts 3-5. These findings show that the Cincinnati Police Department should take care in their future practices to increase training for officers and to evaluate their methods of force. Recommendations include training police officer to

withhold unnecessary use of force and increased manpower in districts 3, 4, and 5 to improve citizen/police relationships.

### **C37. Influence of Knowledge and Opinions on Alternative Justice in the United States**

Courtney Lyons, Rachel Bull; Faculty Mentor: Dr. Karena Malavanti

*Department: Psychology & Neuroscience*

The United States has one of the highest incarcerated populations and uses a punitive approach to criminal justice. However, this approach has drawn controversial attention due to wrongful convictions, and opinions regarding this type of system may be changing. We sought to determine current opinions on two possible alternatives to traditional justice: restorative justice and mental health courts (MHCs). Restorative justice is a more humane approach to reintegration following incarceration and has shown to be more economical while also promoting increased social harmony for both the offender and the community (Ahlin et al., 2015). Mental health courts are intended to provide mental health services to individuals that commit crimes due to their mental illness, as well as reduce recidivism by targeting criminogenic risk factors (Bonfine, Ritter, & Munetz, 2016). Many people are unaware of the benefits of rehabilitation and reintegration in the community. Previous research has shown that increased knowledge about the criminal justice system tends to have an impact on opinions, leading us to also examine the relationship between relevant education and opinions on alternative justice. Given the evidence of changing attitudes toward other criminal justice topics, gauging public opinion on restorative justice can be a valuable tool (Mandrachia, 2013). Using an undergraduate sample and a more representative sample from Amazon MTurk, we hypothesized that we would find a relationship between more positive attitudes toward alternative justice approaches and increased education. This has important implications for policy, as public opinion is an important determinant of public policy.

### **C38. Applied Statistical Analysis and Community Outreach: Reducing Euthanasia Rates in the City of Waco Animal Shelter**

Jason Rodriguez, Emma Fox, Zachary Tibari; Faculty Mentor: Dr. Karena Malavanti

*Department: Psychology & Neuroscience*

The purpose of this study was to investigate the effectiveness of the spaying and neutering of pets on lowering euthanasia rates in shelters. We analyzed data from Animal Birth Control Clinic, a nonprofit organization that specializes in providing affordable spay/neuter pet services to low-income pet owners. Early spaying and neutering of animals has a direct impact on controlling the overpopulation found in cities. ABC Clinic utilizes a cost-effective surgery model to help owners who cannot afford animal services at a full-service veterinarian. These surgeries have shown a reduction in stray animals because intact animals are the most likely contributors to increased pet homelessness and eventually euthanasia. If overpopulation is controlled, then there are less animal intakes at the shelters, which lowers the euthanasia rate in those cities (“Promote and Perform,” 2007). Cities without spay or neuter programs have increases in new animals in the community, therefore leading to an increase in euthanasia rates, showcasing the importance of those programs (Humane Society International, 2018). An ordinance was passed in August of 2013 requiring all residents in the city of Waco, Texas to spay or neuter their cats and dogs (Animal Safety and Ordinance Information, 2018). Euthanasia rates were strongly negatively correlated with spay/neuter surgeries at the ABC Clinic ( $r = -.934, p < .001^{***}$ ) from an 11-year period, 2006-2017. Data were further analyzed using logistic regression and chi-square. Results indicate that local ordinances requiring spaying/neutering of pets is a strong predictor of lower euthanasia rates at the local shelters.

### **C39. Effects of Short-Term Stress vs. Exercise on Memory**

Bisma Ikram, Luke Moraglia, Robert Barnes, David Carpenter, Lana Madi, Eric Dorris, Kinsey Lano, Sarah Lathrop, Katelyn Petersen, Josh Learned, Greg Sullens; Faculty Mentor: Dr. Melanie Sekeres

*Department: Psychology & Neuroscience*

Chronic Stress has been shown to impair memory and decrease cognitive function. In contrast, exposure to healthy lifestyle factors, such as exercise and environmental enrichment, have beneficial effects on brain health and cognition, including enhanced hippocampal-dependent memory and hippocampal neurogenesis. In this preliminary study we aim to understand the effects of chronic stress versus exercise on physical and cognitive health across the lifespan in a mouse model. Mice were divided into an Environmental Enrichment (EE) group, a Chronic Mild Stress (CMS) group, and a Control group. Behavioral measures of learning and memory were conducted at baseline. Mice were reared for a month with their respective conditions. Behavioral tests were conducted again after rearing to determine the effects of stress and exercise on learning and memory. Although there was no significant impact on spatial memory, the CMS group displayed a greater decline in recognition memory than the other groups. In the fear conditioning paradigm, EE mice displayed lower levels of fear memory. We predict greater group differences in hippocampus-dependent memory after ten to thirteen months of chronic stress or exercise.

#### **C40. Short Term Effects of Chronic Stress and Exercise on Anxiety**

Luke Moraglia, Bisma Ikram, Robert Barnes, David Carpenter, Lana Madi, Eric Dorris, Kinsey Lano, Sarah Lathrop, Katelyn Petersen, Josh Learned, Greg Sullens; Faculty Mentor: Dr. Melanie Sekeres

*Department: Psychology & Neuroscience*

Chronic Stress has been shown to impair memory and decrease cognitive function. In contrast, exposure to healthy lifestyle factors, such as exercise and environmental enrichment, have beneficial effects on brain health and cognition, including enhanced hippocampal-dependent memory and hippocampal neurogenesis. In this preliminary study we aim to understand the effects of chronic stress versus exercise on physical and cognitive health across the lifespan in a mouse model. Mice were divided into an Environmental Enrichment (EE) group, a Chronic Mild Stress (CMS) group, and a Control group. Behavioral measures of learning and memory were conducted at baseline. Mice were reared for a month with their respective conditions. Behavioral tests were conducted again after rearing to determine the effects of stress and exercise on learning and memory. Although there was no significant impact on spatial memory, the CMS group displayed a greater decline in recognition memory than the other groups. In the fear conditioning paradigm, EE mice displayed lower levels of fear memory. We predict greater group differences in hippocampus-dependent memory after ten to thirteen months of chronic stress or exercise.

#### **C41. Applying the Interpersonal Theory of Suicide to Veterans**

Patrick Ormsby, Dr. Eric Meyer, Dr. Bryann DeBeer; Faculty Mentor: Dr. Sara Dolan

*Department: Psychology & Neuroscience*

**Introduction:** Approximately 20 Veterans commit suicide a day, a number that, while shrinking, is nonetheless far too high. Research is investigating the efficacy of the Interpersonal Theory of Suicide (ITPS), originally applied to civilian populations, in predicting suicidal ideation of veterans with the consideration of three modifiable factors. The IPTS paradigm proposes that thwarted belongingness (TB) and perceived burdensomeness (PB) interact to produce suicidal ideation, which can become a suicide attempt after the Veteran has an acquired capability for suicide (ACS). **Methods:** 20 peer-reviewed articles were considered in this review. Articles were found on PubMed using the keywords “interpersonal theory of suicide,” “suicide,” “veterans,” and “modifiable factors.” **Results:** Review of the literature showed that TB in the presence of PB added some variance to predicting suicidal ideation, however PB was often found to add variance to results without the presence of TB. The interaction of PB and ACS, PB and TB, and even ACS alone, were often predictive and measurable modifiable factors influencing a Veteran’s suicidal ideation. **Discussion:** Findings of this literature review suggest that specific self-report assessments are required to gain precise data on the effect of each modifiable factor. Also, the modifiable factors the ITPS proposes do not seamlessly apply to Veterans. Studies had inconsistent findings; TB, PB, and ACS were found in different studies as significant and nonsignificant to

variance. The results suggest that improving and standardizing measures may rectify conflicting outcomes across studies.

#### **C42. Transcranial Magnetic Stimulation as a Therapy for Treatment Resistant Major Depressive Disorder and Posttraumatic Stress Disorder**

Hailey Fox, Dr. Geoffrey May, Dr. Laura Zambrano-Vazquez, Dr. Steven Nelson; Faculty Mentor: Dr. Sara Dolan

*Department: Psychology & Neuroscience*

Although major depressive disorder (MDD) or depression, is typically treated with various therapies and psychoactive medications, many individuals do not experience remission. Transcranial Magnetic Stimulation (TMS) has been found to provide long-term, effective symptom relief with few adverse side effects for patients with psychiatric disorders, especially those with treatment resistant depression. Similarly, many individuals diagnosed with posttraumatic stress disorder (PTSD) do not benefit from therapy alone. Since abnormal functioning of the dorsal lateral prefrontal cortex (dlPFC) is related to both MDD and PTSD, researchers are investigating the use of TMS to treat PTSD. TMS employs the use of electromagnetic coils to stimulate dysregulated areas of the cerebral cortex associated with cognitive and behavioral symptoms of MDD and PTSD. While areas like the dlPFC are typically targeted for treatment of these disorders, varying the position of stimulation and type of coil used allows for individualized treatment of psychopathologies. This poster reviews the physiological mechanisms of TMS, the individualization of treatment by varying the coil type and targeted site and presents the preliminary results of study investigating the use of TMS as an adjunctive treatment with psychotherapy for PTSD in veterans. This study titled “Trauma Extinguishing by Magnetic Induction” (TEMI) is being conducted at the VISN 17 Center for Excellence. A total of 80 participants were randomized to receive 30 sessions of either TMS stimulation or a sham stimulation over the course of eight weeks. Functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) were used to determine the effect of the TMS treatment.

#### **C43. Traumatic Brain Injury and Suicide in Veterans: Mixed findings and potential new directions**

Steven Nemecek, Dr. Laura Zambrano-Vazquez, Dr. Eric Meyer, Dr. Bryann DeBeer; Faculty Mentor: Dr. Sara Dolan

*Department: Psychology & Neuroscience*

Suicide rates among United States veterans are higher relative to those observed in the civilian population. Military personnel are returning with unseen wounds resulting from the high occurrence of improvised explosive devices (IED) that lead to brain damage in the form of a traumatic brain injury (TBI). Research has shown there is a link between Posttraumatic Stress Disorder (PTSD), depression, TBI, and suicidal ideation (SI). Considering the prevalence of these three disorders in the veteran population helps account for, in part, the increased incidence of suicide attempts and completed attempts observed among veterans. The purpose of this poster is to review the literature regarding TBI and suicide in the veteran population. Research has shown mixed results when attempting to isolate TBI, and control for PTSD and depression. While some studies show that TBI leads to increased suicidal ideation, others have shown no clinically relevant difference between presence or absence of TBI. Yet others, have proposed TBI as a mediator between other factors associated suicidal ideation. Despite the mixed state of findings, a common factor among the studies is the use of cross-sectional design to study the veteran population. A longitudinal study that controls for PTSD and depression would be better suited to address the effects of TBI, SI, and suicide in veterans. The results from a longitudinal study could help elucidate the role of TBI in veteran suicide, and thus help determine whether resources should be allocated to an intervention on TBI in an attempt to reduce prevalence of suicide.



#### **C44. Increased Circulating Cortisol Levels Due to Prolonged Stress and the Implications for Alcohol Use in Combat Veterans: A Research Proposal**

Tessa Breeding, Dr. Yvette Z. Szabo, Christina D. Hejl, Dr. Rakeshwar Guleria, Dr. Steve Nelson; Faculty Mentor: Dr. Sara Dolan

*Department: Psychology & Neuroscience*

Problematic alcohol use and alcohol use disorder (AUD) are prevalent among combat veterans, though underlying causal mechanisms of abuse remain broad and incomplete. One potential mechanism is cortisol, a glucocorticoid released from the adrenal glands in response to stress. Cortisol could help assess alcohol abuse potential in combat veterans, as alcohol is often used as a coping mechanism during periods of prolonged stress. This poster presents a proposal to explore the relationship between cortisol, stress, and alcohol use. We hypothesize that combat exposure, a proxy for prolonged stress, will positively correlate with circulating cortisol levels and a higher cortisol response to acute stress paradigms. Higher cortisol, in turn, will be associated with an increased probability of utilizing alcohol as a coping mechanism, as literature indicates that subjects with a high cortisol response show increased sedation to alcohol. To test this, veterans would complete self-report measures of combat exposure and alcohol use. A baseline saliva sample would be taken during an initial rest period, followed by three more taken after administration of the Trier social stress test, an acute stress paradigm. Saliva samples would be analyzed for circulating cortisol levels using an antibody pre-coated enzyme-linked immunosorbent assay. Positive correlations between combat exposure, baseline cortisol, higher cortisol responses to stress and alcohol use would suggest that higher cortisol due to prolonged stress may be a cause for the increased use of alcohol as a coping mechanism. The findings could be used as means for developing further studies and measures for AUD prevention.

#### **C45. A Review of Implementation Strategies for Psychotherapy for Depression in Primary Care**

Victoria Malone, Dr. J. Mignogna, Dr. J. Benzer; Faculty Mentor: Dr. Sara Dolan

*Department: Psychology & Neuroscience*

Primary care clinics are often the front line in health care for treating mental health concerns. Evidence-based psychotherapies (EBPs) for depression are readily available in this setting, however, additional efforts are needed to improve their use. We conducted a narrative review of empirical literature to identify strategies used to implement EBPs for depressions in primary care settings. Literature was searched from Pubmed, PsychInfo, and EMBASE databases. Twenty articles were identified and reviewed. For each article, the implementation strategies and the model of care were recorded. As part of the review, a simplified version of the Expert Recommendations for Implementing Change (ERIC) strategies was used to categorize implementation strategies employed in included studies. A variety of implementation strategies were reported. Preliminary results show that the most common ERIC strategies employed were stakeholder outreach and education, use of evaluation and iterative strategies, and adapting and tailoring context. These EBPs were commonly delivered by a psychologist, social worker, or nurse. Common implementation barriers included improper screening tools, limited time with patients, and restricting screening to a single diagnosis. Study limitations included small sample sizes that may reduce the generalizability of study findings. Additional research is needed to inform future implementation of EBPs in the primary care setting.

#### **C46. Moral Injury, Occupational Burnout and Remotely Piloted Aircraft Operators**

Emily Johnson, Dr. Frankfurt; Faculty Mentor: Dr. Sara Dolan

*Department: Psychology & Neuroscience*

**Introduction:** Moral Injury is a novel construct that describes the psychological impact of experiencing morally transgressive acts. Moral Injury produces symptoms like those brought on by PTSD, but there are important

distinctions between the two. It has been speculated that RPA Operators face risk of PTSD, yet the rates of PTSD in RPA Operators are significantly less than ground combatants. However, RPA Operators have been found to experience elevated psychological distress and high rates of occupational burnout which raises the question of whether they would be at higher risk of Moral Injury. This poster reviews the literature on Moral Injury and the mental health of RPA Operators to determine why there is a discrepancy between distress and PTSD. **Methods:** Results from 20 peer-reviewed articles were considered for this review. **Results:** Review of the literature showed that a significant amount of RPA operators suffer high emotional exhaustion leading to high burnout rate. The literature suggests this emotional exhaustion is caused by the nature of RPA Operator duties. Although the research directly investigating Moral Injury in RPA Operators is limited, the literature identified several factors that could be suggestive of Moral Injury. **Discussion:** Since the risk of developing Moral Injury increases with exposure to combat and is compounded by the myriad decisions that RPA Operators are faced with each day, the psychological distress causing such occupational burnout maybe Moral Injury, rather than PTSD. The review highlights the importance of better mental health care for RPA Operators to help diminish the burnout rate.

#### **C47. Development of Autistic-like Behavior in C57 Mice following Early Life Seizures**

Siena Condon, Suzanne Nolan, Samantha Hodges, Andy Holley, Lindsey Tomac, Ilyasah Muhammad; Faculty Mentor; Dr. Joaquin Lugo

*Department: Psychology & Neuroscience*

**Objective:** There is substantial evidence for a link between early life seizures (ELS) and development of an autistic phenotype, perhaps mediated through hyperactivity of the PI3K/Akt/mTOR pathway. Previous work has shown this pathway to be upregulated in rodent models following various early life seizures paradigms. However, few studies have examined the behavioral and molecular effects of PD10 seizures in mice. The present study aims to investigate the effects of 3 flurothyl-induced seizures on PD10 in C57 mice pups on both communication impairments and mTOR pathway signaling. **Methods:** Pups were placed in an inhalant chamber and underwent 3 flurothyl-induced seizures on PD10. Control mice were held in a separate chamber for an equal amount of time. Hippocampal tissue was collected at 1hr., 24hr., PD12, and PD15 timepoints following the PD10 seizures for use in Western blotting analysis of PI3K/Akt/mTOR pathway proteins. On PD12, a separate cohort of mice were tested in an isolation-induced ultrasonic vocalization (USV) paradigm to evaluate whether ELS is associated with communication impairments. **Results:** USV analysis indicated a significant qualitative difference in call types emitted by seizure versus control pups. Western blotting results illustrated increased levels of p70S6K and S6 proteins at varying post-seizure timepoints. **Conclusions:** Significant differences in USV call types suggests that ELS led to altered communicative abilities. The elevated PI3K/Akt/mTOR pathway protein levels suggest a possible mechanistic link for these communicative differences.

#### **C48. Examination of cytokine expression and sickness behavior in a mouse model of Fragile X syndrome**

Lindsay Tomac, Samantha Hodges, Suzanne Nolan, Ilyasah Muhammad; Faculty Mentor: Dr. Joaquin Lugo

*Department: Psychology & Neuroscience*

Fragile X syndrome (FXS) is a neurodevelopmental disorder caused by a single genetic mutation in the Fragile X mental retardation 1 (*FMRI*) gene. Recently, there has been evidence that FXS patients may have altered immune function that could be mediating behavioral and cognitive aspects of the disorder. Previously in our lab, we found baseline hippocampal pro-inflammatory cytokine expression levels to be significantly decreased in *Fmr1* knockout (KO) mice, a mouse model of FXS. To expand on these results, we investigated how *Fmr1* KO mice responded to an innate immune stimulus. We first administered a single 0.33 mg/kg intraperitoneal injection of the bacterial mimetic lipopolysaccharide (LPS). Four hours after injections, brains were dissected, followed by RNA isolation and qRT-PCR on hippocampal tissue. As expected, we found LPS significantly increased pro-inflammatory cytokines in *Fmr1* KO and WT mice. Additionally, *Fmr1* KO mice were found to

have trending elevated cytokine expression after LPS administration when compared to WT mice. To examine differences in sickness behavior following innate immune stimulation, we conducted a 2<sup>nd</sup> study, where mice were tested in a burrowing paradigm with a single injection of LPS prior to testing. Twenty-four hours following injections, we examined cytokine expression and similarly to the 4hr. time point, we expect cytokine levels to be significantly altered between genotypes. While *Fmr1* KO mice have altered baseline cytokines, how they respond to an innate immune stimulus will allow us to determine whether dysregulated immunity could be playing a broader role in the pathophysiology of FXS.

#### **C49. The impact of early life seizures on the development of autistic-like behavior across two genetic mouse strains: 129SvEvTac and C57BL/6 mice**

Christian Hernandez-Zegada, Samantha Hodges, Suzanne Nolan, Andy Holley, Matt Binder, Lindsay Tomac, Siena Condon, Christian Potter, James Okoh; Faculty Mentor: Dr. Joaquin Lugo

*Department: Psychology & Neuroscience*

Epilepsy and Autism spectrum disorder (ASD) have a high comorbidity rate, with the co-occurrence of having both disorders being approximately 30% in children with either disorder. Research has begun to look into this relationship by examining how early life seizures (ELS) can lead to the development of autistic-like behavior in rodent epilepsy models. However, different seizure induction methods and background strain of mouse used has shown variable results. Therefore, further investigation is critical to determine the most optimal mouse model to study the comorbidity. In this study, we used the inhalant flurothyl to induce seizures in male and female 129SvEvTac and C57BL/6 mice on postnatal days (PD) 7 to 11. Each mouse received 3 seizures per day, each approximately 2 hours apart (15 seizures total). All mice went through behavioral testing 3 months later during adulthood to examine how the flurothyl seizures in early developmental periods affected the behavioral phenotype. Overall, we found that both strains of mice had decreased repetitive behavior across different tasks, but no changes in hyperactivity in the open field, sociability in the social partition task, or learning in a fear conditioning task. In addition, there were significant differences in behavior between the two strains across varying behavioral tasks. Understanding mechanistically how early life seizures can contribute to the development of autistic-like behavior will be critical for elucidation of new therapeutic approaches for both disorders. This study will help us gain a better understanding of the molecular mechanism mediating the high comorbidity between epilepsy and ASD.

#### **C50. The Impact of Multiple Flurothyl Seizures on Vocalization Development in Male and Female C57BL/6J Mice**

Ilyasah Muhammad, Suzanne Nolan, Samantha Hodges, Siena Condon, Matthew Binder; Faculty Mentor: Dr. Joaquin N. Lugo

*Department: Psychology & Neuroscience*

Prior evidence suggests that early life seizures (ELS) in both humans and mice contribute to the development of Autism spectrum disorder (ASD). While other core characteristics of ASD, such as sociability and repetitive behavior have been studied following ELS in mice, communication deficits have not been widely studied. In this study, female and male mice were given three flurothyl-induced seizures two hours apart during postnatal days 7-11. On postnatal day 12, ultrasonic vocalizations (USVs) were recorded via a mother-pup separation paradigm. The data revealed that quantitative aspects of USVs were significantly impacted. For example, the vocalization rate, sequence length and number of vocalizations increased following seizures, while the pitch (frequency mean) decreased. However, qualitative analyses, such as syllable type, did not differ between the seizure and control mice. In addition, sex did not significantly impact qualitative and quantitative results.

Overall, the study helps to elucidate how ELS may play a role in the development of autistic-like behaviors, specifically, in the domain of communication.

### **C51. Assessing the impact of early-life immune insult on autistic-like behavior and seizure susceptibility**

Zachary Pranske, Suzanne Nolan, Samantha Hodges, Ilyasah Muhammad, Matthew Binder; Faculty Mentor: Dr. Joaquin Lugo

*Department: Psychology & Neuroscience*

Recently, there has been extensive evidence emphasizing the role of immune reactions in mediating the comorbidity between epilepsy and Autism spectrum disorders (ASD). Past studies have indicated that 5–38% of ASD cases have comorbid epilepsy, and conversely that around 6% of epilepsy patients are diagnosed with ASD. We aimed to better understand this connection in the context of early-life immune infection. To examine this, we investigated the role of a single intraperitoneal (i.p.) injection of 0.1 mg/kg lipopolysaccharide, a bacterial mimetic which simulates systemic infection, in C57BL6/J postnatal day 10 (PD10) mice. Following LPS injections, we recorded isolation-induced ultrasonic vocalizations (USV) on PD12 to examine how an early-life immune insult can lead to the acute development of autistic-like behavior, specifically deficits in communication. Files were analyzed using an automated processing graphical user interface in MATLAB for deficits in both quantitative and qualitative aspects of vocalization behavior. On PD15, mice were given the chemoconvulsant flurothyl (GABA receptor antagonist). Seizure susceptibility was measured by latency to generalized seizure. While previous studies have shown that early life inflammation can increase seizure susceptibility in rodents, and separate studies have examined the link between early life inflammatory insults and adult autistic-like symptoms, we aimed to clarify the comorbidity between the disorders by specifically correlating seizure susceptibility with autistic-like behavior in LPS-injected mice. Because early-life communication deficits are a useful biomarker for future ASD diagnosis, this study could help to better understand the link between autism and epilepsy in patients with early-life immune infections.

## **STATISTICS C52-C54**

### **C52. Accelerating Exact Conditional Inference in Discrete Exponential Family Models**

Dohyun Kim, Peixin Gao, Grant Innerst; Faculty Mentor: Dr. David Kahle

*Department: Statistical Science*

Sampling from the conditional distribution of multiway contingency tables is used to conduct exact conditional goodness-of-fit tests for discrete exponential family models. Markov chain Monte Carlo (MCMC) and sequential importance sampling (SIS) are two methods used to do the sampling. These methods both have great theoretical properties, but in practice the computations required can be prohibitive. In this work we present novel C++/R implementations of three strategies proposed to enhance speed and accuracy of the original MCMC: First, the hit and run algorithm allows the chain of tables to more quickly explore the support of the conditional distribution. Drawing on an analogy from chess, the original MCMC can only apply king-type moves, advancing to the next table one at a time. The hit and run algorithm uniformly picks from a range of possible moves that still result in the fiber, allowing the moves to be bigger and thus getting to distant tables more quickly like queen-type moves. Second, hybrid MCMC-SIS schemes combine their strengths and minimize their weaknesses. Third, adaptive (non-uniform) move sampling is used. Instead of picking the moves uniformly every time, the accepted moves are recorded each time. Then the information is used to weigh the moves based on their popularity.

### **C53. Temperature, Single Men, and Crime?**

Harrison Dai; Faculty Mentor: Dr. Joshua Patrick

*Department: Statistical Science*

The occurrence of non-violent crimes has been commonly attributed to factors such as race and socioeconomic background. That is, the most prevailing thought is that non-violent crimes occur in areas where there is a high density of racial minorities who live in low socioeconomic conditions. Findings, however, from both sociological and social psychology research suggest that there are several other statistically significant attributing factors to non-violent crimes. Two prevailing social psychology and sociological theories, the affective-aggression hypothesis<sup>1,2</sup> and social control<sup>3</sup>, suggest that non-violent crimes are significantly influenced by temperature and the number of single men within a given area. Further investigation of other potential factors attributing to non-violent crimes can give law enforcement an augmented perspective on where to allocate resources in the most effectual and efficient way possible. Drawing on non-violent crime data spanning from 2012-2016 from the Portland, Oregon Police Department, time-series analysis was used to examine the relative strength of both temperature and the number of single men on the frequency of non-violent crimes that occurred within those 4 years.

<sup>1</sup> Field, S. (1992). The Effect Of Temperature On Crime. *British Journal Of Criminology*, 32(3), 340-351

<sup>2</sup> Anderson, C. A., Deuser, W. E., & Deneve, K. M. (1995). Hot Temperatures, Hostile Affect, Hostile Cognition, and Arousal: Tests of a General Model of Affective Aggression. *Personality and Social Psychology Bulletin*, 21(5), 434-448.

<sup>3</sup> Sampson, R. J., Laub, J. H., & Wimer, C. (2006). Does Marriage Reduce Crime? A Counterfactual Approach To Within-Individual Causal Effects. *Criminology*, 44(3), 465-508.

#### **C54. Time Series Modeling of U.S. Unemployment Rate and GNP**

Ruramai Gumbo; Faculty Mentor: Dr. Joshua Patrick

*Department: Statistical Science*

In the paper Harvill and Ray (2005), the authors used nonlinear time series modeling to forecast the GNP with the unemployment rate of the United States. Expanding on their model, which involved multivariate functional coefficient autoregressive (FCAR) models, we added an extra linear autoregressive term in our model, which allows for better fit by the root mean square prediction error (RMSE). By minimizing the RSME, we found our model best fit the data by utilizing eight quarters of unemployment, or two previous years, in contrast to the two quarters that were used in Harvill and Ray. Since Harvill and Ray's model only included data up to 2003, we aimed to see if our model procedure could produce similar results for more recent data up to 2016. Conclusively, our results show that our model still fit the recent data well, even with the Great Recession of 2008.

**SESSION TWO: Wednesday, March 28<sup>th</sup> and Thursday, March 29<sup>th</sup>  
BAYLOR SCIENCES BUILDING – 2<sup>ND</sup> FLOOR**

**ANTHROPOLOGY C55-C58**

**C55. Interobserver Reliability of Ectocranial Suture Obliteration Assessment in Determining Age of Death**

Alexandria Assenheimer, Lauren Sides, Maddi Tipping; Faculty Mentor: Dr. Katie Binetti

*Department: Anthropology*

Cranial suture obliteration assessment is a methodology used in both forensic and archaeological contexts to determine age at death for human skeletal specimens. As humans mature, cranial sutures fuse together. Then, as a general trend that extends from maturation to senescence, sutures become less visible as individuals age; a process known as “obliteration”. Meindl and Lovejoy (1985) first generated a systematic method of post-mortem age estimation by visually assessing cranial suture closure in skeletal specimens of known demographics, then assigning numeric scores to the sutures that represented categories of progressing stages of obliteration. However, this method has garnered considerable debate. Due to the subjectivity of visual observation, individual interpretation and application of the Meindl and Lovejoy (1985) method leaves room for imprecision and incongruity between interobserver conclusions of suture closure classification. The objective of this study is to determine the reliability of this method by evaluating how disparately observers employ the Meindl and Lovejoy (1985) scoring system. Observers each conducted ectocranial suture obliteration assessments using the Meindl and Lovejoy (1985) method for six cranial specimens. The observer results were analyzed via chi-squared tests for variance to determine the statistical significance of scoring discrepancies. The results of this study should inform forensic and bioarchaeological investigators about the reliability of interobserver application of the Meindl and Lovejoy (1985) method for age assessment and determine the necessity for further methodological standardization.

**C56. Observations of the Effects of Water Salinity on Bone**

Mai Dramiga, Samantha Herkner, Kelli Jones, Tammy Wake; Faculty Mentor: Dr. Katie Binetti

*Department: Anthropology*

Forensic studies on human decomposition have rarely focused on how salt water effects bone. Existing literature on aquatic taphonomy addresses the processes of soft tissue decomposition and the expectations of aquatic scavenging on a body, but not how water salinity levels may affect skeletal remains. The current study addresses this discrepancy by isolating salinity levels and observing bone placed in differing saline solutions. Five pieces of bone of approximately the same size were cut from the single bone sample and four of those pieces were immersed in different tanks of saline solutions ranging from simulated fresh water to a simulated brine pool. The fifth piece was a dry control for comparison. All tanks were held at room temperature and salinity levels were regularly monitored to maintain the desired differences between tanks. Observations were made of the visible changes that occurred to both the bone and the water. Since salt water has corrosive tendencies, we hypothesized that the bone sample in the simulated brine pool water would show the greatest amount of deterioration. The results of this study may have implications for the interpretation of skeletal remains recovered in a variety of contexts including those that are of interest to forensic scientists, paleontologists and archaeologists.

**C57. Does knowledge of mtDNA bias potential jurors?**

Lilla Dorvee, Molly Ginn, Nicholas Mercurio, Destiny Saxiones; Faculty Mentor: Dr. Katie Binetti

*Department: Anthropology*

Since the beginning of the judicial branch and the establishment of a legal system, it has been important for jurors to understand information presented to them in court. Juries are meant to be representative of the general population, yet each individual juror's perspective, beliefs, and educational background may influence their interpretation of evidence. When cases involve biological evidence such as DNA, an educational background in a scientific field may be beneficial to understanding and interpreting what is presented at trial. Previous studies indicate a potential bias may exist because of an individual juror's past academic history, or lack thereof <sup>(1)</sup>. In this study we aimed to look for biases in a population of college students who are eligible to serve on juries. Our study population was limited to Baylor students that can be categorized into three groups based on their academic credentials: 1) no biology education, 2) lower-level biology education, and 3) upper-level biology education. After reading a summary transcript of a mock case, we asked the study participants whether the evidence was sufficient for a conviction. We hypothesize that students who have taken advanced collegiate biology classes are better suited to determine the validity and accuracy of the DNA evidence in a case than those who had only taken lower-level biology courses or none at all. We present here the results of our study.

1. Hans, V. P., Kaye, D. H., Dann, B. M., Farley, E.J., Albertson, Stephanie (2011). *Science in the Jury Box: Juror's Comprehension of Mitochondrial DNA Evidence*. *Law Hum Behav*, 35:60-71.

### **C58. Visualizing the Etruscan “City of the Dead”: Cumulative Viewshed Analysis of the Necropolis at San Giuliano (Italy)**

Lauren Sides, Matthew Owen; Faculty Mentor: Dr. Davide Zori

*Department: Baylor Honors College*

The necropolis at San Giuliano is made up of hundreds of Etruscan rock-cut tombs, where inhabitants of the adjacent plateau buried their dead and practiced funerary rituals. However, little has been written about the relationship between the Etruscan domestic and ritual landscape. A probabilistic model of intervisibility between the San Giuliano necropolis and plateau was created to assess this relationship and to demonstrate the use for Geographic Information Systems (GIS) in archaeology. Drone photo-documentation was used to conduct an aerial survey of the San Giuliano landscape to create a digital elevation model (DEM) for the site. Cumulative viewshed analysis (Wheatley, 1995) was applied to ascertain the individual intervisibility of each tomb with the plateau, which was then algebraically summed to display the mutual intervisibility of all the tombs with the plateau. To reduce the propagation of error of the viewshed model, experimental and substantive concerns such as the DEM quality and changes in the environment over time were accounted for with a probabilistic model (Fisher, 1991), which displayed the average results after varying parameters in vegetation and observer heights. These models helped to determine future areas for excavation on the San Giuliano plateau, as well as warranted an inter-site analysis of Etruscan tomb intervisibility.

Sources:

Fisher, P.F. (1991). First experiments in viewshed uncertainty: the accuracy of the viewshed area. *Photogrammetric Engineering and Remote Sensing*, 57: 1321-1327.

Wheatley, D. (1995). Cumulative viewshed analysis: a GIS-based method for investigating intervisibility, and its archaeological application. In Lock, G. and Stančić, Z., eds., *Archaeology and Geographical Information Systems*, pp. 171-186. London, Taylor & Francis.

## **RELIGION C59**

### **C 59. Excavating the Kenyon Collection**

Rachel Risk; Faculty Mentor: Dr. Deirdre Fulton

*Department: Religion*

The Dead Sea Scrolls have been a source of fascination since their initial discovery in 1947. They have also been a source of controversy among scholars, who debate their origin and significance. This study brings to light a little-known conflict between two British scholars, Kathleen Kenyon and John Allegro, in the quest to recover, translate, and publish the Dead Sea Scrolls. A thorough examination of correspondence written between 1960-1965, housed in the Kathleen Kenyon Archaeology Collection at Baylor University, reveals two opposing sides in the debate concerning how the information contained in the scrolls should be handled. While Allegro was of the opinion that the text and translation of the scrolls found in Cave 11 should immediately be published and placed on exhibition in England and the US, Kenyon and her colleagues disagreed, preferring a more careful approach since the delicate scrolls were desperately in need of conservation work to keep them from disintegrating entirely. Additionally, Allegro angered Kenyon by insisting that some of the scrolls contained clues to the location of lost treasures of the Second Temple, and by leading his own excavations that tended to damage historical sites rather than produce incredible discoveries. This study provides a particularly powerful example of the ongoing issue of ethics, research, and information distribution in the archaeological community, and is especially timely in light of the discovery of the most recent cache of Dead Sea Scrolls.

## **PHYSICS C60-C68**

### **C60. Testing of New Front-End Electronics for the HCAL at CERN**

John Lawrence, Mentor: Dr. Kenichi Hatakeyama

Collaborators: Caleb Smith, Chris Madrid, Jordan Potarf, Andrew Baas

*Department: Physics*

The Hadron Calorimeter (HCAL) in the Compact Muon Solenoid (CMS) detector at CERN is being upgraded replacing several of its electronics. The HCAL is designed to detect hadrons that come out of the proton-proton collisions supplied by the Large Hadron Collider (LHC). New readout modules, containing Silicon Photomultipliers (SiPM) which take the light signals from the detector and convert them to charge signals, are some of the new electronics being installed.

Using a test beam capable of producing particles found in the CMS detector, the new readout modules were put in experiment like conditions to fully understand their functionality before they were used in the detector. The SiPMs in the new readout modules process the signals very differently than the old readout modules so there are features in these SiPMs that need to be understood. To process the signals the SiPM take the light signals from the detector and output a respective amount of charge in response but the output charge does not always increase linearly with input light. It is also important to find the shape of the output charge of the SiPM. With the data from the test beam it is possible to measure the SiPMs non-linear output and find its output pulse shape. Based on details of the SiPMs properties a virtual SiPM simulation, which can take inputs and give theoretical SiPM outputs, was also created to assist in the analysis

### **C61. Metal and Organic Thin Film Growth**

Nick Larson; Faculty Mentor: Dr. Zhenrong Zhang

*Department: Physics*

The interaction of organic molecules with various metal and semiconductor substrates has important applications in sensing, light emission, and transistors. Therefore, it is important to control thickness, topographical roughness, and other such surface characteristics of both organic molecules and substrates for understanding of the substrate-molecule interaction. The primary



goal of this project has been to grow thin film and nanoparticle samples with precise control of thickness and roughness. Copper Phthalocyanine (CuPc), an organic molecule, was deposited onto gold and MoS<sub>2</sub> substrates using physical vapor deposition. Molecular densities of these samples varied from isolated molecules, sub-molecular ‘islands’, and monolayer. While CuPc depositions have been well documented on metallic substrates due to their plasmonic enhancement effects, its spectra on MoS<sub>2</sub> has not been well studied as semiconducting materials lack plasmonic enhancement. Our group was able to acquire spectra of these samples using Tip Enhancement Raman Spectroscopy (TERS). The results show that CuPc molecules interact intermolecularly with each other to stabilize their orientation on a MoS<sub>2</sub> substrate. Future directions include the production and analysis of other material depositions, as well as developing a method for depositing silver nanoparticles onto TERS tips.

### **C62. Optical Fiber Tips for Use in Tip-Enhanced Raman Spectroscopy**

Brynna Neff; Faculty Mentor: Dr. Zhenrong Zhang

*Department: Physics*

Tip-enhanced Raman spectroscopy (TERS) is a useful technique for studying the chemical composition of a sample. The goal of this study is to improve the results the operation and sensitivity of TERS obtained in this method by using a new type of plasmonic tip, made out of an optical fiber which has been etched and then coated with gold. One of the main advantages of TERS in comparison to other methods of Raman Spectroscopy is the possibility of confining the signal excitation location to less than 1nm. In addition, TERS can be used in scanning tunneling microscopes to image individual molecules. In the proposed setup with an optical fiber tip, the electromagnetic signal is carried to and from the tip along the fiber instead of than having an external light source focused on the sample, leading to better results. This research project focused on testing the optical properties of these gold-coated tips. Raman spectra obtained with the fiber tip in liquid showed that it is possible to obtain a clear Raman signal through the gold-coated fiber tips. By coupling the fiber tip to laser light reflected within a prism, it was shown that the tips are capable of picking up a near field electromagnetic signal. Finally, observations of the light emitted from the fiber tips showed strong evidence of plasmonic resonance coupling. This work has prepared us to test the fiber tips in an STM.

### **C63. The Effects of Cadmium on Calcium Binding and Dimerization of N-Cadherin.**

Garrett Williams, Susan Pedigo; Faculty Mentor: Dr. Zhenrong Zhang

*Department: Physics*

Cadherins are cell adhesion proteins that are important for tissue formation and integrity. Cell-Cell adhesion occurs through the formation of strand-crossover dimer between identical calcium

-bound cadherins on the surface of neighboring cells. Specifically, Neural Cadherin (N-Cadherin) cell adhesion plays an invaluable role in early development processes such as angiogenesis and the development of the neural plate. Due to the necessity for proper cell adhesion during cell differentiation in development, this study quantifiably examines whether binding of other metallic divalent cations would disrupt calcium-sensitive binding and dimerization in vitro. The effect of cadmium(II) on the linkage between calcium binding and dimerization was of particular interest. Studies associate cadmium toxicity with a variety of health effects including various pulmonary and neural cancers. Through the use of MatLab and Excel, an algorithmic and stimulatory analysis was conducted on Calcium binding, Calcium dimerization, and Calcium binding in competition with Cadmium to N-Cadherin. The equilibrium constants for Calcium binding ( $K_{Ca}$ ) and Cadmium binding ( $K_{Cd}$ ) were experimentally determined using fluorimetry and computationally verified. The data presented in this study provides a numerical basis for the effects of Cadmium on the binding of Calcium to N-cadherin.

### **C64. Self-consistent Simulation of Microparticle and Ion Wakefield Configuration**

Dustin Sanford, Naoki Ellis, Beau Brooks; Faculty Mentor: Dr. Lorin Matthews

*Department: Physics*

In a complex plasma, positively charged ions often have a directed flow with respect to the negatively charged dust grains. The resulting interaction between the dust and the flowing plasma creates an ion wakefield downstream from the dust particles, with the resulting positive space region modifying the interaction between the grains and contributing to the observed dynamics and equilibrium structure of the system. Here we present a proof of concept method that uses a molecular dynamics simulation to model the ion wakefield allowing the dynamics of the dust particles to be determined self-consistently. The trajectory of each ion is calculated including the forces from all other ions, which are treated as “Yukawa particles” and shielded from thermal electrons and the forces of the charged dust particles. Both the dust grain charge and the wakefield structure are also self-consistently determined for various particle configurations. These results will be employed to analyze the formation and dynamics of field-aligned chains in CASPER’s PK4 experiment onboard the International Space Station, allowing examination of extended dust chains without the masking force of gravity.

### **C65. Energy Transfer During Magnetic Storms**

Taylor Robinett, Courtney Turner; Faculty Mentor: Dr. William B. Cade III

*Department: Physics*

Due to the natural processes that occur within the solar atmosphere, the sun is continuously emitting matter into space in the form of solar winds, energetic particles, and coronal mass

ejections. These particle masses, if ejected in the right direction, can collide and interact with the Earth’s geomagnetic system, causing what is known as a geomagnetic storm. Traditionally, magnetic storms are categorized qualitatively using what is known as the Disturbance Storm Time (or DST) index. This is a negatively based index that reflects the severity of the global geomagnetic disturbance during a storm window. This research uses a quantitative approach to solar wind –magnetospheric interactions by using solar wind velocity, density, and angle of impact to determine the amount of energy being transferred into the earth’s atmosphere by passing solar events. The energy value calculated is known as the epsilon parameter ( $\epsilon$ ). By comparing the epsilon parameter to the standard DST index, we attempt to determine the accuracy of current categorization methods, as well as, further refine our understanding of geomagnetic storms on a quantitative basis.

### **C66. Magnetic Resonance Imaging of Porous Media Flow**

Blake Gigout; Faculty Mentor: Dr. J.S. Olafsen

*Department: Physics*

Magnetic Resonance Imaging can be used to probe 3D fluid flow in otherwise opaque porous media. In this study, coconut oil is the fluid used to extract three dimensional fluid flow within porous media comprised of porcelain spheres. Coconut oil was chosen due to the thermophysical properties of this phase change material (PCM) near the fluid solid phase transition. As the melting temperature of coconut oil is around room temperature, the transition point and temperatures near it allow for a manner that increases the viscosity of the fluid, slowing its flow through the porous media, permitting data to be obtained from MRI scans each of which take several minutes. Calibration is necessary to correct for the magnetic field gradient, effects of temperature on MRI images as well as the temperature dependence of the fluid parameters. Three dimensional image analysis of the MRI scans is accomplished using software programs written in-house in the Interactive Data Language (IDL). Volumetric flux through the entire imaging volume as well as fluid flux through a single MRI slice are both used to characterize the gravity driven fluid flow in the vertically oriented porous media. Bulk measurements of coconut oil in the absence of the porous media are used for MRI calibration as well as to characterize

the phase transition, first using a 1-D model of Newton's Law of Cooling and eventually a complete 3D application of the heat equation.

### **C67. Epsilon-Near-Zero Perfect Absorber in Ultra-Thin Films**

Catherine Arndt, Aleksei Anopchenko, Sudip Gurung, Long Tao, Ho Wai, Howard Lee; Faculty Mentor: Dr. Howard Lee Department of Physics, Baylor University, The Institute for Quantum Science and Engineering at Texas A&M University

*Department: Physics*

There is a significant interest in the development of ultra-thin optical absorbers, potentially leading to layered broadband absorbers. Ultra-thin epsilon-near-zero (ENZ) materials (<100nm) such as, Indium Tin Oxide (ITO) and Aluminum Zinc Oxide (AZO) layers, support certain radiative and bound p-polarized plasmonic modes at epsilon-near-zero (ENZ) frequencies. Excitation of the radiative Berreman mode leads to resonant light absorption and perfect absorption in the near-IR spectrum. By utilizing these properties, we demonstrate perfect absorption (>99%) in <10nm thick ITO films and <55nm thick AZO films 1. The perfect absorption in deep subwavelength ITO nanolayers is due to the excitation of the Berreman mode or ENZ mode. A super continuum laser (600nm –1700nm) excites modes of the ultra-thin ENZ layer. The specular reflection from the sample is collected, revealing >99% absorption in the near-IR spectrum. The perfect absorption of single layer ultra-thin films may be layered to create a broadband absorber 2. Perfect absorbers facilitate the development of compact and tunable metamaterial devices and flat zero-index optics.

### **C68. Curvature Analysis of Kerr-Newman Black Holes**

Caleb Andrew Elmore, Cooper Watson, MD Ali, Andrew Baas; Faculty Mentor: Dr. Gerald Cleaver

*Department: Physics*

Mapping the inside of a black hole requires coordinate invariant functions due to the force of gravity bending spacetime inside the hole. The invariant functions for Kerr-Newman black holes of various geometric shapes were calculated using Mathematica. These were then plotted to show spacetime warping as a function of position inside the event horizon of the black hole. This project will be extended for wormholes and the Alcubierre warp metric to determine whether each is traversable.

## **ENGINEERING C69-C73**

### **C69. Optical Transmission through Coconut Oil during Phase Change**

Taylor Hetrick; Faculty Mentor: Dr. Linda Olafsen

*Department: Engineering*

Magnetic resonance imaging (MRI) is a powerful tool in biomedical imaging. Maximizing the benefit of MRI to patients and doctors requires a contrast agent to identify fine details in the three-dimensional cross sections. Coconut oil has been identified as a potential contrast agent, and is also of great interest for its latent heat energy storage capacity, particularly for use in developing nations where coconut oil is inexpensive and readily available. To aid in the adoption of coconut oil as both an MRI contrast agent and energy storage material, we present a preliminary study of the thermal and optical properties of non-hydrogenated coconut oil, liquid at room temperature due to the removal of fatty acids with high melting points during distillation. Using a simple optical set-up consisting of a 635 nm laser diode and a photodiode power sensor, we analyze the changes in measured light intensity as the beam transmits through a sample of coconut oil undergoing phase change. We run a series of trials varying both the size

of the coconut oil container and the vertical position of the laser beam spot relative to the container. Finally, we utilize MATLAB software for data analysis and estimation of time constants.

### **C70. Graphene Transfer and Spectrum Analysis**

Benjamin Jones; Faculty Mentor: Dr. Linda Olafsen

*Department: Engineering*

Graphene is a two-dimensional hexagonal array of carbon atoms with high optical, electrical, and thermal conductivity, making it a promising material for a variety of applications. The ultimate purpose of this work is to explore the potential usefulness of graphene contacts in the development and improvement of semiconductor optoelectronic devices, including mid-infrared lasers and light emitting diodes. The object of this project was to transfer graphene to various substrates and then perform optical analysis using a Fourier Transform Infrared Spectrometer. A major component of this research project was implementation of a new process of transferring a single layer or multiple layers of graphene to a substrate. This process involved Trivial Transfer Graphene™ (TTG) and only required water, heat, and an acetone bath for the transfer to take place. We transferred graphene layers to gallium antimonide and germanium substrates and then analyzed the transmission of light through those samples in both the near- and mid-infrared ranges of the electromagnetic spectrum. While graphene is known for having strong optical transmission in the visible wavelengths (97.7%), this work aims to verify that that desirable behavior extends to longer wavelengths for infrared optoelectronic applications.

### **C71. Using HPC to Model Quantum-dot Cellular Automata**

Gabriel Hahn; Mentor: Dr. Enrique Blair

*Department: Engineering*

In an effort to reduce power dissipation in computing devices we aim to use the charge based computing paradigm of molecular Quantum-dot Cellular Automata (QCA). The interactions between neighboring cells containing quantum dots enables general-purpose computing. The clock and other inputs excite the system causing it to vibrate which requires QCA to relax the system to its ground state so calculations can be performed. This occurs primarily through environmental coupling. To help molecular designers engineer computational molecules for minimal power dissipation, we explore the design space for molecular QCA. We model clocked molecular QCA molecules and their interaction with the environment using the Lindblad equation with computational help from the Baylor Super Computer. This method was effective in determining optimal environmental coupling levels to reduce power dissipation which occurred at  $22 T_{\text{vib}}/T_1$ . This level is still too high so different configurations or a different molecule need to be tested.

### **C72. Fabrication and evaluation of a Distributed Bragg Reflector for an optical cavity-based biosensor**

Angela Ankpan, DongGee Rho; Faculty Mentor: Dr. Seung Kim

*Department: Engineering*

In most deadly diseases, the survival rates of patients significantly increase if the presence of the disease is discovered early. This can be achieved using a point of care biosensor, which can detect the presence of diseases in early stages in a variety of locations. My team seeks to create a point-of-care biosensor using an optical system for early detection. The device works by taking the scaled differential of two laser diodes transmitted through a sample cavity, which calls for a sample with high reflectivity and low absorption. We decided to use the distributed Bragg reflector method for our system because it would produce a highly reflective sample but would have a much lower absorption rate than using metals. This method alternates two dielectric materials with different refractive indices to produce a partially reflective sample with very low absorption. RF sputter-

ing is used to deposit a TiO<sub>2</sub> thin film layer onto a sample in succession with an SiO<sub>2</sub> layer for several periods to create the distributed Bragg reflector. In this presentation, we are going to (1) present the simulation results of the optical cavity-based biosensor using distributed Bragg mirrors, (2) optimize sputtering processes to fabricate distributed Bragg mirrors, and (3) evaluate results of the fabricated distributed Bragg mirrors.

### **C73. The Effect of Al Doping on the Electronic Properties of Amorphous InZnO Thin Films**

Chandon Stone, Austin Reed; Faculty Mentor: Dr. Sunghwan Lee

*Department: Engineering*

Amorphous aluminum-doped InZnO thin films (a-IAZO) were produced using magnetron co-sputtering, where an InZnO target was deposited using DC-magnetron sputtering simultaneously with an Al target by way of RF-magnetron sputtering. The Al content of the resulting thin film was controlled by controlling the sputter power of the Al sputtering while the sputter power of the InZnO target was kept constant. The electronic properties of the a-IAZO thin films as a function of RF sputtering power were then studied in detail using Hall Effect measurements. It was found that the resistivity increased, while the carrier mobility and carrier density decreased with the addition of aluminum. The thin films with the least amount of aluminum, deposited at 10 WRF-power, exhibited a maximum as-deposited carrier mobility of roughly 35 cm<sup>2</sup>/Vs. The thin films with optimal electrical properties deposited at 10 WRF-power were also annealed at a range of temperatures to study the effect of annealing on electronic properties. While it was found that a-IAZO thin films annealed at 100°C exhibited a maximum carrier mobility of approximately 48 cm<sup>2</sup>/Vs; the a-IAZO thin films annealed at increasing temperatures were observed to exhibit correspondingly decreasing carrier mobilities. However, all the annealed a-IAZO thin films showed a correlating decrease in carrier concentration with increasing annealing temperature as a result of a decreasing number of oxygen vacancies.

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