

The 9th Annual University of Notre Dame
**UNDERGRADUATE SCHOLARS
CONFERENCE**

Friday, April 29, 2016 in the Hesburgh Library

Oral Presentations Session 1

9:00 am – 10:00 am

Statistics & Strategy in National Policy – HL103

Linking policy to national progress with the help of data tools: A case study of 5 developing nations

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Finance and Mathematics

Advisor: Martin Murillo, University of Notre Dame, Notre Dame Global Adaptation Index

In the context of climate change, linking national policies to tangible progress can be challenging. The reasons for this vary, but include the lack of specific data relating to such policies and projects, as well as difficulty in acquiring such data if it exists (i.e. relevant repositories are decentralized or information is not in a user-friendly format). Furthermore, because climate change-focused actions are relatively new, explicit climate change initiatives are also difficult to find. Thus, approaches that identify proxy actions must be carried out in order to identify the existence of correlations. In this context, methods and tools for linking policy to progress are relevant, as international donors who are about to disburse large amounts of aid need information so they can prioritize funding, see whether the nation has responded positively to previous aid, and determine funding modalities. In this paper, we provide preliminary results consisting of 5 nations that have successfully improved their access to reliable drinking water through the combination of policies and projects. We showcase data collection tools we have created, the chain of policies that have been successful and the resulting impacts, and our recommendations to funding organizations on how to best allocate future funds.

“Lo que quieren es un espacio de dignidad”: How land shapes notions of identity and dignity within traditional communities

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Anthropology and Peace Studies

Advisor: Gabriel Torres, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology

In this discussion, I will examine the relationship between the concepts of human dignity, identity and land within traditional communities in Chile and England. In each of these contexts, land has been a cornerstone of the native identity. Although each region has a distinct history, many questions linked to identity are similar.

The concept of indigeneity has been important in Chile from the time that the Spanish arrived in the 16th century. Now, after centuries of discrimination, racism, oppression, and intermingling, the question “what it means to be indigenous” is more important than ever. Historically, land was a key part of indigenous culture. It remains important, but in a different context, more closely associated with identity than utility. Much of the population has at least one indigenous ancestor, but due to the stigmatization of indigeneity, many deny any linkage; on the other hand, many have only small amount of indigenous heritage, yet are very enthusiastic about the culture. A discussion on what it means to be indigenous today in Chile, and of how dignity emerges within this context are therefore critical to creating an accepting and understanding society.

The land of the Lake District of England is the foundation of the shepherd identity and community that has existed for over 1,000 years. A current UNESCO World Heritage status bid aims to preserve this relationship, which has shaped the picturesque landscape. The bid raises important questions about how the shepherds fit into the current cultural landscape, as tourism in the Lake District increases and gentrification has become burgeoning issue. UNESCO is meant to uphold the right to culture, which is why it is necessary to critically engage the World Heritage bid—does the bid support and augment the dignity that shepherds derive from their traditional existence, or is the larger purpose simply to attract a greater number of tourists?

Each of these contexts has its own issues related to dignity, land, and identity that when combined, provide grounds for a significant discussion of how traditional communities construct nuanced notions of identity and exist within the world today.

Courtesy of the Red, White, and Voting Blue: How Elections Affect Military Strategy

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Mediterranean and Middle East Studies and Political Science

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How does military force employment change when affected by the electoral cycle? While democratically elected leaders need the electorate’s support to obtain office, the conduct of international security, war strategy, and realpolitik may require civilian leaders to ignore public opinion in order to ensure the survival of the state. I argue that, in the dynamics of the American electoral cycle, if a President is seeking reelection and is subject to electoral constraints, then his/her force employment – measured by troop

counts – will decrease or be delayed starting with the first primary elections and continuing as the election draws near. First, I define key terms and critique the existing literature covering democracies and war strategizing. Next, I examine four case studies: President Lyndon B. Johnson's first and second electoral cycles while in office, 1964 and 1968, respectively, and President George W. Bush's first and second electoral cycles while in office, 2004 and 2008, respectively. Using these four cases, I find my data in correlative troop counts and causative decision-making process evidence culled from Presidents' and military advisors' comments during each case study's electoral cycle. They reveal that there exists an awareness of and attention to public opinion and domestic politics from the primary season to the general election. Leaders should be cognizant of how their domestic interests affect their capabilities during conflicts. Democracies might view military engagements through a lens of domestic politics, not state security; through public perception, not foreign aggression.

Gender & Race in Contemporary Society – HL129

My Strategy Brings All The Boys To The Yard: An analysis of the gender gap and its impact on the swing vote in United States presidential elections

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Gender Studies, Political Science, and Theology

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In United States presidential elections, statistics show that women vote differently than men. This empirical observation has led to a common understanding of women in politics called the gender gap, the concept that men and women vote differently. It is the widespread misunderstanding of this concept that I will address in this paper.

The simplification of our societal understanding of gender in politics to simply the gender gap does a disservice to the complexity of the relationship between gender and politics. Specifically, the gender gap does not provide a comprehensive understanding of the loyalty with which genders vote for particular parties.

The general population seems to believe that women are swing voters and are thus crucial votes to capture in order to win an election. This conception, though persuasive due to its emphasis on an underrepresented group of active, passionate, and involved voters, is not true to reality. Statistics indicate that women tend to be more loyal voters than men, which means that men must be more fickle voters than women, making men the more likely gender to swing its vote. This phenomenon is missed by the conversation on the gender gap, which focuses on the difference in votes between men and women and not on the difference in party loyalty between men and women. The result is that society

continues in its misunderstanding of who makes up the swing vote; media continues to misrepresent the gendered aspects of the swing vote; and party strategy continues to appeal to core voters rather than the swing voters it desires to reach. We must bring the gender gap and the swing vote into conversation with each other in order to more fully understand the relationship between gender and politics.

As I will discuss, the concept of women as swing voters has a high-profile history that both parties and media outlets have little incentive to change. I will also give examples of potential implications of a societal shift in common perspective on women voters. Further research should be done on strength of party identification and on issue trends within each gender.

Training Technopreneurs: Potential Solutions for Improving Female Technopreneurs' Self Efficacy in Switzerland

Stephen Freeman
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Sociology & Gender Studies

Advisor: Mary Kearney, University of Notre Dame, College of Arts & Letters, Dept. of American Studies, Film, Television, and Theatre, and Gender Studies

While Switzerland hosts a near equal number of male and female entrepreneurs, female-founded ventures in Switzerland are reportedly less successful than male-founded ventures as measured by output and growth. The relationships between gender, technological literacy, and motivation to internationalize businesses were examined for one sample group: male and female Swiss entrepreneurs in the tech sector. Similar effects on technological literacy and business internationalization are shown for all participants and support earlier research on the relationship between gender, technological literacy, business internationalization, and an entrepreneurial venture's output. Additionally, the motivation to internationalize a business proved stronger for more technologically literate individuals than for individuals who were not exposed or exposed very little to technology during their childhood and teenage years. Implications for educators and policy makers were discussed, and areas for future research outlined. In order to test my hypotheses, I analyzed data gathered in my study conducted between December 27th, 2014 and January 10th, 2015 with varying age groups representing different points in entrepreneurial careers within the Swiss tech industry. Twelve Swiss men and women answered questions evaluating their attitudes, skills, career perceptions, and technological literacy. A total of twelve surveys and interviews were analyzed. My main methods of research were interview and observation. I attended conferences and entrepreneurial meetups to observe how female Swiss entrepreneurs approach tech entrepreneurship. The finding that female entrepreneurs lacked technological literacy when compared to male entrepreneurs was unanticipated. The implications of my conclusions suggest that increasing the activity of female Swiss entrepreneurs starts with education. Educating Swiss girls for technological literacy to see opportunities in all industries, and particularly the technology industry, begins by increasing access to technology education before the collegiate level.

Video Gamers and the Video Gamed: The Intersection of Race and Gender in Modern Video Gaming

Evan Hlywa
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Mathematics & Theology

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Dept. of Sociology

The purpose of this presentation is to discuss the intersection of race and gender in modern video gaming, with respect to video gamers and video gaming culture, and with respect to these identities as portrayed in the relevant media. Of particular interest is in what proportion and in what manner are such the racial and gender identities of modern video gamers, reflected in this form of entertainment which they consume. The intersection of these identities will be examined in several contexts. The demographic of American video gamers themselves shall be compared with the demographic information of the American population at large. The stereotyping of these identities as gamers within modern video game culture shall also be examined, as well as any correlation between one's identity with respect to race and gender, and the types of video games one prefers to play. Moreover, the actual portrayal of marginalized racial and gender identities within popular modern video games shall be discussed by examining the representation of the relevant identities within the major video game blockbusters of the last decade. Also considered in this presentation is the role of race in the recent controversy over gender in video game culture, commonly known as "Gamergate".

Theology & Secularism Through the Ages – HL 222

Sharing Stories: The Importance of Fiction for Understanding Mystery in a Secular Age

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Classical Civilization and Theology

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This project seeks to demonstrate the importance of fiction for conditioning individuals to accept truth as mystery. In a secular age, truths which transcend human reason are often overlooked, discredited, and dismissed. However, some truth is unable to be completely grasped by human intellect. Fiction has the ability to bring mystery into contact with the particular, and this facilitates contemplation about important, but transcendent, truths.

Through participation in the mysteries of creation, incarnation, and salvation, fiction opens up new kinds of knowing and thinking. By grounding mystery in the details of particular stories, readers are encouraged to interact with truth as mystery. Fiction validates human desires which transcend the realm of the immanent and inherently underscores the existence and importance of truth in the form of mystery. This work seeks to understand how humankind can best approach mystery, using the philosophical and theological writings of Charles Taylor, Christian Smith, Joseph Cardinal Ratzinger, John Paul II, Martha Nussbaum, C. S. Lewis, Dorothy Sayers, and Flannery O'Connor, as well as the fiction writing of Lewis, Sayers, and O'Connor.

The Haight & the Hierarchy: Church, City, and Culture in San Francisco, 1967-2008

Sarah Morris
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American Studies and Political Science

Advisor: Thomas Tweed, University of Notre Dame, College of Arts & Letters, Dept. of American Studies and History

Between the rise of the local counterculture in the 1950s and the Summer of Love in 1967, San Francisco gained a mostly deserved reputation as a bohemian haven for alternative lifestyles and political liberalism. By the 1980s, after the Castro District had emerged as the “Gay Mecca,” its signature progressivism had become recognized worldwide. Yet the Roman Catholic Church also had an influential presence before and after the city became part of U.S. territory in 1848. The network of Catholic parishes and schools nurtured Irish, Italian, German, and Portuguese migrants, and ecclesial leaders not only transformed the built environment between 1884 and 1924, but grew influential enough to enjoy civic clout until the 1960s. Focusing on the period when the Church began to lose its local influence, this thesis explores how three actors—San Francisco’s Archdiocese, municipal and civic governing bodies, and the robust, often eccentric public culture—interacted between 1967 and 2008. Utilizing three illuminating case studies—the obscenity trial surrounding Beat poet Lenore Kandel’s “The Love Book” in 1967, Pope John Paul II’s visit to San Francisco in 1987, and Proposition 8, a 2008 California ballot initiative seeking to make same-sex marriage illegal throughout the state—I tell a complicated story of increasing divergence. Although the Catholic Church’s teachings on matters of economic justice and immigration mostly aligned with the cultural and political leaders’ progressive ethos, this accord was not enough to sustain the Church’s position as the city’s de facto cultural arbiter. Instead, as this thesis will show, contrary views on issues relating to gender and sexuality led to irreconcilable differences, as the Church gradually lost political and cultural influence over the course of those four decades. By 2008, when both Catholic and non-Catholic residents voted against the Archdiocese’s official stand on same-sex marriage, the Church no longer could claim to be a powerful cultural authority.

Tracing Shades of Womanist Theology in the Life of Fannie Lou Hamer

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Advisor: Stuart Greene, University of Notre Dame, College of Arts & Letters, Dept. of Africana Studies and English

Springing from Alice Walker's seminal text *In Search of Our Mother's Gardens*, rooted in the lived experiences of black women, and originating with black female theologians, womanist theology serves as a heuristic for understanding the world, the Christian faith, and black women's place in both. In this paper, I posit that by examining Fannie Lou Hamer's life and work through the lens of womanist theology, students of the Civil Rights movement might better understand the faith- and community-based motivations that drove her activism in ways that have heretofore been ignored. Using biographical details and Hamer's own statements regarding her activism, I apply the term "womanist" to her conceptions of God and her self-expressed charge to lead a life of faith in action. As contemporary activists draw inspiration and guidance from womanist theology's emphases on praxis, inclusive community-building, the inherent agency of black people and the innate value of black lives (especially those of black women), ethical approaches to social justice, and prodding the Black Church and Christianity as a whole to embrace activism as an integral dimension of faith, I conceive of Fannie Lou Hamer as a foremother of womanist theological thought and action. With this paper, I wish to add to the growing body of womanist-influenced scholarship that seeks to reframe and celebrate the often-devalued, yet potent female actors of the Civil Rights movement in order to better comprehend black women's leadership in ongoing anti-oppressionist movements. Keywords: Fannie Lou Hamer, womanist theology

Engineering and Scientific Applications – HL 248

Quantifying Uncertainty of Certain Problems

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Advisor: Waad Subber, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering and Joseph Powers, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

A key part of science and engineering is developing models to predict the future behavior. For realistic predictions, the mathematical models should be calibrated based on experimental data. However, the quality of experimental data is corrupted by measurement error. A number of strategies exist to calibrate mathematical models despite uncertain experimental data, the most common of which is the method of least squares. Bayesian inference is an alternative technique to consider the error associate with the data. Bayesian inference is advantageous because it determines the probability

distribution of the model parameters using prior knowledge and measurement data. Consequently, the confidence interval can be provided and thus the solution is more informative. The advantages of Bayesian inference will be demonstrated on an engineering example of a spring in static equilibrium.

Versatile Nanofiltration Membranes with Plug and Play Chemistries

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Chemical Engineering

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Chemical Engineering

Advisor: William Phillip, University of Notre Dame, College of Engineering, Dept. of Chemical and Biomolecular Engineering

Fresh water is a necessity for survival. As the demand and cost for freshwater increases, research into water purification techniques becomes paramount for the future. Membrane facilitated filtration on the nano-scale offers a method for purifying otherwise wasted water. Membranes fabricated from amphiphilic poly(acrylonitrile-*r*-oligo(ethylene glycol) methyl ether methacrylate) (P(AN-*r*-OEGMA)) can be made with well-defined pore diameters that range from 2.0 to 10 nm. While offering a small and tunable pore size, these amphiphilic copolymer membranes only select based on pore size. As such, these membranes are limited to the size-selective filtration of particles. However, their self-assembled structure offers the opportunity to modify the chemical functionality of the pores. This work discusses the ability to add useful chemical functionality to the pore structure without hindering the size selectivity, structure, or fabrication of the membrane. The chemical environment within the pores of membranes derived from a poly(acrylonitrile-*r*-oligo(ethylene glycol) methyl ether methacrylate-*r*-glycidyl methacrylate) (P(AN-*r*-OEGMA-*r*-GMA)) copolymer can be easily manipulated due to the glycidyl methacrylate (GMA) moieties.

Using facile methods, the GMA moieties can be functionalized in either an aqueous or an organic solution. An aqueous environment offers reaction pathways to incorporate amine and sulfonic acid groups that impart positive charge and negative charge, respectively, to the membrane pores. This functionality allows the membrane to separate ions of different valence based on electrostatic interactions. These membranes demonstrate potential as high performance nanofiltration membranes that can be used to treat reclaimed wastewater or separate biofuel feed stocks. Functionalization in an organic solvent provides a reaction pathway to incorporate fluorinated carbon groups, crown ethers, and other reactants that are not soluble in aqueous environments. Fluorinated carbon groups and crown ethers incorporate promising antifouling moieties into the pore structure.

Leveraging Disturbance Characteristics to Improve Disturbance Rejection in Simulated Biped Robot Walking

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Mechanical Engineering

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Advisor: James Schmiedeler, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

This research aims to improve the efficiency of disturbance rejection in robot biped walkers by exploiting dynamics of a walker's response to a disturbance. This is achieved by exploring via simulation the relationship between disturbance characteristics and the walker's capability of rejecting such disturbances. From these trends, regions within the state space are found that correspond to dynamic stability (i.e. the walker returns to a steady state periodic walking motion) if the state of the walker upon taking the first step after the disturbance is within such a region. Different disturbance characteristics are found to correspond to different stable regions. Controlling the state of the walker such that it is inside the corresponding stable region when taking the next step after a disturbance would improve the stability of the walker in a more efficient manner than current control methods.

Poster Presentations - Session 1

9:00 – 10:15 am

Hesburgh Library North Entrance Gallery

Do I Fit In?: School Climate and Identity Development for Minorities

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Developmental Psychology

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Developmental Psychology

Advisor: Sandra Graham, University Not Specified, Department of Education, Human Development and Psychology

Early adolescence is a critical time for individuals to establish connections with their ethnic group. Previous research shows that having a positive ethnic identity buffers psychological stress and is associated with higher academic achievement. Educators concerned with improving academic success for minorities should understand what fosters a positive ethnic identity. The current study investigated which school factors predicted strength of students' ethnic identity. Surveys were administered to 3,700 seventh graders at 26 middle schools throughout California. Surveys assessed students' ethnic identity, their school's racial climate (fair or discriminatory), and ethnic representation at their school (estimated percentage of students with same ethnicity). The measure of ethnic representation was used to identify participants who perceived themselves to be a minority at their school. Data was analyzed using a regression model. Findings revealed that the effects of being underrepresented on students' ethnic identity significantly varied by school climate. Specifically, being underrepresented had no relation with ethnic identity if a student perceived their school's racial climate to be positive. This suggested that minority students with a positive ethnic identity attended schools with a fair climate. However, students who perceived themselves as a minority at a school with a less positive racial climate indicated having less connection with their ethnic identity and a lower regard for their own ethnic group. These findings suggest that the racial climate of a school plays a key role on ethnic identity for marginalized individuals. Implications from this study support the implementation of diversity programs that promote a more inclusive school environment.

Food Deserts in NYC: Using Geographic Information Systems to Study Food Security in an Urban Environment

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Geographic Information Systems (GIS) is a tool used to analyze spatial data and it has recently been used in several studies to look at food security in the United States and internationally. Food insecurity occurs when people do not have reliable access to good quality and a good quantity of food, and food deserts are urban neighborhoods or rural towns without ready access to fresh, healthy, and affordable food (USDA 2009). New York City has fresh and healthy food readily accessible, but not by all of its residents. As one of the most expensive places to live in the world, good quality food is not always affordable. Are certain boroughs more likely to have food deserts? Do race and socioeconomic status affect the likelihood one will live in a food desert? Are fast food restaurants more common in food deserts? Using data from NYC Open Data and data from the United States Census 2014 National Projections, a map will be created in ArcGIS, showing the probability of food deserts in New York City. Linear regression models will be run on socioeconomic demographics as well as the final model containing

all variables. Preliminary results show several areas on Staten Island, Brooklyn, and Queens as possible food deserts. The Bronx shows the most areas in which food deserts are highly likely. Manhattan shows the least number of possible food deserts, but this may be due to the population density of the particular borough. Racial demographics seem to have no significant effect. The results confirm that New York City does have possible food deserts, which may have some implications in food-related policies. Future studies could include interviews with New York City residents about their food shopping and eating habits. Another possible study would be longitudinal, in which age or a certain generation would be the focus. Maybe younger generations will see food insecurity as more of an issue and access will improve dramatically over their lifetime.

Sex Moderates the Effect of REM Sleep on Emotional Memory Consolidation

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Psychology

Advisor: Jessica Payne, University of Notre Dame, College of Arts & Letters, Dept. of Psychology

Sleep benefits the consolidation of emotional memory. Although previous research suggests that rapid eye movement (REM) sleep may strengthen the memory traces of negatively salient information, it remains unclear if obtaining more REM sleep linearly predicts better memory for emotionally negative stimuli following long delays. The purpose of this study was to determine if the amount of REM sleep during the night following encoding of emotional and neutral stimuli would predict long-term memory performance (i.e. 12hr and 1 week later). To test this, thirty-four healthy undergraduate university students (ages 18-21; 22 females) rated the valence and arousal of 160 images – 80 negative and 80 neutral. Participants in the wake group (n=17) were shown the images in the morning and were tested in the evening before sleeping in the lab. Sleep participants (n=17) were shown the images in the evening and tested for recognition the next morning after sleeping in the lab. Both groups returned one week later for a second recognition session with 160 images (40 negative and 40 neutral from the encoding session, 40 negative and 40 neutral images that were new). REM sleep alone did not significantly predict better memory for negative images. However, further exploration using a multivariate regression analysis revealed that sex was a statistically significant moderator of the effect of REM sleep on emotional memory 1 week later. Specifically, more time spent in REM sleep predicted better memory of negative images for males, whereas time spent in REM sleep was negatively correlated with memory for these images in females. These findings corroborate previous studies indicating that females do not experience the memory enhancing effect of sleep when they are either taking oral contraception or in the follicular phase of the menstrual cycle. Importantly, all of the female subjects of this study were in one of these categories. This preliminary evidence

suggests that sex may be a critical variable to consider in future investigations into sleep and memory consolidation.

Sorption of rare earth elements lanthanum, cerium, and praseodymium to UO₂

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Civil Engineering and Geological Sciences

Advisor: Amy Hixon, University of Notre Dame, College of Engineering, Dept. of Civil Engineering and Geological Sciences

Procedures for tracing rare earth element (REE) signatures are increasingly being developed for use within the nuclear chemistry community. Studying the diffusion of trace elements into and out of solid-phase nuclear materials in contact with water under different aging scenarios may lead to the identification of definitive aging signatures. In this experiment, twelve REEs, lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), and ytterbium (Yb), were mixed with UO₂ powder at pH of 3-10 in order to study sorption over a 9 day period. From this set, La, Ce, and Pr were selected for analysis. Inductively coupled plasma mass spectroscopy (ICP-MS) results show that equilibrium was reached within 24 hours for all three elements and that sorption followed an S-shaped curve, with values of roughly 10-20% sorption under acidic conditions and complete sorption under alkaline conditions. Further research on the sorption curves of other REEs will be important to increase the knowledge of potentially reliable aging signatures.

Juvenile Incarceration in Ireland and the Community Programs Available to Juvenile Offenders

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Neuroscience and Behavior

Advisors: Nancy Michael, University of Notre Dame, College of Science, Dept. of Biological Sciences

The Nanovic Research and Travel grant allowed me to travel to Dublin, Ireland, in order to research juvenile incarceration in Ireland. This research project was a search for information about the Irish juvenile justice system overall, with a specific emphasis on the community programs that are available for the juvenile offenders. During my trip, I was able to have many one-on-one meetings with directors of community programs, tour

their facilities, and learn an immense amount about their specific programs, the probation system in Ireland, and overall trends in the juvenile justice system. Since the establishment of the Department of Children and Youth Affairs and, specifically, the creation of the Irish Youth Justice Service (IYJS) in 2005, Ireland has increased the focus on the effects of juvenile incarceration. The IYJS is responsible for leading and driving reform in the area of youth justice. Numerous programs have emerged in the past ten years in Ireland, focused on juvenile offenders, which aim to achieve these better outcomes. This demonstrated efficacy makes Ireland an ideal place to study what can be done to reduce juvenile incarceration rates in the United States. There is an abundance of literature demonstrating how early life environment influences brain development, and although the explicit studies have not yet been conducted, there should be no doubt that the environment in which these juveniles were raised in contributes a great deal to their brain development, choices, and overall sense of right and wrong, potentially leading to their crime and later incarceration. The juvenile justice system must provide programs that address potential deficiencies in brain function, which result in misconduct and, furthermore, work to enrich their programming while they are incarcerated in order to fundamentally change their behavior. This project is a compilation of my first-hand research on the Irish juvenile justice system, including the efficacy of the community programs that target juvenile offenders, as well as suggestions for implementation in the United States.

Analysis of Dublin's Smart City Initiative

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Grace Hills
College of Arts & Letters
Neuroscience & Behavior

Jennifer Flanagan
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Economics

Advisors: Anre Venter, University of Notre Dame, College of Arts & Letters, Dept. of Psychology and Jay Brockman, University of Notre Dame, College of Engineering, Dept. of Computer Science and Engineering

Dublin is one of the world's leading "smart cities," pioneering projects using sensor data to circumvent issues such as traffic congestion, noise pollution and flooding emergencies. Reports in the news and on the internet can be misleading, however. Our research team intended to investigate the smart city projects being implemented by speaking with Dublin City Council and top academic researchers in the field. We sought to discover how data from sensors is being collected and used, how this sensor technology influences quality of life for citizens and their engagement in urban development, and how such

projects economically impact Dublin overall. Understanding of the development of smart cities is crucially important, as smart city technologies are becoming prominent in many fields. Our own South Bend, IN, is now working to become a smarter, more efficient city by using similar technologies.

We met with Rob Kitchin of Maynooth University, David Prendergast of Intel, Anne Holohan, Brian Caulfield, and Melanie Bourouche of Trinity College Dublin., and finally Jamie Cudden, head of Dublin City Council's Smart City Committee.

Overall, we found that Dublin still has a long way to go. On the economic side, smart city development holds less incentive to pioneer smart city technology than initially thought, as projects are often tailored to a particular city, thus limiting opportunities for future economic gains. Adaptability to other city models is difficult to prove at start making investors hard to recruit. An effort to focus on less nuanced projects will improve economic benefit. Psychologically, the most interesting findings were the lack of awareness amongst the general public and the issue of protection of individuals during the rise of the tech age. Regulations on this front must be addressed before cities can move forward with these projects. From a technological standpoint, Dublin is using simple sensors or data from unlikely "sensors", such as GPS devices or smartphones, to innovatively improve its transportation, energy consumption, and environmental impact. However, there must be more communication between the many projects and with the people of Dublin for this city to grow into a groundbreaking model of the future city.

Improving the Capacity of Kenya to Detect Counterfeit Pharmaceutical Drugs

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Chemical Engineering

Tabitha Healy
College of Science
Neuroscience and Behavior

Advisor: Marya Lieberman, University of Notre Dame, College of Science, Dept. of Chemistry and Biochemistry

A fraction of pharmaceuticals procured within the developing world are of unacceptable quality. Each year substandard or counterfeit drugs kill more than 100,000 people in Africa. This is especially a concern within Kenya, where 25 percent of medicines could be substandard. At the University of Notre Dame, Associate Professor Marya Lieberman's team within the Department of Chemistry and Biochemistry has developed cost effective, high tech paper that uses colorimetric chemistry to detect the presence of certain ingredients in pharmaceuticals, referred to as paper analytical devices (PADs). However, once drugs are flagged, it is important to confirm their deceiving nature through use of High Performance Liquid Chromatography (HPLC). At the Moi Teaching and Referral Hospital in Eldoret, Kenya, Professor Lieberman has been working to set up a lab with HPLC capabilities to enable hospital staff to conduct this type of pharmaceutical analysis on-site. The lab currently has two donated Waters

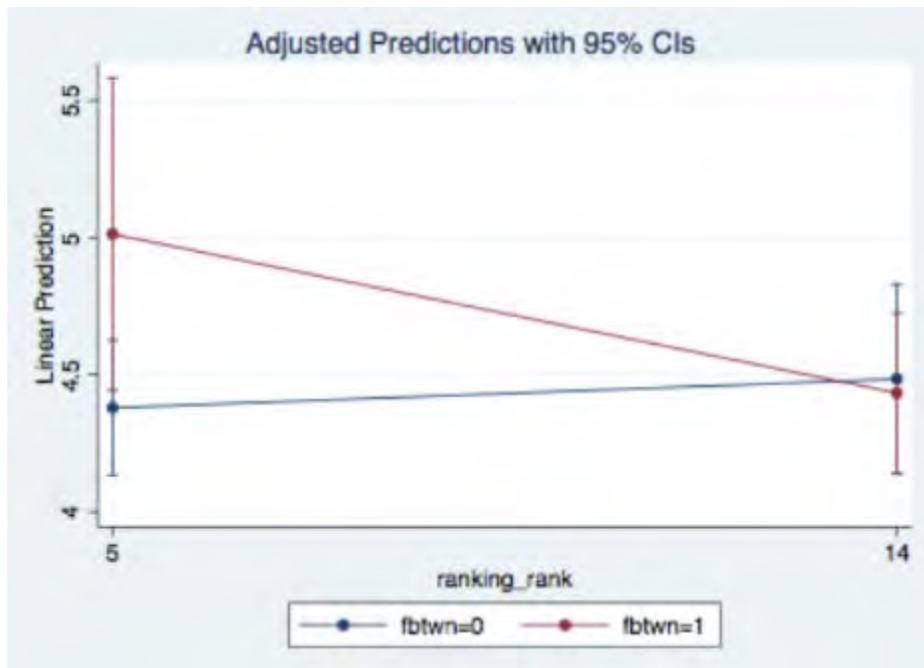
2695 HPLC Systems, which are in poor repair and inadequate to meet their needs. Travel to Eldoret, Kenya was arranged to help train individuals on HPLC methods, repair equipment, and explore an alternative confirmatory assay for amoxicillin and clavulanic acid via Thin Layer Chromatography to serve as a preliminary indicator for the absence or degradation of clavulanic acid. One HPLC machine was successfully repaired. The other required new bearings within its vacuum degasser. Progress was made in the development of an assay for amoxicillin and clavulanic acid. However, reagent scarcity in Eldoret, Kenya limited the resolution that could be obtained.

Social Support, Rank, and Testosterone in Performance Art

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Anthropology

Advisors: Mark Golitko, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology, Gabriel Torres, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology, and Lee Gettler, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology

Previous research indicates that high testosterone levels are advantageous during intergroup competition and public performance, while low testosterone is correlated with greater empathetic behavior. Less is known about the implications of testosterone during intragroup interactions that require both competitiveness and empathy. Here, we studied a college improvisational comedy group to assess the relationships between social support, rank, empathy, and testosterone. These performers are a useful study population because group members must behave cooperatively to successfully compete for castings. Participants (n=19) rated their intragroup friendships (social support) and ranked other members based on importance to the group. We measured salivary testosterone from five separate samples per subject. Members with more social support tended to be ranked lower than those with less support ($p = 0.1$); this effect was more pronounced among women. Group members' empathy and testosterone levels did not relate to their social support or rank (all $p > 0.3$). Lastly, there was a statistical trend for an interaction between social support and rank in predicting testosterone ($p=0.071$), with highly ranked, highly socially supported subjects having elevated testosterone. While our sample size is somewhat limited, these results inform our understanding of the multidimensional behavioral correlates of testosterone during group interactions.



Metastasis on a Chip

Mikyaila Jaramillo

College of Engineering

Chemical Engineering

Advisors: Aleksander Skardal, Wake Forest University, Wake Forest School of Medicine, Wake Forest Institute for Regenerative Medicine

Current models of cancer metastasis are primarily limited to two dimensional culture dishes and in vivo animal subjects. Culture dishes minimize cell interactions by forcing the cells into a planar organization, distorting the behavior of cancer. The use of animals relies on direct parallels to humans for cancer mechanisms and responses while limiting the integration of fundamental species differences. Therefore, these representations are imperfect in application to complex human metastasis and are impractical for further development of cancer treatments. A three dimensional in vitro chip model is proposed which utilizes human cells and mimics cancer spread from the intestine to the liver. The chip is created from polydimethylsiloxane to hold the system and encased in plastic chips to prevent contamination. The cells are suspended in hydrogel organoids which behave as human tissue by providing structure, flexibility, and porosity for cell flux. The gel is derived from hyaluronic acid and gelatin through crosslinking of disulfide bonds of thiols. HEPG2 liver cells and INT-407 intestinal cells are combined with the gel components of their respective organoids. HCT-116 cancer cells are combined with the intestine organoid. UV light is briefly applied to solidify the material. Dulbecco's Modified Eagle Medium (DMEM) is supplied as a nutrient resource and its flow transports cells between the organoids. Marimastat, a matrix inhibitor which limits

tumor growth, is introduced into the DMEM to determine the effectiveness of the system to model drug treatments. The organoids were imaged and the fluorescence of the cancer cells was quantified using pixel concentration. From day 10 to day 16, the intestine and liver organoids showed an overall increase in pixel concentration from 5.01% to 9.78% and 4.13% to 9.02%, respectively. This indicates the gel and DMEM provided an environment suitable for cell transport and tumor growth. After 14 days, the chips were disassembled and a Live/Dead stain was completed on an intestine and liver organoid to illustrate the cellular components.

Europium Sorption to Aluminum (hydr)oxide Mineral Phases

Patricia Kay
College of Engineering
Chemical Engineering

Teresa Baumer
College of Engineering
Civil Engineering and Geological Sciences

Advisors: Amy Hixon, University of Notre Dame, College Not Specified, Dept. of Civil Engineering and Geological Sciences

The presence of radioactive material in the environment due to nuclear weapons production and testing and waste from nuclear power generation requires an understanding of the interaction between these materials and the earth. Radioactive materials remain active for many years due to their long half-lives and pose threats to human and environmental health. Therefore, it is important to know how these materials move and behave so they may be safely stored out to 1 million years as required by law. In this research project, the interaction between europium and aluminum (hydr)oxide mineral phases is studied through a series of batch-sorption experiments to analyze and eventually model sorption behaviors. Europium has an oxidation state of +III and is studied individually as an analog for plutonium, which can simultaneously exist in four different states (+III, +IV, +V, +VI). Aluminum (hydr)oxides are key components of the clay materials proposed for use in a geologic repository for used nuclear fuel and high-level waste and represent three different surface structures that are most commonly encountered in such systems. Current debate in the scientific community centers around whether or not minerals with similar chemical compositions, but different arrangements and surface acidities, have an impact on binding behavior.

Batch-sorption experiments were designed to test the partitioning of europium between the aqueous and solid phases as a function of mineral type, mineral and Eu concentration, and pH. The minerals used, α -alumina (α -Al₂O₃), γ -alumina (γ -Al₂O₃), and gibbsite (Al(OH)₃), were analyzed at the same solid phase concentrations. The concentration of europium in the aqueous phases was monitored as a function of time using mass spectrometry and optical emission spectrometry.

The fraction of europium associated with the solid phases increased with increasing pH for all three mineral phases with sorption behavior changing most around a pH of 6. Preliminary results indicate that europium had similar affinities for all three mineral phases, showing slight differences in surface arrangement and acidity does not affect binding behavior. Ultimately, results of experiments for many concentrations and types of actinides will reveal behavioral trends to model mobility and behavior of radioactive materials in the earth.

use of animals relies on direct parallels to humans for cancer mechanisms and responses while limiting the integration of fundamental species differences. Therefore, these representations are imperfect in application to complex human metastasis and are impractical for further development of cancer treatments. A three dimensional in vitro chip model is proposed which utilizes human cells and mimics cancer spread from the intestine to the liver. The chip is created

Creating a New Urban Center in San Antonio, Texas

Michael Langer
School of Architecture
Architecture and Psychology

Advisors: Jose CornelioDaSilva, University of Notre Dame, School of Architecture, Dept of Architecture and Kimberly Rollings, University of Notre Dame, School of Architecture, Dept of Architecture

The built environment has a significant impact on how we live our lives, yet contemporary architecture fails to add vitality and life to communities. Architecture espouses more than just a building; it should respond to its environment in sensible and sustainable ways, build in response to its context, and create spaces which encourage community contact and pedestrian traffic. One city with a strong downtown center is San, Texas. It is most successful around the River Walk region because it creates a walkable and pleasant area with commercial activity. Yet, there are some missed opportunities in San Antonio in which the River Walk was not utilized. This, to me, was most evident with the location of the San Antonio Public Library. Libraries are entering a renaissance of sorts and have been changed from acting as simply places of learning, but also places of collaboration and group meetings. They should be utilized as urban centers. The library had been designed off the River Walk and is in a location surrounded by large, assuming streets and parking lots and garages. It is a dead community. If the library had been designed instead two blocks south, it would be on the curve of the River Walk which would allow for greater tourist and local access from traffic on the River Walk. Having this idea in mind, a trip to San Antonio was taken to understand the site, to engage with the zoning board, and gather information, as a true architect. Photos and measurements were taken to document the site and meetings were arranged with different government groups to understand the laws. A further concern in architecture is creating architecture which helps create an identity of place. As such, older and historic building were also documented to get a sense of the character of

San Antonio architecture to find ways in which the building design could be understood as a Texas building. The final result is my integrative design which is composed of an urban proposal for a new Arts District and a new San Antonio Public Library, fully accessible from and taking full advantage of the River Walk.

Modular UAGV: DISCOVER Lab develops working prototype for modular land-air drone

Andrew Lasher
College of Engineering
Mechanical Engineering

Marcel CachovadePaiva
College of Engineering
Electrical Engineering

Advisors: Xiaobin Zhang, University of Notre Dame, College of Engineering, Dept. of Electrical Engineering, Bo Wu, University of Notre Dame, College of Engineering, Dept. of Electrical Engineering, and Hai Lin, University of Notre Dame, College of Engineering, Dept. of Electrical Engineering

The Distributed Cooperative Systems Research Laboratory (DISCOVER Lab) is committed to designing systems of autonomous agents that dynamically, robustly, and cooperatively achieve a common goal. These agents consist of unmanned aerial vehicles (UAVs) in quadrotor and stacked propeller configurations, and unmanned ground vehicles (UGVs). This research seeks to combine the advantages of both land-based and aerial robotics in a single land-air drone. The objective of this research is to conduct a feasibility study for a modular unmanned aerial and ground vehicle (UAGV) that combines the simplicity and stability of UGVs with the versatility and large travel range of UAVs. Through the use of modeling software and rapid prototyping technologies, researchers at the DISCOVER Lab are developing a working prototype of a land-air drone that consists of a number of identical modules. Modularity allows the drone's size to easily be scaled according to its mission. Each land-air module utilizes a coaxial helicopter configuration mounted to a triangular omni-directional wheel platform. This arrangement allows each module four degrees of freedom in flight and three degrees of freedom in ground travel. The alignment of permanent magnets on the outer side of each wheel establishes structural connections between modules. Each module's onboard controller analyzes gyroscope and inertial measurement unit (IMU) readings to stabilize the pose of the UAGV through controlling two propellers, two thrust vectoring servos, and three wheel servos. Success of the prototype will be judged according to whether the UAGV modules can (1) engage in stable and governed flight, and (2) engage in governed ground travel, and (3) engage and disengage structural connections with other modules. This research aids in the design of autonomous systems to be used in rescue operations or remote data collection. The flexibility offered by modular UAGVs will simplify the mission planning and allow the

autonomous agents to adapt in size and shape according to the requirements of different tasks.

Characterization of Biofilm Growth and Performance on Membrane Aerated Biofilm Reactor (MABR) Technology

Monica McFadden
College of Engineering
Environmental Engineering

Advisor: Robert Nerenberg, University of Notre Dame, College of Engineering, Dept. of Civil Engineering and Geological Sciences

Several analyses were performed to characterize biofilm growth and nitrification fluxes on a Zeelung® Membrane Aerated Biofilm Reactor (MABR) membrane bundle. MABR is a potentially transformative technology that uses gas-supplying membranes to achieve high oxygen transfer efficiencies during the aeration process in wastewater treatment, thus greatly decreasing energy requirements. MABRs can also remove total nitrogen (TN), and may minimize emissions of nitrous oxide (N₂O) and volatile organic carbons. The nitrification flux was monitored for a membrane assembly grown in bulk solution under maximum growth rate conditions. The flux improved with time, as the biofilm thickness increased. Subsequent experiments monitored nitrification flux for a membrane assembly in a flow cell in the presence of low BOD concentration. Data were compared to experiments without BOD; it was found that the presence of low concentrations of BOD has a detrimental effect on nitrification rates.

Microscopy revealed that biofilm readily attaches to many surfaces of the membrane bundle, including the yarn-based core, when sufficient oxygen is present. Biofilm was thickest at the bundling fibers, which provided a point of attachment and protection from hydraulic shear. DNA extraction was performed on the biofilm to identify the relative proportions and locations of heterotrophic and autotrophic bacteria throughout the system. Though the DNA analyses have not yet been completed, it is expected that nitrifying autotrophs grow closest to the membrane, while heterotrophic organisms form the outermost part of the biofilm.

Global Health Immersion in Ethiopia

Angela Patel
College of Science
Neuroscience and Behavior

Advisor: Cecilia Lucero, University of Notre Dame, College of Arts & Letters, First Year of Studies

In the USA, a patient-centered, team-based, and physician-administrator partnership model of integrated practice, education, and research has been evolved at Mayo Clinic for over 150 years. There are many factors to consider when trying to apply the key

principles from such models of integrated delivery to other areas of the nation and world. Linguistic, technologic, educational, and cultural barriers remain unmoved in some measure. In addition, the United States has a physician density of 2.45 physicians/1,000 population (2011). In comparison, Ethiopia has a density of 0.03 physicians/1,000 population (2009)—the third lowest ratio in the world. Inevitably, the lack of physicians is only a partial representation of some of the larger issues that Ethiopia's healthcare system faces. Hence, several programs and collaborations have been established in an effort to improve interprofessional health education and practice in Ethiopia.

For the past 10 years, several teams from Mayo Clinic have been partnering with various agencies and officials in African countries to build capacity for collaborative learning, health workforce development, and academic advancement towards improved population health outcomes. The successes and failures of the Continuing Medical Education (CME) conference, which covers topics concerning the advancement of knowledge and skills related to medical, surgical, and interprofessional health education, offers invaluable insight into the design of effective international partnerships and vocational training teams. Through experience and relationship there is hope in moving forward. The immersion illuminated several challenges encountered by external educational partners and organizations such as Mayo Clinic when engaging in educational outreach and transcultural dialogue. This report describes some of the recent challenges and strategies used to support CME infrastructure and health professional development within the Ethiopian context.

Companionship Caregiving and Moral Development in Preschool Children

Kallie Renfus
College of Arts & Letters
Psychology

Advisor: Darcia Narvaez, University of Notre Dame, College of Arts & Letters, Dept. of Psychology

Purpose: This project seeks to examine the relation between parent and teacher attitudes and behaviors and child sociomoral development. By examining children ages 3-5, their parents, and their preschool teachers, we hope to get a cross-section of the life and development of the child. The results will provide a perspective on the relative impact of teachers, as well as parents on children's moral development. First we examine how consistent parent and teacher attitudes and behaviors are with the evolved developmental niche (EDN), which is a measure of responsive caregiving towards children. We expect that a higher consistency with the EDN will coincide with higher scores on measurements of sociomoral development, assessed through parental and teacher report surveys.

Procedures: Approximately 55 mothers, 55 children, and 11 teachers were recruited through a preschool center. Parents and teachers were surveyed in order to assess the extent to which their attitudes and behaviors aligned with the EDN. This survey looked at the perceptions of the ability of both parents and teachers to recognize a child's needs,

their perceptions of the child's moral development, and asked about the adult's own moral orientations.

Expected Results: We expect the data to be analyzed using multiple regression. We predict that more EDN-consistent parenting will relate to higher scores of sociomoral development in children. We also hypothesize that the more the attitudes and behaviors from teachers are consistent with EDN-consistent parenting, the greater the children's scores of sociomoral development will be.

Conclusions and Implications: The results of this study have the potential to help us to better understand the impact that parents and teachers have on the moral development of children in today's culture. This information could be used to work to foster positive sociomoral development in children, and could have a larger effect on the moral development of society in the future.

Polymer-Templated, Quantum Dot Solar Cells

Margaret Tucker
College of Engineering
Civil Engineering

Advisor: Ian Lightcap, University of Notre Dame, College of Science, Center for Sustainable Energy

Traditional solar cells use only one semiconductor with a fixed bandgap, therefore it can't absorb photons with a lower energy than the bandgap and all the excess energy that is used to excite the electrons into states above the valence band of the single semiconductor in the cell is lost. The resulting efficiency losses are the largest deterrent for the commercial use of solar cells. Quantum dot solar cells would decrease the excess energy loss by introducing multiple semiconductors of different diameters which have different bandgaps to the cell. To achieve this cell, highly porous TiO₂ substrate has been created and filled with polymer. The polymer will be gradually dissolved and different sized quantum dots will be deposited at different depths in the film. The creation of stratified layers of these quantum dots of different bandgaps will allow for the efficient collection of photons of different energy levels.

Predicting Footbridge Dynamic Characteristics in the Conceptual Design Stage from Smart Phone Data of Existing Footbridges

Savannah Washlesky
College of Engineering
Civil Engineering

Maria Gibbs
College of Engineering
Civil & Environmental Engineering & Earth Sciences

Advisor: Ahsan Kareem, University of Notre Dame, College of Engineering, Dept. of
Civil & Environmental Engineering & Earth Sciences

Many people in developing countries around the world living in rural communities become isolated because of seasonal flooding in surrounding rivers. The construction of footbridges in these isolated areas increases the community's access to schools, healthcare, and economic opportunities. The dynamic characteristics of suspension footbridges in the developing world are unknown during the design stage, making it difficult for designers to predict and mitigate wind-related vulnerabilities of conceptual designs. This project analyzed previously collected smart phone sensor data from suspension footbridges in Central America, South America, and Africa using a MATLAB code. The code dissected the sensors' vertical pluck acceleration data and calculated frequency and damping ratio values for each footbridge. The data was analyzed within several frequency regions to identify multiple bridge frequencies. The collected frequency values for different modes (lateral, vertical, and torsional) were tabulated and modeled in a multiple regression analysis code against bridge design parameters such as span, cable modulus of elasticity, and tower height. This 3D best-fit regression is a tool that allows a user to input theoretical bridge design parameters to determine a bridge's expected frequency. This research project contributes to a larger body of knowledge surrounding how suspension footbridges act in strong winds and the appropriate mitigation to stabilize them to promote safer crossings.

Oral Presentations Session 2
10:30 am – 11:30 am

Human Conditions Through the Written Word – HL 103

The Meaningful but Impersonal Immortality of the Aristotelian Human Soul through the Agent Intellect

Sean Costello
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Economics and Philosophy

Advisor: Sean Kelsey, University of Notre Dame, College of Arts & Letters, Dept. of
Philosophy

Aristotle is, certainly, one of the most rigorous philosophers to ever live. Besides being a brilliant ethicist, biologist, and metaphysician, he treated what was, perhaps, the first systematic account of the soul in his *De Anima*. This paper is engaged with answering the

question “Does Aristotle believe the human intellect is immortal and, if so, is it a meaningful, personal immortality?” The crux of the argument concerning immortality lies in a single chapter of Aristotle’s psychological treatise, *De Anima* (Book 3, Chapter 5), where Aristotle mentions an intellect whose essence is activity (the agent intellect). In order to establish the immortality of *human* souls I construct an argument consisting of two premises: (1) the agent intellect is a part of the human soul and (2) the agent intellect is immortal and separable. The conclusion is, of course, that a part of the human soul is immortal. This argument is refined several times throughout the paper, and a multitude of objections – such as the claim that the agent intellect is really the Divine Intellect or that thinking is impossible without imagination – are raised and responded to, with the final conclusion being that Aristotle *does* believe in the immortality of the human soul. From here I argue that, based on a distinction between meaningful and personal immortality posited by Bernard Williams, it is likely that, after death, the immortal agent intellect lives a meaningful life (i.e. one involving transformative interactions), though not a personal one (i.e. one without recognizable and familiar character traits) due to the extremely different non-physical nature of post-bodily existence.

Fragmentation and Modernity in David Foster Wallace’s The Pale King

Charlie Ducey
College of Arts & Letters
English

Advisor: Matthew Wilkens, University of Notre Dame, College of Arts & Letters, Dept. of American Studies and English

The research component of my senior thesis investigates the unfinished status of David Foster Wallace’s posthumously published work *The Pale King* (2011), which concerns the lives of IRS employees. Since the novel was assembled into a merely fragmentary suggestion of a novel by Wallace’s editor Michael Pietsch, my main research question asks how we can best understand, and subsequently what we can glean from this work as a set of fragments. With the critical acclaim garnered from his magnum opus *Infinite Jest* as well as numerous pieces of journalism and short fiction, Wallace belongs to a widely influential group of American literary figures, such as Thomas Pynchon and Don DeLillo, whose writing shapes cultural and artistic understanding. *The Pale King* in particular calls into question the meaningfulness of work and the sources from which we derive meaning in the post-industrial world. Though Wallace’s death leaves us shortchanged with a novel of fragments, for a writer of Wallace’s status even these fragments deserve thorough inquiry.

To approach these questions, I draw both on existing scholarship of Wallace’s literary work as well as archival work conducted at the Harry Ransom Center (HRC) at the University of Texas at Austin, where Wallace’s papers, including those used by Pietsch to construct *The Pale King*, are housed. While scholars usually begin with the themes of *The Pale King*, such as boredom and civics, I start from the very form of the work. I contend that form fits function in this whirlwind of a book, as the fragmentary structure

Advisor: Eileen Hunt Botting, University of Notre Dame, College of Arts & Letters,
Dept. of Political Science

Cable and streaming television has altered the way viewers access and perceive government. Television connects Americans with the institution under which they live not only through news broadcasts, but also through fictional representations of the government in political dramas. How do monologues in political dramas represent classical political theories? I argue that if American political dramas embody perspectives on the American regime, then *The West Wing* embodies Plato and Aristotle's related political philosophies while *House of Cards* embodies Machiavelli's political philosophy. Comparing Plato's *Republic*, Aristotle's *Nicomachean Ethics*, and Machiavelli's *The Prince*, I examine how classical political philosophy – concerning the role of the regime's leader and the government's telos – is present in Josiah Bartlet and Frank Underwood, the American Presidents in *The West Wing* and *House of Cards*, respectively. Bartlet and Underwood are known for monologues indicating their views on the teleology of the regime. In the cable television and Netflix era, viewers may look at the American institution as either a common good and virtue-enhancer or as a divisive, self-serving vehicle where the simple aim is power. These two shows engender and/or influence public perceptions on real world politics.

Literature & the Creative Process – HL 129

Abul-Abbas the Elephant: a Research-Based Illustrated Children's Book

Karen Neis
College of Arts & Letters
Medieval Studies

Advisors: Li Guo, University of Notre Dame, College of Arts & Letters, Dept. of Classics, Maria Tomasula, University of Notre Dame, College of Arts & Letters, Dept. of Art, Art History, and Design, and Linda Major, University of Notre Dame, College of Arts & Letters, Dept. of Medieval Studies

My senior honors project is an illustrated children's book called *Abul-Abbas the Elephant*. It is a standard 32-page book, which means I am creating 16 15"-22" illustrations which will each be printed across two pages. The subject of the story is the journey of the elephant Abul-Abbas, who was given to Emperor Charlemagne by the caliph Harun al-Rashid around the years 801-2 AD. The elephant, and an assortment of other gifts, were handled by the Carolingian emissary Isaac. The story appeals to me because it demonstrates political cooperation between a Muslim, Christian, and a Jew at a time which many people assume was "barbaric." I believe that children – and adults – of the twenty-first century should hear more stories of interreligious dialogue of the past. I chose to focus on the elephant since I hope to appeal to children's sympathy for animals, and I will also focus on themes of homesickness and trust.

The illustrations are inspired by art produced in the Carolingian Renaissance and

the Abbasid time period. I am using Carolingian illuminated manuscripts, such as the Lorsch Gospels and the Utrecht Psalter, for references. I am also using Abbasid frescoes, such as those from the palaces of Samarra, and other works, such as tapestries and vases. Other, more distant sources are the decorative mosaics of the Dome of the Rock and a mosaic of an elephant boarding a ship in Piazza Armerina. I am using colored pencils, markers, ink washes, and ink pens.



A Fabric of Traces: A Deconstruction of “We All Walk Away, But We Do Not Leave”

Mc Kenzie Hightower
College of Arts & Letters
English

Advisor: Steve Tomasula, University of Notre Dame, College of Arts & Letters, Dept. of English

E.M. Forster once said, “We move between two darkneses,” between birth and death, nothingness and nothingness. This conjures up an immense liminality for me, creatures suspended in the sticky goo of life, struggling to move and be and love within a space of negation, of perpetual dying. These two darkneses complicate time as well, fusing the past and the future. What is the present supposed to do in the face of such unity? It is compressed, made the opposite, the antagonist, the Other. There is something slightly uncanny about the present when thought of in this way, as if it is a violation of a natural

state, a struggle against a void. Naturally, as with any thought of a perpetual present, stagnancy permeates, interiority and subjectivity contending with the inescapable traces of the past and the future. This struggle—and the grotesque beauty that accompanies it—is the subject of my interconnected collection of short stories, “We All Walk Away, But We Do Not Leave.” The collection “functions as a transgressive activity which disperses the author as the centre, limit, and guarantor of truth,” as J.C. Young might put it. This fracturing of author/text/meaning is vital, because it allows for genre to also be violated. Within this collection, fabulism and realism are conflated; interanimating each other in such a way that they are endlessly circling around an axis of connection and progress that is just out of reach.

Farfield, the fictional East Texas town that is the setting of each story, binds this collection together thematically and stylistically. Spanning from when the Comanche’s still road through east Texas to the dusty modern era that never quite found the town, the narrative proceeds through time in a circular fashion. It loops through generations in reverse, sons studied before mothers, and is heavily preoccupied with love, whether for a child, a departed relative, or an estranged wife. The form of the collection itself changes with each new perspective: from micro-stories to text informed by images. Each plot is different in each successive story, but all are tied together by their connection to Farfield, a broken and stagnant place.

Shakespeare, Middleton, and Ambiguous Witchcraft

Michael Vaclav
College of Arts & Letters
English and Philosophy

Advisor: Jesse Lander, University of Notre Dame, College of Arts & Letters, Dept. of English

The text of Macbeth that we know today, and commonly attribute entirely to William Shakespeare, was in fact significantly revised in 1616, ten years after its initial performance, by Thomas Middleton. The most substantial change that Middleton brought to the play was the expansion of the role of the infamous witches and the addition of their leader, Hecate. While the textual details of this revision have been extensively studied, little attention has been paid to how Middleton actually changed the characters of the witches in a thematic sense and, in turn, affected the play as a whole. This is a consequential claim because Macbeth is widely read and often held up as a quintessentially “Shakespearean” play. Taking Middleton’s authorship into account is not only of interest to academic study, it also provides an opportunity to reconsider the popular perception of Shakespeare as an isolated genius writing his works for immediate canonization.

My study of the Weird Sisters of Macbeth places them alongside many other portrayals of witches on the early modern stage. By evaluating similar figures in other plays that were produced around the same time, I draw attention to details that are commonly found among these witches in order to draw as clear a picture as possible of what constitutes

witchcraft on the early modern stage. I then consider the Weird Sisters of Macbeth in both their original, Shakespearean iteration and their later Middletonian versions. While the Weird Sisters that we see in the text today clearly fall under the definition of the traditional English witch, Shakespeare's original Weird Sisters were much more ambiguous and defy concrete classification. To refer to Shakespeare's "witches" is misleading. This label creates the false idea that Shakespeare wrote the Weird Sisters to be traditional witches, and more importantly, it fails to acknowledge the significant impact that Middleton had on Macbeth.

Examining Standardized Educational Policies – HL 222

Putative Punishment Fuels the School-to-Prison Pipeline for At-Risk Students

Savannah Kounelis
College of Science
Biological Sciences

Advisor: Iris Outlaw, University of Notre Dame, College of Arts & Letters, Dept. of Sociology and Emmanuel Cannady, University of Notre Dame, College of Arts & Letters, Dept. of Sociology

Putative punishment and so-called zero-tolerance policies in public schools across the United States impose severe consequences for a specific set of actions regardless of circumstances. The increased utilization of putative punishment increasingly causes schools to bypass due process for students facing suspensions and expulsions. Additionally, there is a direct relationship between the enforcement of zero-tolerance policies and the number of suspensions and expulsions across the U.S. and specific groups of children are more prone to receiving putative punishment than others. Children of color and special needs students are disproportionately affected by these rules, and are thus more likely to be suspended and/or expelled than other groups of children. Research has shown that black children and children with disabilities are 31% more likely to be suspended, expelled, or arrested than their white or able-bodied counterparts for performing the same behaviors (ACLU, 2012). This fact is a major contributor to the school-to-prison pipeline, in which increased risk of suspension/expulsion places these kids at higher risk of dropping out of school and concurrently at higher risk of entering the juvenile justice system. Students who face suspension and expulsion are 3 times more likely to be in contact with the juvenile justice system in the year following their punishment (ACLU, 2012). Through analysis of available literature on these phenomena, I will show that putative punishment is a defective and detrimental rule system used in the majority of public schools today. I will then provide evidence to show that these zero-tolerance policies target specific groups of children, directly putting them at risk of entering the juvenile justice system. Additionally, I will offer alternative methods of enforcing school rules that won't fuel the school-to-prison pipeline.

Graduating High School in Indiana with a Cognitive Disability

Jacqueline Mack
College of Arts & Letters
African Studies and English

Advisors: Iris Outlaw, University of Notre Dame, College of Arts & Letters, Dept. of Sociology and Emmanuel Cannady, University of Notre Dame, College of Arts & Letters, Dept. of Sociology

The public education system in the U.S. has been a topic of contention for a number of years among students, parents, educators and politicians alike. Federal budget cuts, No Child Left Behind, poor nutritional options, gaps in access to resources and growing classroom sizes are just a few of the problems that exist within the system. But even though things like a lack of funding and sub-par food affect students across the board, there are certain groups that bear a heavier burden than others. The purpose of this research is to explore the education laws and guidelines for public schools in the state of Indiana and how they relate to individuals with cognitive disabilities. I will explain specific statutes and use statistical findings to provide context for the information being provided. I am doing this in an effort to bring to light how marginalized individuals within this community are uniquely targeted and blocked from successfully exiting Indiana's public school system and progressing thereafter. In an effort to further build upon my research, I would like to add the personal narratives of individuals and families who have struggled with this particular issue. As crucial as it is to rely on facts and numbers, the stories of lived experiences are important in their own right and deserve to be produced as valuable research, as well. It would also be worthwhile to examine how other states compare to Indiana in terms of graduation access for individuals with cognitive disabilities.

A Payoff Worth More Than Money: Or, Writing a Meaningful Case Study for Classroom Use

Zachary Myszka
Mendoza College of Business
Accountancy and History

Claudia Kulmacz
Mendoza College of Business
Business Undeclared

Jennifer Prosser
Mendoza College of Business
Business Undeclared & Political Science

Advisor: Jessica McManus Warnell, University of Notre Dame, Mendoza College of Business, Dept. of Management

This case study explores global business ethics and virtuous supply chain management and how these issues could be discussed in a classroom. By painting the picture of Dikembe Dabo, a struggling Congolese miner, and Tim Anderson, a tech innovator and up-and-coming entrepreneur, this case study challenges readers, and particularly students, to consider a possible scenario from multiple perspectives. The authors were three business students under the leadership of a Mendoza College of Business faculty member and the outgoing Chief Ethics Officer of the United Nations, a visiting lecturer at Notre Dame, who were part of a group of eight students selected to work on the case project. The world of business is becoming increasingly globalized in response to technological change and consumer demand. Now and in the future, business leaders are being called to adapt to a company's global needs and answer increasingly complex problems that bring together law, ethics, and business savvy. Through research of governmental policies and the history of the Democratic Republic of the Congo, this case study presents a comprehensive, yet open-ended opportunity for teachers to engage students in ways that they find interesting and challenging. Further consideration is given to the possibility of creating a course focused on writing and presenting complex business ethics cases. The research involved in writing the case, analysis and teaching note allows for in-depth exploration of issues introduced in business courses, and for student engagement in developing materials for understanding complex international business issues.

Cycles of Inequality – HL 222A

Capitalism and the Cycle of Poverty

Ralph Price
Mendoza College of Business
Program Not Specified

Advisor: Emmanuel Cannady, University of Notre Dame, College of Arts & Letters, Dept. of Sociology and Iris Outlaw, University of Notre Dame, College of Arts & Letters, Dept. of Sociology

This research paper seeks to address the extent to which free enterprise mechanisms address three primary areas which contribute to the cycle of poverty: 1) lack of businesses and employment opportunities, 2) lack of access to capital and 3) lack of access to child care. Each area serves to demonstrate whether or not a free market system succeeds in providing the needed services which would assist individuals in overcoming poverty. For each area, I will demonstrate how the private sector has responded to the demand in low-income areas as well as the role of the public sector and the services they provide. Through preliminary research, I've discovered that low-income areas are severely lacking opportunities and access to low cost services in comparison to higher income areas, despite the greater need in the former. I will also demonstrate how the cycle of poverty is exacerbated by the lack of access to these services which would typically be provided in abundance by the private sector in more affluent areas. The primary purpose of this research is to identify the shortfalls of the free enterprise system

in attempting to alleviate income disparities and structures which sustain poverty. My analysis will not go so far as to provide specific solutions to each area but rather, identify weaknesses in capitalism and the idea that individuals who work hard enough can eventually break the cycle of poverty. For my analysis, I will be relying on research reports, information on state and federal programs and other peer-reviewed articles.

Inverse Inequality: How Both Genders Navigate Identity Amidst the Sexual Double Standard of Hook-up Culture in College

Shannon Sheehan
College of Arts & Letters
Gender Studies and Sociology

Advisor: Mary Ellen Konieczny, University of Notre Dame, College of Arts & Letters, Dept. of Sociology

Recent social literature has focused on the prevalence of ‘hook-up’ culture as the primary medium for romantic relationships in college. However, despite the liberalization of attitudes towards sex – sex outside of marriage and sex between people regardless of gender, women are still defined by their sexual activity in a way that men are not. This phenomenon is referred to as the sexual double standard. Previous studies have identified the existence of the sexual double standard in college hookup culture, however they have largely ignored the detrimental affect that the sexual double standard has on men, specifically since traditional notions of heterosexual masculinity value sexual conquests. Concern over consequences for deviating from social norms lead to the internalization of inferiority, allowing those who violate the norms of the sexual double standard, to experience negative affects on self-esteem. In this thesis, I identify pockets of inegalitarian gender ideology that inform identity construction – these are mechanisms for the conservation of gender inequality. I utilize a survey from a random sample of the Notre Dame Class of 2016, based off of the 2011 College Social Life Survey designed by Paula England. Questions focus on attitudes and behaviors related to sexuality and measures of identity. I hypothesize that gender has a moderating affect on the relationship between sexual activity and identity. Virginity can serve to protect women from stigmatization, however men are scrutinized for not participating in hookup culture, meaning that virgin men may in fact experience stigmatization and shame similar to that of casually sexually active women. Subsequently, virgin men and casually sexually active women have the lowest composite identity scores, and highest reports of negative feelings related to sexual encounters of all survey participants. These findings hold important implications for the conservation of gender inequality and identity formation during a critical time of the young adult life phase, where college students are developing conceptions of their ‘self’ and preparing for adult life.

Minority Perspectives on Race in the U.S. – HL 248

SO WHAT'S FUNNY?: UNDERSTANDING BLACK HUMOR ON THE WEB

Ijeoma Ogbogu
College of Arts & Letters
Anthropology

Advisor: Alex Chavez, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology

Storytelling, limericks, songs, puns, and many other face-to-face avenues of both delivering and receiving humor are an integral part of the human experience. Part of humor's utility is its ability to reinforce bonds of sociability and shared identities through face-to-face interactional settings that are fundamentally embodied. With the recent and rapid emergence of the internet—alongside social media platforms—a new type of jocularity has emerged that I term “digital humor.” This new form offers both opportunities and limitations—mass proliferation and disembodiment, respectively. This paper explores the relationship and tension between these two aspects of digital humor through the window African-American humor, specifically. Humor has been a binding agent of the African-American experience in ways that comment both directly and subversively on racial hegemony. It has been an avenue for African-Americans to exert power, relieve frustrations, and criticize—in other words, signify his or her position, attitudes, and stance in a hostile world. With this history in mind, I explore digital humor on black twitter, world star hip-hop, etc. in order to reveal how humor changes once it goes beyond face-to-face interaction, beyond traditional settings that rely on an embodied singular shared “Black” identity and ask: what happens in virtual contexts that are disembodied? I contend that this sense of shared identity becomes fractured along the lines of race, phenotype, class, and gender precisely because it is disembodied, distanced, and therefore available for critical scrutiny that calls into question what Black identity is and who gets to claim it. This area of inquiry is of importance, particularly given the recent emergence of movements such as Black lives Matter, Unapologetically Dark, and other race-centered initiatives that have strong digital components and that are entirely about the experience of black bodies and black expression. This work builds on and integrates the fields of cultural anthropology, media studies, linguistic anthropology,

The Division and Unification of the African American and Latino Communities

Melissa PechFigueroa
College of Engineering
Computer Science

Advisor: Emmanuel Cannady, University of Notre Dame, College of Arts & Letters,
Dept. of Sociology and Iris Outlaw, University of Notre Dame, College of Arts & Letters,
Dept. of Sociology

The United States of America has a long history of troubled race relations. Traditional research has focused on the binary model of black and white relations, with much omission in substantive research pertaining to other minority groups. As the cultural landscape of the United States changed, researchers began to focus on the relationship between brown-white relations, but still using whiteness at the focal point of that relationship. Now due to the ever changing demographics of the United States where traditionally marginalized minority groups such as the Latino population are estimated to become a demographic majority by 2044, effectively converting the United States into a majority-minority nation, it is becoming increasingly important to study the interactions of the two largest minority groups: African Americans and Latinos (US Census Bureau, Projections of the Size and Composition of the U.S. Population: 2014 to 2060). This research paper will focus on the relationship between the African-American and Latino communities, particularly within urban cities such as Houston, Chicago, and New York with a primary focus on Los Angeles. Urban cities provide an excellent focal point in race relations due to the diversity of life within the cities, providing miniature models of the projected demographic of the entire United States. According to the United Nations, 66% of the population will live in cities as the world's population becomes increasingly urban. Within the major cities, I will look at the complex historical race relations between the two groups, taking into account incidents of conflict, tension, and cooperation, leading all the way to the current status of contemporary race relations between the African American and Latino communities. Through a close examination of the intersections of the two groups, I hope to highlight these areas of contention, improvement, and cooperation, taking into consideration the reasons why events unfolded in such a way, learning from the positive and negative outcomes of each action, for the main purpose of proposing a model for future successful collaborations

Poster Presentations Session 2

10:30 – 11:45 am

Hesburgh Library North Entrance Gallery

Facial Expression Recognition

Diandra Akemi Alves Kubo

College of Engineering

Computer Science

Advisor: Patrick Flynn, University of Notre Dame, College of Engineering, Dept. of
Computer Science and Engineering

Human facial expressions are one of the most important channels of communications, and can be reliably used to understand the states of the mind. In fact, when verbal

communication is not available or not possible, analyzing one's facial expression can be a reliable way to label emotional state. Marketing firms have invested in facial expression analysis as part of their efforts to measure reactions and levels of interest of customers; by contrast, healthcare companies are studying the technology as they search for better ways to assist those who cannot verbally express their needs. As a result of this interest, many facial expression recognition algorithms and methods have been developed. We review the literature, characterize the different classes of methods, and run experiments on algorithms from these different classes to get tangible results. We undertook an analysis and evaluation of these methods as a first step to choose which one is the best for an application. Tests were made on the JAFFE and BU-3DFE Databases, which contain images covering the six basic emotions and the neutral expression. Initially, three methods were used. Clmtrackr, a motion and feature based javascript library that uses a linear classifier to determine the expression; Eigenfaces, a deformation method that uses eigenvectors as features along with a simple Nearest-Neighbor classifier; and the Microsoft Project Oxford API, a facial expression recognition web service. On both datasets, two types of tests were made: a test verifying the performance of each classifier and a test verifying the performance on the images that contained expressions that all algorithms were able to identify. Clmtrackr had the worst performance and had trouble finding faces on the images, the Eigenfaces performed just above random chance, and Microsoft's API achieved the best performance, although its accuracy did not exceed 70%. This indicates a need for a new and different approach to the problem. We aim to use deep neural networks as a first step in the feature extraction from the images with the Caffe framework and then make use of more advanced machine learning classifiers, such as Support Vector Machines as the final classifier.

Inter-Hospital Project on Improving End-Life-Care in the Michiana Region: A Consultation Research Project

Shaley Albaugh
College of Science
Neuroscience and Behavior

Advisor: Dominic Vachon, University of Notre Dame, College of Science, Dept. of Preprofessional Studies

With improved health care unsurpassed by any era, Americans are living longer than their predecessors. By 2030, more than 20 percent of U.S. residents are projected to be aged 65 and over. Yet, with improved health care and longevity more and more people, old and young, are living with chronic health conditions that they must manage until they die. As of 2012, 117 million people—about half of all adults—had one or more chronic illnesses. Many health care organizations are concerned with their patients with chronic diseases, especially with those managing their illnesses toward the end-of-life. Fortunately, several solutions to end-of-life care have emerged in the 20th century: the fields of hospice and palliative care. Hospice care provides holistic care in the last months of life while palliative care provides effective, specialized medical care for patients with serious,

chronic illnesses. Many health care leaders in the Michiana area have grown concerned about effective end-of-life care and seek to improve their community's ability to deal with end-of-life challenges. Regional hospital systems in the Michiana area have approached the Ruth M. Hillebrand Center for Compassionate Care in Medicine for consultation. Reviewing the recent literature and interviewing local hospitals in the Michiana region, The Ruth M. Hillebrand Center for Compassionate Care in Medicine explored the emerging fields in end-of-life care and identified problems for both individuals and health organizations. The overall aim of the review was to gather relevant information to help articulate problems and barriers for local, potential end-of-life programs at an inter-hospital meeting. In this systematic review of the literature, we identified 6 key themes that can affect the utilization and implementation of palliative care: societal perspectives, advanced care planning, communication issues, physician attitudes, financial aspects, and organizational wide training. We observed that the most successful end-of-life care programs incorporated these themes into their health systems which lead ultimately to improved health care quality.

Cafeteria Assessment for Elementary Schools (CAFES)

Katherine Cobian
College of Science
Biological Sciences & Sociology
Alexis Doyle
College of Science
Biological Sciences & Peace Studies

Advisor: Kimberly Rollings, University of Notre Dame, School of Architecture, Dept. of Architecture

The built environment, including all of the physical components of where we work and live, is an extremely important part of public health practice and policy design. The design of the built environment can affect healthy eating, especially fruit and vegetable consumption, in elementary schools. As childhood obesity continues to affect especially low-income U.S. students who are often dependent on federally-funded breakfast and lunch programs, there is a need for a tool that can identify low- and no-cost ways schools can promote healthy eating among students. The Cafeteria Assessment for Elementary Schools (CAFES) is a reliable and objective tool that quantifies physical attributes of school cafeterias linked to selection and consumption of fruits and vegetables at the scale of individual food item, container, table/display, and room. CAFES, originally piloted in 50 schools in four states, was used to evaluate 10 additional local elementary schools in South Bend, Indiana. Results were used to refine the tool and develop low- and no-cost interventions schools can implement to improve fruit and vegetable selection and consumption among students. The poster will discuss development of the tool and interventions.

The Perception of Childhood Cancer: Do Parents and Children See Eye to Eye?

Shannon Deasey
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Sociology

Advisor: Richard Williams, University of Notre Dame, College of Arts & Letters, Dept. of Sociology

Childhood cancer accounts for 1% of all cancers. Childhood cancer most often strikes when children are in the most primal stages of development, newborn to age 15. The amount of children affected by cancer continues to rise each year, but consequently so does the rate of survival. As children continue to survive, questions regarding how children and parents view their respective illnesses arise. Do children and parent's view cancer the same? Do they see treatment and side affects through the same lens? The answer to these questions can ultimately affect the type of treatment and support children receive during cancer treatment. This affects both the parent and child during treatment. This study examines the relationship between the opinion of the child and the opinion of the parent regarding the child's cancer. Questionnaires were completed by 16 child and parent pairs at Children's Hospital and Clinics Minneapolis, and the resulting data indicated that there are indeed significant differences between how children and parents perceive childhood cancer and how they are affected in their everyday life. Questionnaires consisted of 15 questions which subjects ranked answers on a scale of 1-10. Questions were both subjective and objective in nature. Significant differences between the child and parent responses were found only with the questions more subjective in nature, as compared to the objectively natured questions that showed little difference in responses.

Crawling Across the Sun: An interview analysis of interstate corrective education

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Political Science

Advisor: Carolina Arroyo, University of Notre Dame, College of Arts & Letters, Dept. of Political Science

The United States incarcerates more people per year than any other nation in the world, and the sobering truth for some individuals locked behind bars is that their first sentence is not likely to be their last. The incarceration and recidivism crisis facing the United States stems from many origins, though some promising solutions exist. Corrective education stands as one means to address the masses of post-incarcerated individuals that return to prison at alarming rates. The United States has a complex corrections system in which individual states employ numerous tactics, programs, and policies, each with varying results. Focusing on two specific case study states, Rhode Island and New

Mexico, this project aims to provide some explanation as to how these states' approaches to correctional education could account for their discrepancies in state recidivism. Through the use of in-depth personal interviews with 16 inmates incarcerated in the states, this study uses individual testimonies to elucidate the specific translatable skills, valuable certifications, and personal empowerment that inmates obtain from corrective education. This study has uncovered valuable information on how factors such as the distribution of funding, educational program structure, and government policymaking have influenced each respective state's recidivism rates. Though it cannot be explicitly stated that this study has reaffirmed a strong correlation between participation in corrective education programs and individual recidivism, it does build upon the existing field of corrections literature. Through its examination of useful policy implications that could serve to enhance the United States corrections system moving into the future, this study succeeds by lending a voice to those who are largely omitted from scholarly literature on this subject – the inmates themselves.

Key words: corrective education, recidivism, incarceration

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Which Classroom is Best? A Comparative Study of Spanish Classes for Heritage Language Learners

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Sociology & Spanish

Advisor: Andrea Christensen, University of Notre Dame, College of Arts & Letters, Dept. of Education, Schooling, & Society

Current research highlights the advantages of complete Spanish proficiency for heritage Spanish speakers in the U.S.. According to the Linguistic Interdependence Hypothesis, developed heritage language (HL) skills transfer to the development of second language skills. For heritage Spanish speakers in the U.S. learning English as their second language, complete Spanish proficiency, therefore, contributes to the development of complete English proficiency, a predictor of academic success. Current research also argues that HL classes designed specifically for heritage language learners (HLLs) effectively promote HL proficiency and reflect either an Isolated Language Teaching or Content-Based Instruction (CBI) class design. Previous research demonstrates the benefits of each classroom design; however, current understanding of HL classes for HLLs lacks insight into whether CBI or isolated language teaching is a more effective class design for promoting complete HL proficiency. This gap in knowledge leads to the following research question: Do the HL reading skills of HLLs develop more strongly with content-based instruction or in isolated language teaching? The present study seeks to answer this question through a comparison of the reading comprehension exam scores of heritage Spanish speakers at two middle schools in the Midwest. Students at one

school were enrolled in a Spanish heritage language class that utilized isolated language teaching, while students at the other school were enrolled in a Spanish theology class being taught largely in Spanish, reflecting a CBI curriculum. Data analysis of the reading comprehension exam scores reveals improvements in the Spanish reading skills of the students enrolled in the Spanish theology course, while scores of students in the isolated language teaching course showed no change. These results suggest that CBI is a more effective class design to develop the Spanish reading skills of heritage speakers. Conclusions drawn from this study are useful in assessing the effectiveness of classroom design in promoting the Spanish reading proficiency of Spanish HLLs. This information is important and relevant given the current context of the U.S. and its rapidly growing heritage Spanish-speaking youth population.

A Computational Tool for the Insertion of Aluminum into Zeolite Frameworks

Brian Keene
College of Engineering
Chemical Engineering

Eliseo MarinRimoldi
College of Engineering
Program Not Specified

Advisors: Edward Maginn, University of Notre Dame, College of Engineering, Dept. of Chemical and Biomolecular Engineering and Kathleen Schuler, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology

Zeolites are industrially relevant for use as heterogeneous catalysts and in separation applications. The adsorption properties of a zeolite are governed by their topology and the siting of aluminum within the crystalline framework. While some aspects of the role of structure directing agents during the synthesis process of a given zeolite are understood in the context of pore formation and size, it is not yet well understood how the siting of aluminum within the framework occurs. Simple statistical rules and distributions for the prediction of aluminum siting within the framework have proven to be inadequate, as have energy minimization methods, which do not account for process conditions during synthesis of the zeolite [1](#). As such, it was deemed useful to be able to simulate zeolite frameworks under process conditions using Monte Carlo methods. In order to do this, a tool was needed which could dope zeolite frameworks with aluminum; common file formats describing the crystal structures of zeolites often only contain silicon and oxygen. The present work discusses a computational tool which can parse the pdb file of a given zeolite and can dope the zeolite to a user specified Si/Al ratio, subject to the Lowenstein rule. The script allows for the framework to be of the orthorhombic, non-orthorhombic, or triclinic crystalline geometries. An arbitrary number of unique configurations may be generated, and distributional data describing the radial distances between nearby aluminum atoms can be computed. This work represents

an early step towards making Monte Carlo simulations for the calculation of aluminum siting within a zeolite framework feasible.

[1](#) J. Dêdeček and Z. Sobalík and B. Wichterlová. Siting and Distribution of Aluminum Atoms in Silicon-Rich Zeolites and Impact on Catalysis. *Catalysis Reviews*, 2012, 54 (2), 135-223.

Si, Podemos (Yes, We Can): Youth Unemployment and the Dynamics of Spanish Politics

Anne Kuster
College of Arts & Letters
Anthropology & International Economics

Advisors: James Sullivan, University of Notre Dame, College of Arts & Letters, Dept. of Economics and Econometrics and Eva Dziadula, University of Notre Dame, College of Arts & Letters, Dept. of Economics and Econometrics

My research focuses on the recent dynamics of the intersection Spanish politics and economic crisis, particularly on how unemployment shifts young voters away from incumbent parties and towards liberal parties. Since the fall of dictator Francisco Franco, Spain has enjoyed a two-party political system that gracefully (and graciously) hands off leadership every several years between the Popular Party (PP) and the Spanish Socialist Workers' Party (PSOE). However in recent years, the 2014 birth of new socialist political parties, most notably Podemos, has changed the face of Spanish politics. For the first time in history, the 2015 general elections there was no majority winner, leaving the Spanish political system at a standstill. When combined with the disproportional levels of youth unemployment in Spain (greater than 50% in nearly all regions), these high levels of Podemos' youth popularity creates an interesting image of what could be a highly socialist future of Spanish politics. I posit that the strange result (or lack thereof) in the 2015 election is due to longstanding unemployment, particularly among youth, as well as mitigating cultural factors including lack of adequate education, strong familial ties, and lack of appropriate incentive programs. In short, my research shows that the high levels of unemployment are causing Spanish youth to lose trust in the incumbent government and furthermore move towards the radical change that Podemos and other third parties are offering. Such results are very important for the future of Spanish politics and economic policy.

Correlation of X-ray Maximum Body Width Measurements andQMR Fat Mass Measurements

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Anthropology

Advisor: W. Matthew Leevy, University of Notre Dame, College of Science, Dept. of Biological Sciences

Preclinical imaging has been widely employed in studies of obesity and metabolics. Protocols for assessing whole body and regional adipose tissue density have been reported using MRI, CT, and DEXA (Sjögren et al., 2001; Sasser et al., 2012; Metzinger et al., 2014). Additionally, ¹⁸F-FDG PET has been employed in studies of brown adipose tissue (BAT) and metabolic disease (van der Veen et al., 2012). These techniques provide for longitudinal imaging of obesity models and studies of molecular mechanisms of obesity and evaluation of candidate obesity therapeutics. The Bruker In-Vivo Xtreme provides for multimodal bioluminescence imaging (BLI), Cherenkov (CLI), fluorescence imaging (FLI), direct radioisotopic imaging (DRI), and X-ray imaging. The system has been employed in studies of BAT activity and density. Recently, Van Avermaete et al. (2013) reported on the feasibility of using direct radioisotopic imaging for ¹⁸F-FDG BAT detection. This protocol provides a means of measuring BAT metabolic activity that is significantly higher throughput compared to conventional PET imaging. Additionally, Rice et al. (2015) employed FLI to validate the lipophilic SRFluor680 agent for imaging BAT densities. Still, there are currently no methods reported for measuring whole body fat mass using the Bruker In-Vivo Xtreme.

Body Image Pressures in Males and Females

Abbey Murphy
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Sociology

Advisor: Elizabeth McClintock, University of Notre Dame, College of Arts & Letters, Dept. of Sociology

This study examines the amounts and types of pressure male and female undergraduates face in regards to body image. Its goal is to determine if the amounts of pressures males and females face are different and if those sources of pressure are different. In addition, a model of how the measures used in the survey are related to body dissatisfaction and eating pathology is proposed. Interviews add more qualitative information to the current literature on body image and contribute to a greater understanding of how pressures are conveyed to young adults. Participants include a random sample of 260 undergraduates who completed a survey and twelve who completed interviews. Both the survey and interviews address the multiple dimensions associated with body image such as eating patterns, self-esteem assessments, thin-ideal internalization, body dissatisfaction and situational body comparison.

I am still collecting and analyzing data, so there are no conclusions in my abstract yet.

Spiritual Gifts in the Whittier CA Catholic Charismatic Renewal Community

Emma Nalin
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Anthropology and Music

Advisor: Karen Richman, University of Notre Dame, of Arts & Letters, Dept. of Anthropology

The Catholic Charismatic Renewal community values personal experience with the gifts of the Holy Spirit—including but not limited to such ritual practices as healing, prophecy, and speaking in tongues. These experiences fit within the framework of a larger ritual tradition with roots in Latino Spirituality and Christian Pentecostalism. Observational research and interviews in the Charismatic community of Whittier, CA, suggest that spiritual gifts reaffirm community ties while deepening individuals' sense of spirituality. This recalls Marcel Mauss's Anthropology of the Gift, in which gifts create and maintain interpersonal relationships. Spiritual gifts likewise strengthen relationships, both among worshippers and between worshippers and the divine. This poster presents an anthropological analysis of the spiritual gift through the experiences of worshippers, while providing ethnographic context of the Whittier Charismatic community.

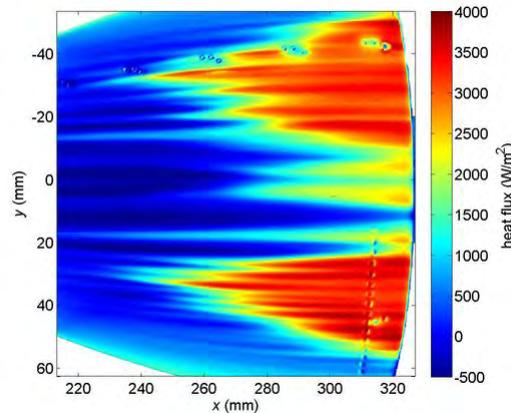
Infrared Thermography Processing of HIFiRE-5 in Quiet Flow

Laura Paquin
College of Engineering
Aerospace Engineering

Advisor: Thomas Juliano, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

Of the three components which comprise the pyramid strategy of the Hypersonic International Flight Research Experimentation (HIFiRE) program, ground testing lies at the foundation. HIFiRE-5 was developed to research the aerothermodynamics on an elliptical cone model. Experimental tests were conducted within the Boeing/AFOSR Mach-6 Quiet Tunnel (BAM6QT) to measure heat flux and identify boundary-layer transition with infrared thermography. While analogous calculations had been performed before with Temperature-Sensitive Paint (TSP), accurate depiction of the results acquired using infrared (IR) images required an investigation into the most suitable processing methods. Initially, infrared images from successive frames were merely differenced in an attempt to produce intensity profiles proportional to heat flux. Ultimately, the images were calibrated to temperature, and a second order Euler estimation was utilized to calculate one-dimensional conduction into the wall of the model. Studies of image registration, intensity-temperature calibration, and curve fitting assisted in generating images fit for transition identification. Comparison of the Euler-generated images with previous differenced images yielded a qualitative assessment of the method. Analysis of the centerline heat flux profiles obtained with TSP and two infrared thermography processing techniques provided a quantitative comparison of the

transition location identified through each method. Ultimately the transition to turbulence identified by infrared thermography was found to occur within 6% of the location found by TSP for Reynolds numbers of $9-12 \times 10^6$ /m. Different criteria determined the amount of transition uncertainty in each IR study; in the initial study, uncertainty accounted for 2-4% of the average transition length, and in the final study, uncertainty encompassed 2-6% of the average transition length. Altogether, cases with the smallest amount of uncertainty demonstrated the best agreement among TSP and both IR-processing methods.



BROTHERS YESTERDAY, BROTHERS TODAY: An Ethnohistory of the Pokagon Band of the Potawatomi and the Three Fires Confederacy

Daphne Reynolds
College of Arts & Letters
Anthropology

Advisor: Jada Benn Torres, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology

The Ojibwe, the Odawa, and the Potawatomi forged powerful historical alliances among themselves that was known as both the Three Fires Confederacy and the Council of the Three Fires. This coalition influenced the history of the Great Lakes region and the balance of foreign powers on the North American continent during the early period of colonization. This poster details an ethnohistory about the associations and networks between these three major Native American groups. In this study I compare oral history from members of the Pokagon Band of Potawatomi and tribal literature, languages, and tradition from Pokagon, the Ojibwe, and the Odawa, with treaties, outside histories and accounts of this socio-political organization, in order to fully comprehend how these three tribes are connected and explore the possibility that they might share a common ancestor.

Cross-Cultural Ethical Case Study

Priscilla Rumbelha
Mendoza College of Business
Business Undeclared & French

Marie-Anne Roche
Mendoza College of Business
Business Undeclared

Ailsa Xing
Mendoza College of Business
Business Undeclared & Chinese

Advisor: Jessica McManus Warnell, University of Notre Dame, Mendoza College of Business, Dept. of Management

This case study examines the social and economic implications of outsourcing production from a fictional American-based company to a city in a developing country. It outlines the decision-making process of a founder of a textile rug company based in Detroit, Michigan whose dismal financial situation has been pushing this CEO to consider outsourcing its operations to Entebbe, Uganda. This study also raises the importance of considering not only financial but ethical implications of business decisions. When considering outsourcing, a business must take into account the jobs lost in the original production process as well as the jobs gained in the new location. The research explores both the individual decision-making issues facing this CEO, as well as the organizational and societal context. Social impact, especially on marginalized women in Uganda, also cannot be brushed aside. Lastly, we will demonstrate how gender roles play a significant role in the business world, perhaps in unexpected ways. This case is a useful teaching tool for students to examine the ethical implications of business decisions. It is designed to be used by students studying business and publication is the goal. It was created by Marie-Anne Roche, Priscilla Rumbelha, and Ailsa Xing, in collaboration with Jessica McManus Warnell, Associate Teaching Professor in the Mendoza College of Business Department of Management, and Joan Dubinsky, former Chief Ethics Officer at the United Nations and a Visiting Scholar at Notre Dame. The project was an opportunity for students and faculty to work together to explore cutting-edge issues in international business ethics in a way that involved student-led research.

A Critical Review on the Triggers of Disordered Eating in Binge Eating Disorder

Monica Simon
College of Science
Neuroscience & Behavior

Advisor: Kristin Rudenga, University of Notre Dame, Kaneb Center for Teaching and Learning

Binge Eating Disorder (BED) is an eating disorder characterized by consistent episodes of uncontrollable eating without subsequent purging episodes. BED is the most common eating disorder in the United States, affecting 3.5% of women, 2% of men. This number increases to 30% within the American population suffering from obesity. As prevalent as BED is, much speculation remains as to the neurobiological factors that contribute to onset and maintenance of the disorder.

Many studies have debated whether it is a stronger motivation to eat or the lack of satiety perception that leads to disordered eating in patients with BED. Stronger motivation to eat would suggest a mechanism involving stress as a trigger and emotional regulation dysfunction in response. This would implicate the hypothalamus-pituitary-adrenal axis in the brain which releases the hormone cortisol in response to stress. Lack of satiety perception would perhaps involve the reward circuitry in the brain, particularly the dopaminergic system. Which of these mechanisms is more influential? In this literature review poster, I will explore current literature on the role of both the dopaminergic system and the HPA axis in binge eating disorder.

Ultimately, the aim of this review is to sort through the robust and complex body of research on the neurobiology of BED in order to investigate the degree to which each mechanism plays a role in BED dysfunction and hypothesize further directions for intervention.

Examining the Dimensions of Religiosity

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Psychology and Theology

Advisor: Darcia Narvaez, University of Notre Dame, College of Arts & Letters, Dept. of Psychology

Many researchers use single-item assessments of religiosity/spirituality in their research, as it saves time and has been shown to be an acceptable and reliable assessment of intrinsic religious orientation (Gorsuch & McFarland, 1972). Furthermore, studies that have attempted to explore multiple religiosity dimensions or factors of have found that the structure of their factors was merely a function of the number of religious people in the sample (Joesph & Diduca, 2007). However, other researchers suggest that religiosity cannot be explored fully through a uni-dimensional model, particularly when assessing the relationship between religiosity and other factors, such as personality (Dezutter, Soenens, & Hutsebaut, 2006). In this study, we compare the effectiveness of the single-item measure of religiosity against a composite multidimensional assessment tool, correlating each with several assessments of moral capacities (e.g., empathetic concern for others, perspective taking ability, and eco-mindedness) to examine whether different expressions of religiosity were associated with a higher or lower level of moral development. Three waves of American adult participants (N1= 450, N2= 409, N3=650), recruited through Amazon Turk, completed a survey consisting of the new Religio-Spiritual Assessment Tool (RSAT), a single-item measure of religiosity, several morality

assessments, and several preexisting religiosity assessment models. Factor analysis revealed five distinct dimensions within RSAT. The factors were internally stable ($\alpha > .8$ for all), and we hoped that they would serve as new, universal variables for assessing religiosity. Thus, we subsequently compared them to several existing measures of religiosity, as well as the single-item measure and several morality measures. While the correlations for RSAT were significant and strong in some cases, the measure was outperformed by at least one (but usually multiple) measures at predicting scores on other measures, including religious fundamentalism and other spirituality measures. As a whole, the RSAT factors were also unable to predict outcomes on measures of moral faculties as consistently or strongly as existing religiosity measures. Interestingly, the single-item measure performed better than RSAT (and most other measures) in almost every factor in which they were compared, lending support to the confirmation that a single-item measure is no less effective in assessing religiosity than complex models.

Uranium Nanocluster Sorption to Quartz and Hematite

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Environmental Engineering

Amy Hixon
University of Notre Dame
College of Engineering
Dept. of Civil Engineering and Geological Sciences

Luke Sadergaski
College of Engineering
Civil & Environmental Engineering & Earth Sciences

Jennifer Szymanowski
College of Engineering
Civil & Environmental Engineering & Earth Sciences

Advisor: Amy Hixon, University of Notre Dame, College Not Specified, Dept. of Civil Engineering and Geological Sciences

Nuclear energy offers a unique, emission-free opportunity to bridge the gap in energy production between fossil fuels and renewable sources. However, reactor safety concerns and an increasing accumulation of used nuclear fuel have led to increased skepticism of nuclear power. Uranyl peroxide nanoclusters may hold the key to developing an advanced nuclear fuel cycle that would challenge these public perceptions; investigating how these clusters interact with solid phases is important to developing a fundamental understanding of their chemical and physical properties.

This study attempts to understand the interaction of the uranyl peroxide nanocluster U_{60} ($[UO_2(O_2)(OH)_{60}]^{60-}$) with quartz (SiO_2) and hematite ($\alpha-Fe_2O_3$). Batch sorption experiments were used to monitor the partitioning of U_{60} between the aqueous and solid

phases as a function of time, U_{60} concentration, and mineral concentration. Initial results show that U_{60} remains in the aqueous phase even after one month whereas 20% sorption of U_{60} is observed in the presence of hematite over the same time period.

The role of social networks in shaping medical student empathy in Puebla, Mexico

Rebecca Wornhoff
College of Arts & Letters
Anthropology & PreHealth Studies

Bernadette Miramontes
College of Science
Biological Sciences & Anthropology

Edna Martinez
College Not Specified
Anthropology

Lauren O'Connell
College of Arts & Letters
Anthropology & PreHealth Studies

Vania Smith-Oka
University of Notre Dame
College of Arts & Letters
Dept. of Anthropology

Alexandria KristensenCabrera
College of Science
Science-Business

Advisor: Vania Smith-Oka, University of Notre Dame, College of Arts & Letters, Dept. of Anthropology

Despite over forty years of research, the processes underlying the loss of empathy (i.e. an ability to cognitively and emotionally understand another's perspective) in medical students are not well understood. The decline paradoxically occurs when students begin contact with patients. In particular, the role of social interactions and networks in empathy decline has not yet been explored. The objective of this study was to identify if, when, and how empathy declined among medical students—particularly the role of students' social networks in this decline. The central hypothesis that guided this research was that significant drivers of empathy of medical students were the clinical social networks to which they belonged, including authorities, peers, and mentors at hospitals/clinics. This poster focuses on research conducted at one medical school in Puebla, Mexico on the peer networks of medical student. Specific interdisciplinary methods used were participant observation and semi-structured interviews, a position

generator, the Toronto Empathy Questionnaire (TEQ), and an 11-question name generator survey of medical students' personal networks. From 98 interviews conducted in 2013 and 2014, there was a statistically significant negative association between average position generator data (personal social standing based on family/ close friend careers) and empathy levels ($p < .01$). There was no significant difference in the average social position between male and female medical students. In interviews, students across ages and semesters expressed empathy as an important value for doctors and mentors to possess. Further research will explore the role of mentors in transferring knowledge and attitudes to medical students.

Oral Presentations Session 3

12:00 – 1:00 pm

Reevaluating Gendered Stigmas – HL 103

Consequences of Teenage Childbearing Reconsidered

Wei Lin

Mendoza College of Business

Accountancy, Chinese, and Economics

Advisor: Kasey Buckles, University of Notre Dame, College of Arts & Letters, Dept. of Economics

I will attempt to understand the true causal effects teenage motherhood has on the lives of women. Teenage pregnancy, as well as teenage motherhood, is widely viewed as a social problem, and women are often advised to delay childbearing. Early research has suggested that teenage mothers are more likely to live under the poverty line and rely on government welfare programs. In the recent decades, however, researchers have challenged the findings of earlier research. They questioned whether previous results showed the causal effects of teenage childbearing or selection-based effects, or both. Many have attempted to differentiate and isolate the causal effects of teenage childbearing from the selection-based effects. One team of researchers, through the use of various innovative methods, suggest that women who are more likely to become teenage mothers are no better off delaying childbirth. Using the methods they employed in their research, namely the use of miscarriages as an instrumental variable, I will attempt to understand the effects of teenage childbearing on women's psychological health and their propensity to engage in health-adverse behaviors. The results from my research indicate that women who delay childbirth are no better off than teenage mothers; in fact, teenage mothers have higher levels of self-esteem and are less likely to suffer from depression. These findings suggest that research regarding the consequences of teenage motherhood should take into consideration the circumstances and environment surrounding these women's upbringings. The results also challenge traditional stigma of teenage pregnancy. Perhaps these pregnancies are not unplanned; perhaps these pregnancies are the results of rational decision-making that researchers have overlooked.

Islam and Pageantry: Great or Tiara-ble?

Kyle Witzigman
College of Arts & Letters
Mediterranean and Middle East Studies and Political Science

Advisor: Li Guo, University of Notre Dame, College of Arts & Letters, Dept. of Classics

How do states with large Muslim populations view women competing in pageants? Sharia law in these countries can be closely related to the regime or it can be a distant thought. Since a majority of the members of Islam are not concentrated in the Arab world, various cultural, social, and theological foundations may affect perspectives regarding women and pageantry. The framework of an 'Islamicate' realm provides a method to probe how sharia law is adopted, applied, and interpreted in a regime's given context. I argue: If a state has strong ties to sharia law in its national law, then it will forbid or discourage pageantry; whereas if the country is secular or has a mixed law approach that combines aspects of sharia and secular law, then pageantry will be permissible. Under sharia law, people aim to cultivate virtue and control vice, which can manifest itself in a community expectation where women are supposed to dress modestly. By examining a selection of regimes in the Islamicate realm, I explore viewpoints on Islam and pageantry and how philosophical and theological ideals on vice and virtue translate into real world applications.

Media in the Political Realm – HL129

Political Satire in HBO's Veep

Raquel Dominguez
College of Arts & Letters
Film, Television, and Theatre and Political Science

Advisor: Susan Ohmer, University of Notre Dame, College of Arts & Letters, Dept. of American Studies and Film, Television, and Theatre

Veep, a critically acclaimed comedy starring Julia Louis-Dreyfus as Vice President of the United States, is a bright spot in the television landscape, providing viewers not only with frequent laughter, but also with a fresh satire of contemporary American politics that is biting and poignant. *Veep* transcends pure entertainment and carves out a space to be powerfully subversive.

I was inspired to analyze HBO's *Veep* after learning about the impact that satirical news programs, such as *The Daily Show*, have on politics and public opinion. Fictional

political programming such as *Veep* is in a unique position to contribute to public discourse (and ignite political change) due to its ability to hold a mirror up to society while maintaining a degree of separation due to the fact they are operating in a ‘fictional’ world—though that world oftentimes largely resembles and comments on contemporary American politics.

I argue that *Veep*’s satire of American politics is effective because it strives to provide an authentic portrayal of American politics, primarily through its use of “ripped from the headlines” narratives. This, when paired with the program’s overall cynical perspective regarding the state of U.S. politics, provides a fertile ground for comedy that challenges traditional sources of power—giving it the ability to influence both viewers and even politics. *Veep* not only satirizes the dysfunctional state of American politics, but also contributes to larger societal discussions regarding institutional sexism, work-life balance, and our media-dominated culture. *Veep*’s continued existence is especially important in the context of the upcoming 2016 presidential election, where there is a significant possibility that former Secretary of State Hillary Clinton can become the first female president of the United States—a possibility that *Veep* has introduced into contemporary public discourse through the character of Selina Meyer.

Where Have All the Manly Journalists Gone?: Gender and Masculinity in Representations of Journalists on American Prestige Television

John Rooney
College of Arts & Letters
Political Science & American Studies

Advisor: Darlene Hampton, University of Notre Dame, College of Arts & Letters, Dept. of American Studies and Jason Ruiz, University of Notre Dame, College of Arts & Letters, Dept. of American Studies

This thesis seeks to explore performances of masculinity in American pop culture representations of journalists. I will begin with a brief overview of the history of journalist characters in popular culture, which were mostly concentrated in feature films including *Citizen Kane*, *All the President’s Men*, and *Good Night and Good Luck*. Then, I will explore the transition of such representations away from movies and towards a brand of television that emerged in the late 1990’s and early 2000’s, which I will call “prestige television.” High quality, cinematic television shows like HBO’s *The Wire* and *The Newsroom*, Starz’s *Boss*, and the Netflix original series *House of Cards* all prominently feature journalist characters that both fall into and complicate the earlier cinematic tropes of masculine journalists.

The television shows and films that I will critically analyze will serve as my primary sources, as texts produced for mass consumption that play an important role in shaping perceptions of gender roles, and in particular, masculinity. I will ground my research and writing in scholarly secondary sources that focus on pop culture and media studies and gender studies. I will also use my previous experience in journalism to argue why

American journalists are a critically important part of American democracy and national identity, and thus why the way in which they are portrayed in our popular culture is both powerful and potentially dangerous. Ultimately, combining my interests in popular culture, journalism, and gender studies, I will situate my argument within the field of American Studies and show how journalists “in the movies” relate to how Americans understand their country and identity.

Media as a Psychological Tool of Colonialism/Imperialism

Mary Tull
College of Arts & Letters
Psychology

Advisor: Emmanuel Cannady, University of Notre Dame, College Not Specified, Dept. of Sociology

This research project examines how media throughout history has served as a psychological tool of colonialism and imperialism, specifically for Western imperialist nations upon indigenous people, people of African descent, Central and South Americans, and other colonized nations and peoples. This will connect media control (especially in the arts) that took place during and soon after colonization to modern media, especially in television, film, and news. Many parallels exist between early imperialist media and today’s media that may whitewash, stereotype, or blame victims of racism. The underlying assumption is that the goal of this media is to serve as propaganda that will psychologically manipulate both those it shames and those who benefit from it to maintain the system of colonialism or racism at hand and not challenge or call for liberation. Early media in colonial times did have the purpose of subjugation and instilling Western norms, as well as maintaining systems of slavery. In modern day, profit remains a main goal, in particular maintaining a system of capitalism that mainly benefits white Americans. Some examples of deviations from this form of media will also be examined, and how these forms have either been rejected by the mainstream or capitalized upon and manipulated to assert the mainstream values. While the argument here will mainly focus on race, these findings can possibly be generalized to questions of gender, sexual orientation, class, etc. These issues of course overlap, and so it is probable that there will already exist evidence for these issues in the findings.

Territorial Expansions & Assimilation – HL 222

Bases for Decision: An Examination of Russia’s Decision to Annex Crimea in 2014

Abby Davis
College of Arts & Letters
Political Science

Advisor: A James McAdams, University of Notre Dame, College of Arts & Letters, Dept. of Political Science

This thesis seeks, first, to identify the key factor(s) that influenced Russia's decision to annex the Crimean Peninsula in 2014 and, second, to draw on this analysis to make predictions about Russia's foreign policy over the next several years. To that end, the thesis critically examines the four principal accounts of Russia's motivations that have figured into debates in the media and in academic circles. These accounts are based on:

1. Russia's claim to be protecting the rights of Russian-speakers in Crimea
2. Putin's desire to bolster his domestic political popularity
3. Russia's strategic interest in keeping Ukraine (and other former Soviet republics) from joining of NATO, and
4. Russia's strategic interest in securing its increasingly tenuous access to the Sevastopol naval base in Crimea.

Ultimately, the most compelling explanation – and the only one capable of successfully accounting for the timing of Russia's intervention – is the fourth, the Sevastopol Explanation.

A Pilot Study: Adult Refugee Education as a Means of Preventing Radicalization

Bridget Rickard
College of Arts & Letters
Peace Studies and Philosophy

Christopher Lembo
College of Arts & Letters
International Economics

Francesco Tassi
College of Arts & Letters
International Economics & Peace Studies

Advisor: William Purcell, University of Notre Dame, College Not Specified, Dept. of Theology

Katholische Universität Eichstätt-Ingolstadt, the only Catholic University in Germany main outreach program, tun.starthilfe, offers German language courses, job skill training, community integration activities, and cultural immersion experiences to refugees in both Eichstätt and Ingolstadt Germany in the hopes of helping refugees successfully integrate into German society. This project explores to what extent the various courses and outreach programs offered by Katholische Universität Eichstätt-Ingolstadt to adult refugees in Germany can successfully facilitate the process of social assimilation for adult refugees and thereby decrease the possibility of radicalization amongst the adult refugee population, as research shows that social exclusion is one of the main factors that contribute to an individual's openness to extreme ideologies.

Existing literature shows that the education of youth within vulnerable populations drastically reduces the possibility for radicalization. However, little research exists on

how the education of adults within vulnerable populations can prevent radicalization. Therefore, this pilot study focuses on the extent to which the education of adult refugees can successfully facilitate the process of social assimilation and thus reduce the possibility of adult refugee radicalization. Broadly speaking, the project entails an extensive literature review, on-site interviews with several students, staff members, and administrators at Katholische Universität Eichstätt-Ingolstadt, as well as interviews with refugees, visits to various refugee camps in Bavaria, Germany, and interviews with Bavarian civil servants. This pilot study will add to the rather limited pool of existing literature on the correlation between adult refugee education, social assimilation, and the possibility of radicalization.

***USC Reception and Undergraduate Library Research Awards
Presentation – HL Fishbowl, 1:00 – 2:00 pm***

Information will be added when the winners are announced.

Biomechanics Symposium

Multidisciplinary Engineering Research Building, Room 103

10:00 am

Make no bones without it: Characterization of region-specific behaviors in non-sutural cranial osteoblasts using Bone Morphogenetic Proteins

Justin Brill
College of Science
Biological Sciences

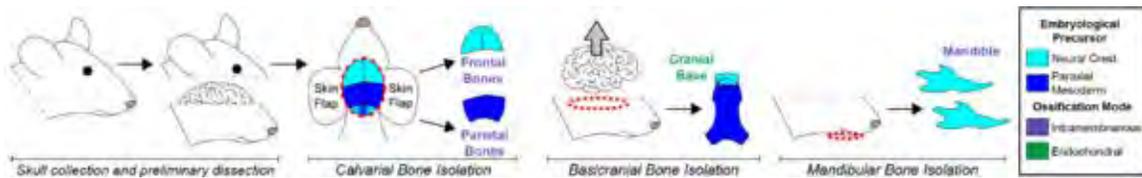
Holly Weiss-Bilka
College of Science
Biological Sciences

Advisor: Matthew Ravosa, University of Notre Dame, College of Science, Dept. of Biological Sciences

It has previously been demonstrated that osteoblasts (oBs) isolated from long bones differ significantly in their response to both chemical and mechanical stimulation vs. bones in the cranium. These findings have challenged the assumption that any oBs, regardless of skeletal location, can be used as a universal model of bone development. Our understanding of craniomandibular oB biology is further complicated by regional differences in ossification mode, embryological origin and loading environment. Characterizing normal oB differentiation at multiple cranial sites will be key to improving current craniofacial clinical interventions and will lay the groundwork for generating new hypotheses regarding craniomandibular development in mammals and other vertebrates.

Previous work has shown basicranial osteoblasts (BoBs) do not respond to traditional osteogenic induction, so a novel treatment method was explored. Bone Morphogenetic Protein 6 (BMP6) was chosen as a potential induction cytokine due to its previous success in inducing mineralization of adipose-derived stem cells. Primary BoBs were isolated from neonatal mice, then micromasses and cell pellets were formed at high densities to mimic in vivo cellular attachments and conditions. Micromasses were treated for 6 weeks under traditional osteogenic media or traditional media supplemented with BMP6. Alcian Blue staining showed that BMP6 was a potent inducer of chondrogenesis, while Alizarin Red staining showed the induction of pervasive mineralization in BoB micromasses. Genetic analysis using qRT-PCR showed significant increases in the expression of osteogenic and hypertrophic markers in BMP6 treated cells along with a marked decrease in proliferative markers. Scanning electron microscopy showed that the treatment group produced a denser extracellular matrix, secreting higher quantities of materials from the cell surface.

Taken together, this identified BMP6 as a potent inducer of mineralization in BoBs, and may play a key role in the in vivo pathway of basicranial development. However it is possible that BMP6 is a non-specific inducer and not part of an intrinsic pathway. Therefore, further experiments are ongoing to determine the specificity of BMP6 to BoBs as well as evaluate the ability of other BMPs to induce mineralization in cranial hard tissues.



3D Tumor Microenvironment Model for Breast Cancer using PEG and GelMA microwells

John Casey
College of Engineering
Chemical Engineering

Advisor: Pinar Zorlutuna, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

Metastatic cancer has a high mortality rate and is difficult to treat because the mechanism for tumor metastasis is unclear. The distinctly heterogeneous tumor microenvironment is involved in tumor growth, metastasis, and drug resistance. Mimicking this diverse microenvironment is essential for understanding tumor growth and metastasis. Current cell culture models have made substantial scientific progress, however, in vitro 3D models are necessary for simulating organ-specific tumor microenvironments. PEG and GelMA hydrogels were patterned with a microwell array to simulate the surrounding extracellular migration. Breast cancer cells studied in both mono-culture and co-culture 3D models were shown to be viable for up to five days. Cell viability, migration, and metabolic activity were studied in this experiment. The results of this 3D model demonstrate that it can provide a platform for new studies of cancer cell interactions with other cells and their environments.

Rabbit Model of Osteonecrosis of the Jaw

Maura Eveld
College of Engineering
Mechanical Engineering

Advisor: Glen Niebur, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

Bisphosphonate therapy is commonly given to cancer patients with bone metastases (intravenous) and osteoporosis patients (oral). Especially linked to oral trauma or oral treatment complications, in many cases patients undergoing bisphosphonate therapy experience cases in which the soft tissue lining does not heal and the bone is exposed. This leads to bone death, or osteonecrosis of the jaw. In this experiment, three rabbit groups were studied: a control group, a group that was given a normal diet with bisphosphonate therapy, and a group that was given a diet that reduced bone quality. Each rabbit received an oral wounding on one side of its jaw. By performing a four-point bending test on both sides of each rabbit's jaw, the intact jaw can be compared to the wounded jaw for each group using each jaw's calculated modulus of elasticity. From this, the effects of bisphosphonate therapy can be enumerated.

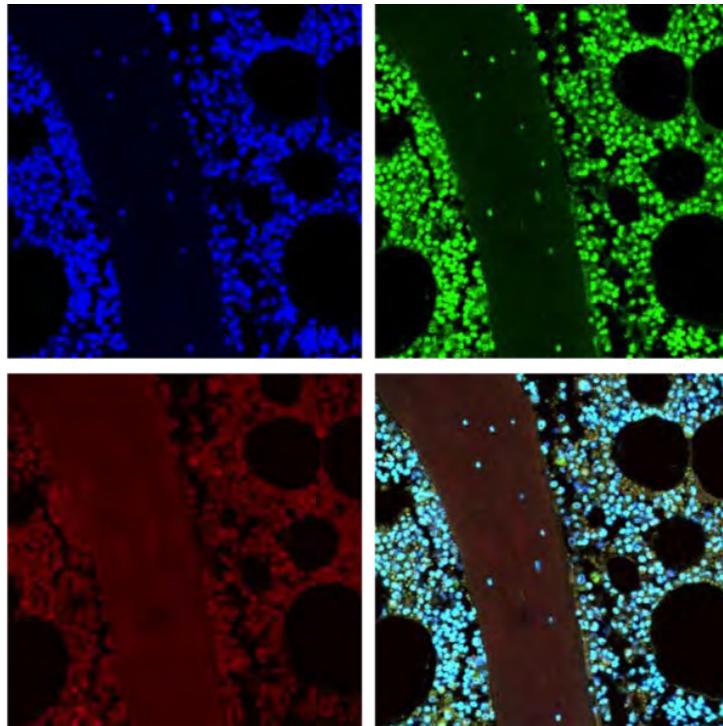
The Role of Cell-Cell Interactions in the Mechanotransduction of Trabecular Bone Marrow

Angela Patel
College of Science
Neuroscience and Behavior

Advisor: Glen Niebur, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

Osteoporosis is a disease characterized by low bone mass and increased risk of bone fracture affecting over 200 million people worldwide. The development of a treatment for osteoporosis that incorporates the natural cycle of bone maintenance would provide a safer alternative to the current treatments. It is known that frequent loading-static cycles during physical activity increases bone mass. Therefore, bone adaptation response to different mechanical stimuli is being investigated. Trabecular bone explants from ovine vertebrae were cultured in custom in situ bioreactors and loaded with low magnitude mechanical stimulation (LMMS) at 0.3 g, 30 Hz for 5 hours/day for 5 consecutive days. The bone cores will be compared to explants cultured in static culture and explants harvested on Day 0. After the bone tissue were sectioned, immunohistochemistry (IHC) was conducted to determine the expression of N-cadherin, actin, and cell nuclei within the trabecular bone marrow of the specimens. Specifically, a DAPI stain (F6057, Sigma-

Aldrich) was applied to visualize cell nuclei within the bone and bone marrow (seen in blue) (Fig. 1). To visualize N-cadherin, a critical membranous protein required for cell-cell binding, a primary N-cadherin antibody (76057, Abcam) and Alexa Fluor 488 (711-095-1520, Jackson Immuno) secondary antibody were applied (seen in green) (Fig. 1). Additionally, a TRITC Phalloidin stain, which labels actin red, was applied to better visualize the localization of the Ncad on the cell surface (Fig. 1). The images were captured using a 40x oil immersion lens on a confocal fluorescence microscope, and image analysis was performed with ImageJ. This data will be used to compare bone marrow N-cadherin expression between the mechanically- and statically-loaded groups. This work will illustrate the role of cell-cell interactions on bone marrow cell mechanotransduction within trabecular bone marrow during mechanical stimulation. Understanding the mechanotransduction of bone marrow opens the door for alternative treatments for osteoporosis.



A Simulation of Bipedal Walking on Inclines and Declines

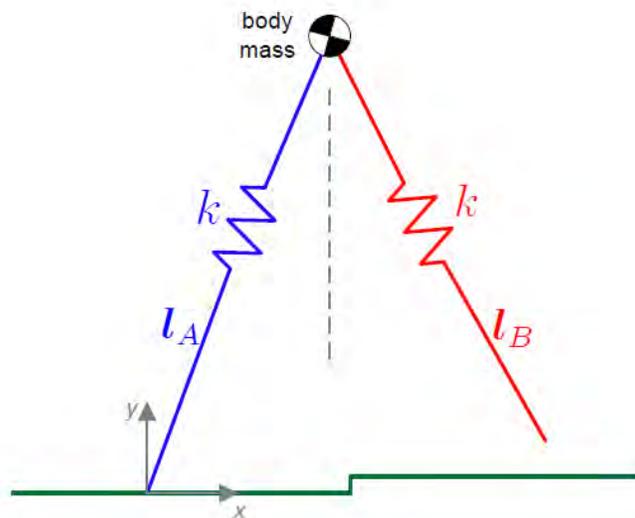
Ana Pervan
College of Engineering
Mechanical Engineering

Advisor: James Schmiedeler, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

Biped robots have become of increasing interest to the scientific community in recent years, as they have potential to be useful in a wide variety of applications. Likewise, modeling the dynamics of human walking is an exciting and challenging research topic

that has utility for robot design, robot control, and human rehabilitation. This presentation demonstrates one approach that has been taken to model bipedal walking on inclines and declines.

A bipedal spring-mass model called the Dual Spring-Loaded Inverted Pendulum (Dual-SLIP) was employed to simulate the dynamics of human walking. It consists of a point mass and two massless legs with springs of equal stiffness, and it has been shown to produce periodic gaits over flat surfaces. Complications arise when one tries to extend the model to include walking on inclines and declines, as shown in the figure below, because the potential energy of the system changes with each step. It is no longer a conservative system, which necessitates modifications to properly account for the addition and absorption of energy. One approach to achieve this allows the free lengths of the leg springs to vary throughout the gait. Previously, this model has aided in the control of humanoid robot walking, but the present work seeks to apply the model to human walking. This research can be used to better interpret experimental data collected from individuals undergoing a novel rehabilitation program of downhill treadmill training, following spinal cord injury.



Human Bone Intracortical Porosity

Jesse Suter
College of Engineering
Mechanical Engineering

Advisor: Glen Niebur, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

Intracortical porosity increases with age and causes a decrease in material properties such as elastic modulus, ultimate stress, and fracture toughness. Specimen specific nonlinear finite element models that include pores, anisotropic elasticity (based on mineralization levels and fatigue damage), and element deletion (to simulate fracture) are analyzed. Correlations between model predicted failure sites and sites of pores, high mineralization, and fatigue damage are analyzed.

UNDERSTANDING THE ROLE OF INSULIN ON MESENCHYMAL STEM CELL DIFFERENTIATION, IN EX VIVO CELL CULTURE

Mary Alyssa Varsanik
College of Engineering
Chemical Engineering

Tyler Kreipke
College of Engineering
Bioengineering

Advisor: Glen Niebur, University of Notre Dame, College of Engineering, Dept. of Aerospace and Mechanical Engineering

The bone marrow niche in trabecular bone contains mesenchymal stem cells (MSCs) that differentiate into a variety of cells including osteoblasts and adipocytes (bone and fat cells). The ratio of osteoblast and adipocyte differentiation affects the overall composition of the niche. The purpose of my research is to understand what factors induce differentiation of MSCs, particularly to the osteoblastic and adipogenic lineages. Many research papers have already been published on the effects of insulin on the bone marrow matrix. However, published research has shown insulin as both an osteogenic and adipogenic MSC differentiating inducer. I performed a series of experiments to pinpoint more exactly how and when insulin affects the MSC differentiation process. In the first experiment, I verified that the supplements in the media are not crystallizing and therefore not interfering with subsequent assays. The second experiment considered the effect of insulin on differentiation, specifically if insulin acts as a “switch” in the beginning of the cell differentiation process or if it is needed throughout the entire duration of cell culture. The purpose of the third experiment was to quantify alkaline phosphatase, a cell differentiation marker, within differentiating MSC cultures in the presence and absence of insulin.